NURSES' KNOWLEDGE, PRACTICE, AND BARRIERS IN IMPLEMENTING PRESSURE ULCER PREVENTION CARE BUNDLES IN ICU OF SELECTED REFERRAL HOSPITALS

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By

Twalibu A. Hussein

A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Masters of Science in Nursing (Critical Care and Trauma) of Muhimbili University of Health and Allied Sciences

October, 2024.

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: '**Nurses' Knowledge, Practice and Barriers in Implementing Pressure Ulcer Prevention Care Bundles in ICU of Selected Referral Hospitals**.' in partial fulfillment of the requirements for the degree of Master of Science in Nursing (Critical Care and Trauma) of the Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam, Tanzania.

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DECLARATION AND COPYRIGHT

I, TWALIBU ABDALLAH HUSSEIN declare that this dissertation is my original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature …….Date ……

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DEDICATION

To my Parents

ABDALLAH HUSSEIN and HAWA ALLY,

‘For always loving and supporting me.

To my wife’s

AISHA RAMADHANI AND NURAIN MKOPI

For appreciating me all the time.

ABSTRACT

Background: Most patients admitted to intensive care units (ICUs) still struggle with pressure ulcer prevention, especially in developing countries. Pressure ulcer prevention bundles are considered essential for lowering the incidence of pressure ulcers in patients referred to intensive care units. There is little information available in Tanzania regarding the difficulties faced by nurses in implementing the pressure ulcer treatment bundle.

Aims: Examining nurses' practices, knowledge, and barriers in applying pressure ulcer prevention care bundles in intensive care units at particular referral hospitals in Dar es Salaam, Tanzania, is the study's main goal.

Methodology: Analytical, cross-sectional study design was employed. The study was conducted at (MNH, JKCI, and MOI). The data was gathered via a self-administered questionnaire. A simple random sampling with a stratified approach was employed to select 112 study participants. The data was evaluated using both descriptive and inferential statistics using SPSS software version 26. A bivariate analysis was carried out with $p<0.2$, which was deemed fit for a multivariate analysis which set the p-value <0.05 as statistically significant.

Results: The study revealed that most of the participants (65.2%) had insufficient knowledge of the pressure ulcer prevention bundle. It was noted that working institutions, level of education, and training were associated with nurses' knowledge of pressure ulcer prevention bundles. (AOR = 10.082, 95% CI: 1.578–64.403, P = 0.015), (AOR = 33.334, 95% CI: 2.478–448.479, P = 0.008), and (AOR = 0.231, 95% CI: 0.077-0.695, p = 0.009) respectively. Moreover, only 42% of respondents had good practice in pressure ulcer prevention bundle implementation. It was found that only training was associated with nurses' practice on pressure ulcer prevention bundles. (AOR = 2.758, 95% CI: 1.18-6.437, P = 0.019. Most barriers reported were insufficient pressure ulcer prevention bundles and the absence of courses offering specialized training on preventing pressure ulcers in the workplace.

Conclusion: The majority of the respondents had insufficient knowledge and practice in pressure ulcer prevention care bundles, and this was associated with the presence of barriers hindering nurses in the proper implementation of this tool for patients admitted to ICUs. Due to insufficient knowledge and practice in pressure ulcer prevention bundle continuous professional training for nurses working in ICUs is important.

KEY TERMS. The pressure ulcer prevention care bundle, Braden scale, Pressure Ulcer, critically ill Patients, National Referral Hospital.

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LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
COR	Crude odds ratio
EPUAP	European Pressure Ulcer Advisory Panel
ICU	Intensive Care Unit
JKCI	Jakaya Kikwete Cardiac Institute
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
NPUAP	National Pressure Ulcer Advisory Panel
PIA	Pan Pacific Pressure Injury Alliance
RNAO	Registered Nurses Association of Ontario

OPERATIONAL DEFINITIONS OF KEY TERM

The pressure ulcer prevention care bundle refers to a comprehensive and systematic set of evidence-based interventions and protocols that are carried out by nurses in critical care units. This bundle includes a variety of tactics designed to reduce the likelihood that critically ill patients will acquire pressure ulcers. These strategies may include but are not limited to, regular patient repositioning, skin assessments, moisture management, nutritional support, and the use of specialized pressure-relieving devices. (1).

Braden scale- is an evidence-based, standardized diagnostic technique that is frequently used in intensive care units to identify individuals who may be at risk of developing pressure ulcers. It includes sensory function, hydration, activity, mobility, nutrition, shearing force, and friction—the six standard risk assessment criteria. (2–4).

Pressure Ulcer- is a localized injury, generally over a bony prominence, brought on by persistent pressure, shear, or friction on the skin and/or underlying tissue. Pressure ulcers in critical care units can appear as full-thickness sores or as patches of skin breakdown ranging from moderate erythema. These wounds result in tissue ischemia and necrosis because the damaged area is not receiving enough blood or oxygen. State of ill health with vital organ dysfunction, high risk of imminent death if care is not provided, and the potential of reversibility

(1).

Critically ill Patients- Patients in intensive care units with vital organ dysfunction, high danger of impending death if care is not given, and the possibility of reversibility in addition to a high risk of developing pressure ulcers. These patients have vital organ dysfunction, such as lung problems, cardiovascular, renal, or neurological problems. (5).

Critical care nursing- is the specialty within nursing that deals specifically with human responses to life-threatening problems. (5,6).

National Referral Hospital – The national referral hospital in this study is made up of the Jakaya Kikwete Cardiac Institute, the Muhimbili Orthopedic Institute, and the Muhimbili National Hospital (Upanga and Mloganzira).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Pressure ulcers can be defined as the tissue beneath becoming injured due to a decrease in circulation around it as the result of compression between external surfaces and bony prominence for a long period. (7).

According to reports, 12.8% of patients admitted to intensive care units (ICUs) globally have pressure ulcers, with Stages I and II being the most prevalent stages. (8). The prevalence of pressure ulcers in African countries is reported to be higher compared to developing countries, ranging from 3.4% to 18.6% for patients admitted to medical and surgical ward ICUs, and those with spinal cord injury prevalence pooled to 44%. (9,10). A study conducted in Tanzania at Muhimbili Orthopedic Institute in 2020 indicated that 19% of 267 patients had pressure ulcers. (11).

It is possible to stop pressure ulcers from forming in the critical care unit if there is early implementation of preventive measures and identification of patients at risk. This can help to reduce costs and the number of patients staying in the hospital. (12). Tanzania's critical care units encounter several issues that lead to an increase in the incidence of pressure ulcers, including inadequate continuous use of pressure ulcer prevention bundles, quick identification of patients at risk of developing pressure ulcers, and pressure ulcer management costs (11).

The series of evidence-based management and care measures for the prevention of pressure sores is known as the pressure ulcer prevention bundle, commonly known as the patient care bundle or nursing cluster bundle. (1). Support surfaces, nutrition, risk assessment, skin assessment, and repositioning are the five components that make up this bundle. (1,13).

Implementation of acceptable standards of care related to pressure ulcers should be done and prioritized for hospitalized patients to prevent the incidence of pressure ulcers. The European

Pressure Ulcer Advisory Panel (EPUAP) establishes and regularly evaluates pressure ulcer therapy guidelines based on research (13).

Implementation of the components of the bundle for preventing pressure ulcers must be done every shift and when patients change conditions to achieve maximum benefit to the patients. Regardless of whether patients are admitted to critical care units or not, the pressure ulcer prevention bundle is a valuable resource that aids in the assessment and planning of patients who are susceptible to developing pressure ulcers. (1,13).

The intensive care unit is a special area designed for patients with life-threatening problems due to the presence of enough resources and skilled nurses to prevent and treat pressure ulcers. Nurses are crucial in preventing pressure ulcers by assessing patients, helping them change positions, providing sustenance, and performing other duties; however, studies show that certain elements prohibit the pressure ulcer prevention bundle from being implemented among nurses in developing countries, including Tanzania. One of the hindrances is inadequate or no up-to-date knowledge of evidence-based pressure ulcer prevention. (14).

1.2 Problem statements

Pressure ulcer prevalence rates worldwide for patients admitted to the ICU are reported to be 12.8% (8). The prevalence of pressure ulcers in sub-Saharan African countries is reported to range from 3.4% to 18.6% for patients admitted to medical and surgical ward ICUs; these figures are higher compared to developed countries, which range from 5% to 13% (15). According to reports, Tanzania has a higher frequency of pressure ulcers 19% of 267 patients hospitalized in intensive care units (ICUs) than the global prevalence (12.8%) (8,11).

Patients with pressure ulcers in the intensive care unit are more likely to suffer infections and sepsis, necessitating further surgery and lengthening their hospital stays. This can in turn increase costs for patients, their families, and the health care system. Early identification is, therefore, the cornerstone for preventing the increase in incidence, prevalence, and associated effects of pressure ulcers in critical care units. (1,12,16).

A variety of tools have been developed to evaluate the likelihood of developing pressure ulcers, such as the Norton, Waterlow, and Braden scales. Because of its great sensitivity, ease of use, and multiple researcher re-verifications, the Braden scale is the most commonly utilized. (3).

Even though there is evidence that a pressure ulcer prevention bundle is effective in avoiding pressure ulcers, the incidence of pressure ulcers is significant in some underdeveloped nations, such as Tanzania. (11).

While it is true that nurses play a critical role in the treatment of pressure ulcers, little is known about their expertise, methods, and the challenges they encounter when putting evidence-based pressure ulcer prevention techniques into practice. Thus, the goal of this study is to assess ICU nurses' knowledge, practices, and barriers regarding the application of a pressure ulcer prevention bundle in a selected national referral hospital in Dar es Salaam, Tanzania.

1.3 Objectives

1.3.1 Broad objectives

To determine nurses' knowledge, practices, and barriers in implementing pressure ulcer prevention care bundle in the intensive care units in selected referral hospitals in Dar es Salaam. Tanzania.

1.3.2 Specific objectives

i. To determine nurses' knowledge of pressure ulcer prevention care bundles at MNH, MOI, and JKCI.

ii. To examine nurses' practice in the implementation of the pressure ulcer prevention care bundle at MNH, MOI, and JKCI.

iii. To identify factors associated with barriers hindering nurses in the implementation of the pressure ulcer prevention care bundle at MNH, MOI, and JKCI.

1.4 Research Questions

1.4.1 Main research questions

What are nurses' knowledge, practices, and barriers in implementing pressure ulcer prevention care bundles in the intensive care units in selected referral hospitals in Dar es Salaam Tanzania?

1.4.2 Specific Research Questions.

i. What is nurses' Knowledge about the pressure ulcer prevention care bundle at MNH, MOI, and JKCI?

ii. What is the nurse's practice in the implementation of the pressure ulcer prevention care bundle at MNH, MOI, and JKCI?

iii. What are the factors associated with barriers hindering nurses in the implementation of the pressure ulcer prevention care bundle at MNH, MOI, and JKCI?

1.5 Rationale

In ICU patients, the incidence of pressure ulcers has been demonstrated to be significantly reduced by the use of a pressure ulcer prevention bundle. In Tanzania, there are very few papers that describe nurses using a pressure ulcer prevention bundle. This study attempts to provide awareness of the knowledge, practices, and barriers faced by nurses in the utilization of the bundle, considering that nurses are vital to the treatment of patients who are sick and play a significant role in keeping patients free of pressure ulcers.

The results of this study will contribute to the body of knowledge by educating healthcare professionals about the current state of knowledge, practice, and barriers in implementing pressure ulcer prevention bundles at MNH, MOI, and JKCI.

Future research on interventions and tactics to improve nurses' abilities and get past obstacles in pressure ulcer prevention can be guided by the study's findings.

The study contributes to the existing body of literature by providing insights into the current state of nurses' knowledge, practices, and barriers in PU prevention within the context of referral hospitals.

Finally, the study is a part of the fulfillment of the requirement of a Master of Science in Nursing (Critical Care and Trauma).

1.6 Conceptual framework.

This conceptual framework is **self-constructed** based on a literature review. It shows the organization of the central focus of the study. It displays how the study's main emphasis is arranged. Studies show that a nurse's education, experience, and work history all have an impact on the knowledge and use of the pressure ulcer prevention bundle. Nurses' views of pressure ulcer prevention may also be impacted by difficulties associated with the pressure ulcer care bundle's implementation. In the intensive care unit, critically ill patients are cared for by nurses from a variety of backgrounds. (17).

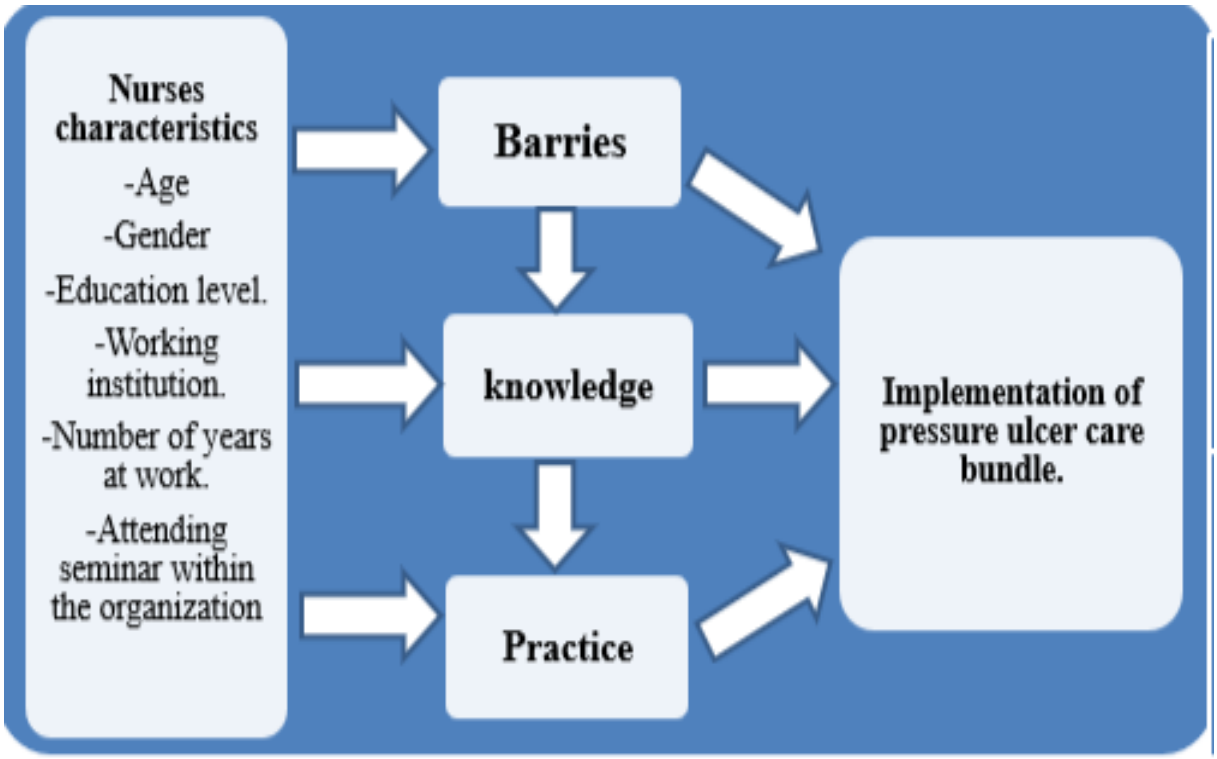


Figure 1. Conceptual Framework: Nurses' knowledge, practice, and barriers in implementing pressure ulcer prevention care bundles in ICU of selected referral hospitals.

CHAPTER TWO

2.0 LITERATURE REVIEW.

2.1 Overview.

The worldwide prevalence of pressure ulcers is 12.8%, with an incidence rate of 8.5% (18) . A study conducted in Ethiopia in 2020 also shows that 11.7% of patients in critical care units had pressure ulcers. (19). A study conducted in Tanzania at the Muhimbili Orthopedic Institute in 2020 shows the prevalence of pressure ulcers was about 19% of 267 patients admitted to the intensive care unit. (11).

The pressure ulcer prevention bundle is an evidence-based management and care intervention to prevent patients admitted to critically ill wards from developing pressure ulcers. These tools are also used by nurses as resource kits for the provision of holistic care, evaluation, and planning of care to prevent patients from developing pressure ulcers. (1,13,20).

Several associations, including the Pan Pacific Pressure Injury Alliance (PIA), the Registered Nurses Association of Ontario (RNAO), the National Pressure Ulcer Advisory Panel (NPUAP), and the European Pressure Ulcer Advisory Panel (EPUAP), worked together to create the pressure ulcer prevention bundle. There are five elements identified in this bundle, which are: nutrition, risk assessment, skin assessment, support surfaces, and repositioning. (1,13,21).

Table 1: The pressure ulcer Prevention care Bundle (22)**.**

Intervention Key Element	**pressure ulcer Prevention care Bundle**
Risk Assessment	The Braden risk-assessment scale is used right after admission to determine the pressure ulcer risk.
Skin Assessment	Every ICU shift should start with a skin assessment. The evaluation should cover all aspects of the skin defect, such as its location, depth, size, color, and moisture (skin contaminated with urine or feces).
Support Surfaces	For patients who are at risk, use pressure redistribution equipment, for example, an air mattress or pillows.
Nutrition	When a patient is admitted, the nurse should evaluate their nutritional state and, if needed, start nutrition supplements as soon as possible.
Repositioning	Change position should be every two hours.

In 2017, a study carried out in Poland in association with the European Pressure Ulcer Advisory Panel documented that this bundle covers all important areas in assessing patients at risk of pressure ulcers, and its important goals are early recognition of the problem, promotion of curative measures, and total prevention of pressure ulcers. (13).

2022 research that was published in Malaysia's International Journal of Academic Research in Business and Social Sciences has demonstrated that using the pressure ulcer prevention bundle by ICU nurses can help patients receive better care and experience fewer pressure ulcers (20,23).

Implementation of a pressure prevention bundle promotes early detection of high-risk patients in critical care settings, which leads to early implementation of protective measures to prevent the development of pressure ulcers and their associated complications. (24,25).

Another study conducted in Brazil in 2018 showed that when Braden scale is used immediately during admission, it helps to identify patients at risk, which facilitates proper planning to reduce the patient's chance of getting pressure sores. Six common risk assessment elements are included in the scale: friction, shearing force, sensory function, moisture, activity, mobility, and nutrition. It is the most widely used scale, and it gained acceptability in assessing patients who are susceptible to pressure ulcers because of its ease of usage and interpretation. It has been verified and selected by different institutions and researchers due to its high sensitivity and specificity (2–4).

Another study conducted in Egypt in 2021 explains the use of the risk assessment scale (Braden scale) in assessing patients at risk. The three-point scale is measured when the patient is exposed to skin friction and shear, and the other five items (sensory function, moisture, activity, mobility, and nutrition) are assessed using a four-point rating system. The minimal score is 6, and the highest score is 23. Patients with no risk (score range: 19–23), low risk (range: 15–18), moderate risk (range: 13–14), high risk (range: 10–12), and extremely high risk (score: fewer than 9) are the groups of patients that are in danger (24,26).

Table 2: BRADEN SCALE – To Estimate the Risk of Pressure Sores (22)**.**

SEVERE RISK: Fewer than 9 overalls. The total score for HIGH RISK is 10–12; the total score for MODERATE RISK is 13–14; the total score for MILD RISK is 15–18; and the total score for NO RISK is 19–23.					
RISK FACTOR	**DESCRIPTION OF SCORE**				**score**
SENSORY PERCEPTION Capacity to effectively react to discomfort caused by pressure.	1. restricted	2. Very limited	3. Slightly limited	4.No impairments	
MOISTURE- The extent of skin's moisture exposure	1. Constantly moist	2. Often moist	3. Occasionally moist	4. Rarely moist	
ACTIVITY Level of Exercise	1. Confined to bed.	2. Chairfast	3. Walks occasionally	4. Walks frequently	
MOBILITY Possibility of adjusting and regulating body position	1. Completely immobility	2. Very limited	3. Slightly limited	4. No limitations	
NUTRITION Regular eating habits	1. Very poor	2. Probably inadequate	3. Adequate	4. Excellent	
FRICTION AND SHEAR	1. Problem: Needs moderate to extensive help when moving.	2. Possible Problem: Moves clumsily or needs little help.	3. No apparent problem		
Total					

2.2 Literature review per study objective.

Knowledge of nurses on the elements and the application of the ICU's pressure ulcer prevention care bundle.

One of the most important aspects of preventing pressure ulcers in ICU patients is the early recognition of patients at risk of developing pressure ulcers and the capacity of nurses to use pressure ulcer prevention bundles. Once the patients at risk are identified, planning and implementation to prevent pressure ulcers can be done easily. It is the responsibility of the ICU nurses to practice preventive measures for pressure ulcers because they spend most of their time with the patients caring for them. For this reason, nurses who are caring for patients with critical illnesses must know how to identify patients who are at risk for pressure ulcers and how to prevent them in patients who have been brought to intensive care units.

A study conducted in Jordan in 2014 reports that nurses working in ICUs are unaware of the presence of current recommended pressure ulcer prevention guidelines and most of them follow outdated methods rather than evidence-based guidelines. (27).

In another study conducted in Jordan in 2014, the study encompassed eight Jordanian hospitals employing master's-level staff nurses and revealed a poor understanding of the guidelines' components and inefficient application of the recommendations. (28).

A study conducted in Jordan in 2014 highlighted that nurses' level of knowledge is not adequate for carrying out the pressure ulcer prevention strategy, and this is due to a lack of specific teaching on pressure ulcer care. (27).

Another study conducted in Australia in 2018 on nurses working in ICU reported that there is a low level of knowledge about the pressure ulcer prevention bundle and their low confidence in the capabilities of reducing pressure ulcers, so there is a need for a comprehensive approach in educating nurses working in ICU, which will help to increase their capabilities. (31).

Three studies conducted in Egypt in 2019 and 2020, where 43 and 30 nurses working in ICUs, respectively, reported that nurses' knowledge of the pressure ulcer prevention bundle during the pre-test was very low compared to their knowledge after the post-test, so there are significant

improvements after implementing the bundle in reducing the pressure ulcer, and there are significant improvements after implementing the bundle in reducing the pressure ulcer, and it is important for the bundle to be revised many times for easy understanding and to be available in ICUs in Arabic and English. It is also very important for nurses to update their knowledge continuously on applying the pressure ulcer prevention bundle to prevent the incidence of pressure ulcers (32–34).

A study conducted at Lahore General Hospital in Dubai, United Arab Emirates, in 2017 found that the general level of knowledge toward using and utilizing pressure ulcer guidelines in pressure ulcer prevention was low, and nurses needed to have training sessions to improve their knowledge toward pressure ulcer guideline's (14).

Tanzanian researchers have not yet published any studies assessing nurses' implementation and understanding of the pressure ulcer prevention care bundle in the critical care unit.

Nurses practice pressure ulcer prevention for critically ill patients in ICUs.

A study conducted in Iran on nurses' procedures for preventing pressure ulcers in 2022 reported that practice was insufficient because the preventive measures taken by nurses are not properly related to the components of the pressure ulcer prevention bundle. (35).

According to a different study done in 2020 in Italy, pressure ulcer prevention practices among nurses were generally poor, while nurses with higher education levels were found to have good practices when it came to using prevention bundles. (a bachelor's degree or higher in qualifying) (36).

A 2017 study carried out in Dubai, United Arab Emirates, also revealed inadequate pressure ulcer prevention practices among nurses employed in critical care units. (14).

In a study conducted in Australia in 2016 and another study in 2017 where a pressure ulcer prevention bundle was implemented in eight ICUs when interviewing nurses who worked in intensive care units, it was found that the majority of them knew a lot about the pressure ulcer prevention bundle, that it was simple to use, and that nurses accepted its use. However, some

nurses reported that the current practice already reflected the new guidelines, so there is no need for this bundle. Due to this reason, some nurses expressed their hesitation about whether the current bundle could be effectively implemented (29,30).

Several studies on pressure ulcer prevention practices for nurses working with critically ill patients are related to the following pressure ulcer guidelines: A study conducted in Ethiopia in 2015 reported that nurses have low practices in pressure ulcer prevention. Additionally, a different study carried out in Ethiopia in 2020 found that nurses employed in intensive care units (ICUs) do not perform pressure ulcer prevention well. This was linked to their lack of understanding of pressure ulcer prevention and their improper use of assessment instruments. (17,37).

To the best of our knowledge, Tanzanian researchers have not published any studies assessing nurses' critical illness prevention strategies for very ill patients in intensive care units.

Barriers faced by nurses in the implementation of the pressure ulcer prevention care bundle in the ICUs.

In a 2018 study conducted in Brazil, nurses were questioned about the application of the Braden scale in critical care units. Most of the nurses knew the importance of this scale in pressure ulcer risk assessment, and some of them use it because the institution forces them to use it; residents are the most frequent users; and others never use the scale due to a lack of time or because it is not routine in the sector. (2).

A study conducted in Jordan in 2014 reported that a large number of patients, support from the institution, and a lack of time and equipment are among the factors causing improper utilization of the pressure ulcer prevention bundle. (27).

The occurrence of pressure ulcers is caused by insufficient pressure ulcer-reducing devices and a lack of risk assessment scales in the ward, according to two studies carried out in Kenya in 2018 and 2021(38,39)**.**

One of the studies conducted in 2019 in Ethiopia reported that barriers facing nurses toward proper implementation of the pressure ulcer bundle are a shortage of air mattresses for pressure relieving patients at risk of pressure ulcers and a shortage of staff in the ICU. (40).

A study conducted in a Ugandan teaching hospital in 2014 reported that the unavailability of current guidelines, shortages of staff compared to the number of patients, inadequate provision of pressure-relieving materials, and lack of risk assessments are major barriers to pressure ulcer prevention in ICUs(41).

A study conducted in Ethiopia in 2015 reported that factors associated with poor implementation of the bundle are shortage of equipment and facilities, prevention guidelines that are not in place, nursing leadership that is not supporting nurses by providing teaching and guidelines, and a shortage of staff. (17,37).

Several studies show similar barriers in pressure ulcer prevention bundles. For example, a study conducted in Addis Ababa, Ethiopia, in 2018 reported that perceived barriers by nurses are a heavy workload and a shortage of staff, pressure ulcer bundles are not in place, training is not done most of the time, and few resources are required for pressure ulcer prevention like pillows and air mattresses. (42).

In summary, nurses operating in developing nations face numerous obstacles as a result of scarce resources, outdated information, and inadequate familiarity with established protocols. Because pressure ulcer incidence is still present in intensive care units, it is crucial to understand the baseline knowledge of the nurses working in these units regarding their knowledge, practices, and barriers regarding the implementation of the pressure ulcer prevention bundle. Knowing how to overcome obstacles and make the right plans can also help to lower the number of patients in the critical care unit who develop pressure ulcers.

CHAPTER THREE

3.0 MATERIAL AND METHODOLOGY

3.1 Study design

The study design used in this study was an analytical cross-sectional study.(43). This study design is advantageous because it is less time-consuming and relatively cheap.

3.2 Study setting.

The adult intensive care units at the MNH (Upanga and Mloganzila), JKCI, and MOI were the sites of the study. The pediatric intensive care unit was not included due to the special considerations they have and the difference between the pediatric and adult assessment scales.

An intensive care unit is a special area of a hospital reserved for the treatment of seriously ill or injured patients who require 24-hour care, close monitoring of life support equipment, and medication to sustain normal bodily functions.

In Dar es Salaam, the Upanga ward of the Ilala district is home to MNH, JKCI, and MOI, while the Ubungo district is home to the MNH Mlogazira branch. The medical ICU at MNH has nine beds, the surgical ICU has eighteen beds, and the maternity ICU has nine beds. There is one ICU at MNH Mloganzila, with seventeen beds. With one ICU that has eighteen beds, MOI accepts patients with orthopedic and neurological disorders from several referral institutions. JKCI is a nationally recognized specialty cardiac center that accepts referrals for cardiac patients from around the nation and abroad. It has nine adult beds. The danger of pressure ulcers exists for all patients under the care of nurses in these intensive care units, so it is crucial to evaluate the knowledge and skills related to pressure ulcer use bundle.

3.3 Study participants

The study involved nurses who are currently employed in intensive care units and have diplomas, bachelor's degrees, and master's degrees at MNH (Upanga and Mloganzila), MOI, and JKCI. The table below shows the distribution of nurses in each specific unit (ICU).

Table 3: Distribution of nurses in ICUs

Institute	ICU	Number of Nurses
MNH (Upanga)	Surgical ICU	25
	Medical ICU	24
	Maternity ICU	18
MNH (Mlongazira)	ICU	28
MOI	ICU	40
JKCI	ICU	22
	Total	157

3.4 Sample size

Given that the sample population was known to be finite, the following formula was applied to determine the sample size of a finite population: (44); (The sample size formula has been adjusted using a finite population correction.)

$$n = \frac{N*X}{(X + N - 1)}$$

Where,

$$X = \frac{Z\alpha/2*p*(1-p)}{MOE2}$$

- Zα/2 is the Normal distribution's critical value at α/2. (e.g. The critical value is 1.96 and α is 0.05 at a 95% confidence level.)
- The 5% margin of error, or MOE,
- p is the sample proportion, and - N is the population size.
- A proportional of 50% (0.5) was used to give the largest sample size, a study conducted in Ethiopia in 2015 (17).
- MOE was set at 5% and the population size was 157 as stated in Table 1 above.

Using these numbers in the formula:

$$X = \frac{(1.96)2*0.5*(1-0.5)}{(0.05)2} = 384.16$$

$$n = \frac{157*384.16}{(384.16 + 157-1)} = 111.66 = 112$$

Therefore, the sample size for this study was 112 nurses working in the ICUs.

3.5 Sampling selection

Stratified sampling is a probability sampling subtype in which each participant has an equal chance of taking part in the study. This ensures that there is equal representation of all ICU nurses in the study. (45). By dividing the percentage of nurses in each ICU by the total number of nurses in all ICUs who would participate in the study and then multiplying the percentage by the sample size computed above, a proportionate sample size from each ICU in the study was achieved. (112). This is shown in Table 2 below.

Table 4: Proportional Sample Size from each ICU in the study

No	**ICUs in the study**	**Total Nurses**	**Proportion sample size calculation in each ICU**	**Sample size proportionate to each ICU**
1.	Surgical	25	(25/157)*112=17.8	18 Nurses
2.	Medical	24	(24/157)*112=17.12	17 Nurses
3.	Maternity	18	(18/157)*112=12.8	13 Nurses
4.	MNH Mloganzila	28	(28/157)*112=19.97	20 Nurses
5.	JKCI	22	(22/157)*112=15.69	16 Nurses
6.	MOI	40	(40/157)*112=28.4	28 Nurses
	Total	**157**		**112Nurses**

To obtain specific nurses from each ICU who are going to participate in the study, the study employed a simple random selection technique to guarantee that each nurse has an equal opportunity to participate.

3.6 Inclusion and exclusion criteria

3.6.1 Inclusion Criteria:

Nurses who were selected to participate in the study are registered nurses and enrolled nurses working in the ICUs. Working experience must be six months and above to ensure they are oriented with the use of the pressure ulcer prevention bundle.

3.6.2 Exclusions Criteria:

Nurses with working experience below six months are not well-versed in the use of pressure ulcer prevention bundles.

Additionally, nurses in administrative roles who did not directly care for patients from the intensive care unit were not included.

3.7 Variables

3.7.1 Independent Variables

- Nurses' characteristics (Age, Gender, Institution at work, Number of years at work, level of education, and previous training on pressure ulcer bundle).

3.7.2 Dependent Variables: -

- Nurses' Knowledge of pressure ulcer prevention bundle.
- Nurses practice in pressure ulcer prevention bundle.
- Nurse’s barriers in pressure ulcer prevention bundle.

3.8 Data collection methods

3.8.1 Data collection tool

The method for gathering data was a self-administered questionnaire (Appendix II). Created by the Principal Investigator following the application of a literature review to assess nurses' knowledge, practices, and barriers when applying the pressure ulcer prevention bundle, the questionnaire contains four sections.

Participant Demographic Data:

Demographic data consists of open-ended questions such as age, gender, kind of workplace, length of employment, degree of education, and prior pressure ulcer bundle training.

Nurse's knowledge:

Knowledge questions consist of 17 multiple-choice questions on elements of the pressure ulcer prevention bundle. The total score was 17 points, with one point awarded for each right response and zero for each incorrect one. Knowledge scores were classified using Bloom's cut-off point as follows: sufficient knowledge if they fall between 80 and 100% and insufficient knowledge if they fall <80% (46).

Nurses practice.

Practice questions consist of 13 close-ended questions and were scored using a five-point Likert scale: never, rarely, sometimes, often, and always. Practice means scores were converted to percentages. Bloom's cut-off point will be used to categorize practice scores. Those who scored never, rarely, and sometimes were grouped as the poor practice group, and those who scored often and always were grouped as the good practice group. A total summation of percentages of the good practice group for all 13 questions and poor practice group for all 13 questions was obtained. To obtain the overall level of the good practice and poor practice groups, the total summation of the percentage of the good and poor practice group was divided by 13 to obtain their mean group respectively. Participants with scores >80% and <80% will be classified as having implemented good and poor practice measures (47).

Nurse's barriers

To determine the barriers that nurses face when executing the pressure ulcer prevention care bundle, a set of 12 closed-ended questions with a "yes" or "no" response make up the barrier questions. A 12-point total score was converted to a percentage, with one point awarded for a "yes" response and zero for a "no" response. "Yes," responses were converted into percentages, and mostly scored barriers were cited.

3.8.2 Data collection procedures

The appropriate authorities were contacted and given written consent to carry out the study. Data was collected between April and May in MNH (Upanga and Mloganzila), JKCI, and MOI ICUs by the researcher and research assistant after providing her an explanation of how to collect and store the questionnaire. After permission was obtained, the researcher gave the respondents in each ICU an introduction to himself, the study's goals, and the methodology and answered different questions of the respondents concerning the study, this was done during the morning report where a large number of nurses were available.

After the respondents had a clear understanding of the study, the researcher worked with the assistant nurse to conduct a simple random sampling of the participants, and consent forms were given to those participants who agreed to participate in the study. After the consent form had been signed, the respondents were given the questionnaire to read and provide a response within one hour. Before collecting the questionnaire, the researcher ensured all of the questionnaires were duly filled out and stored by the researcher and the researcher's assistant.

There was gratitude expressed to the participants. The Principal Investigator's contact information was made available to anyone who might have more questions in the future or be curious about the research's conclusion.

3.8.3 Validity and reliability of data collection tool

To maximize the validity of the tools, before providing the questionnaires to the study participants, six critical care nurses were selected and given the questionnaires to provide their feedback about the content of the questionnaire, their input helped determine the amount of time required, the challenges encountered, the coding, recording, and the analysis path., Also, the reviewer made comments about how easy it was to understand, how readable, and how clear the questions were. The criticism was taken into consideration. Not only that a pre-test was done involving 10% of my sample size to identify any challenges during reading, answering the question, time taken to complete the tool, and the feedback was taken into consideration. This verified that the tool was appropriate for use, (48).

To guarantee the reliability of the tools, the obtained data during the pre-test was used to calculate Cronbach's alpha value (coefficients of internal consistency) in SPSS. The Cronbach's alpha result after calculation was 0.866, indicating good internal consistency and reliability (49). Therefore, the data collection tools are concluded to be reliable.

3.9 Data analysis.

The analysis of the data was done with SPSS software Vision 26. Age, gender, educational attainment, length of time spent in the ICU, place of employment, and any prior training were all considered independent variables when analyzing demographic data for descriptive statistics, which in turn were used to find their relationship with knowledge and practice to pressure ulcer prevention.

Logistic regression, both bivariate and multivariate, was performed and interpreted using crude and adjusted odds ratios, as well as the 95% confidence interval. The multivariable logistic regression model considered candidates with a P-value of less than 0.2 (36).

The choice was made to employ a p-value threshold of less than 0.2 for variable selection because the traditional method of identifying variables that are known to be significant required a p-value of less than 0.05. An application of a P-value < 0.05 from multivariate analysis was made for statistical significance (36).

3.10 Ethical considerations

Permission to conduct the study was sought and granted from relevant ethical committees at MUHAS (Ref No. DA.282/298/01. C/2158), MNH Upanga (Ref No. MNH/CTRCU/Perm/2024/170), MOI (Ref.PA.290/338/01/94), JKCI (Ref No. AB. 123/307/01K/31) and MNH Mloganzila (Ref No. JA.294/428/01B/180). Permission was also sought and granted by relevant directors of the ICUs as well as the nursing supervisors for conducting the study and the training. All participants were given verbal and written information (consent form) on their voluntaries during the consent process, and to ensure the confidentiality of the data numbers were used in questionnaires instead of names. The written forms were kept in a safe locker accessible by the researcher only. Also, participants were free to withdraw from the study at any time. Not only that, information gained from this study shall aid in the improvement of patient care and ultimately in the quality of nursing care provided by the participant.

CHAPTER FOUR.

4.0 RESULTS

4.1 Sociodemographic characteristics of the study population.

Of the 112 (100%) respondents who participated in this study, 68 (61%) were between the ages of 25 and 55, and the mean age was 36 years with a standard deviation (SD) of 6.35. The majority of the respondents were female, 72 (64%), and 55 (49%) of the respondents had a diploma in nursing. Furthermore, 60 (53%) of the respondents had worked in the ICU between 6 and 10 years. About 67 (60%) of the study participants reported that they had never received training on pressure ulcer prevention. This information is presented in the table below. (Table 5).

Table 5: Social Demographic Characteristics of respondents who participated in the study.

Variable	Category	F (N=112)	Percentage (%)
Gender	Male	40	35.7
	Female	72	64.3
Age	21-30	27	24.1
	31-40	68	61
	41-50	12	10.7
	51-60	5	4.5
Level of education	Diploma	55	49.1
	Degree	48	42.9
	Masters	9	8
Working institution	JKCI	16	14.3
	UPANGA	48	42.9
	MOI	28	25
	MLOGANZILA	20	17.9
Working experience	< 1 Year	4	3.6
	1-5 Years	34	30.4
	6-10 Years	60	53.6
	> 10 Years	14	12.5
Receive training	YES	45	40
	NO	67	60

4.2 Nurses' knowledge of pressure ulcer prevention care bundle.

Knowledge of the pressure ulcer prevention bundle was assessed by using 17 multiple-choice questions. Participants were graded as either scoring correctly or not. Participants who scored 13 and above (>80%) questions correctly were regarded as having sufficient knowledge of the pressure ulcer prevention bundle. While those who scored <13 questions correctly (<80%) were regarded as having insufficient knowledge of the pressure ulcer prevention bundle. From these categories, the study found that about 73 (65.2%) of the study participants had insufficient knowledge, while only 39 (34.8%) reported having sufficient knowledge of the pressure ulcer prevention bundle. This information is summarized in Table 6.

Table 6: **Knowledge score on the use of pressure ulcer prevention bundle**

variable	category	frequency	%
Knowledge level	Sufficient knowledge	39	34.8
	Insufficient knowledge	73	65.2
	total	112	100

4.2.1 Response from participants to the knowledge testing questions.

In this study, 90.2% of participants understood the importance of evaluating pressure ulcers for patients at the time of admission to the ICU. Moreover, 80.4% of participants knew the procedure for conducting skin assessments on patients admitted to the ICU, and 76.8% of respondents were familiar with the safety measures to be implemented when transferring patients to avoid pressure ulcers.

On the other hand, 67% of the respondents were not familiar with the components of risk assessment tools. Also, 62.5% of study participants were unable to identify the exact number of pressure ulcer prevention bundle components and risk assessment tools. (Table 7).

Table 7. Nurses' knowledge of pressure ulcer prevention bundle.

Items	Correct answer	Incorrect answer
1. How many components are present in the pressure ulcer prevention bundle?	42 (37.5%)	70 (62.5%)
2. Which are components of the pressure ulcer prevention bundle	46 (41.1%)	66 (58.9%)
3. How many components are present in the risk assessment tool?	42 (37.5%)	70 (62.5%)
4. Which are components of risk assessment tools	37 (33%)	75 (67%)
5. Which category does a patient fit into if their Braden score is 11?	44 (39.3%)	68 (60.7%)
6. Which criteria make up an extensive skin assessment?	66 (58.9%)	46 (41.1%)
7. When should patients' skin examinations be finished?	85 (75.9%)	27 (24.1%)
8. Importance of evaluating pressure ulcers to patients at the time of admission	101 (90.2%)	11 (9.8%)
9. How is a skin assessment conducted?	90 (80.4%)	22 (19.6%)
10. Height at which a bed must be raised to prevent pressure ulcers	51 (45.5%)	61 (54.5%)
11. precautions need to be followed to keep patients' skin in good condition	47 (42%)	65 (58%)
12. Repositioning bedridden patients should occur every	76 (67.9%)	36 (32.1%)
13. Which diet is essential for keeping patients from developing pressure ulcers?	79 (70.5%)	33 (29.5%)
14. Where the turning schedule should be placed	63 (56.3%)	49 (43.7%)
15. safety measures to be implemented when transferring patients to avoid pressure ulcers	86 (76.8%)	26 (23.2%)
16. exposures to excessive moisture are the most common factors associated with skin damage.	85 (75.9%)	27 (24.1%)
17. Repositioning frequency is based on	76 (67.9%)	36 (32.1%)

Bivariable and multivariable logistic regression for the association between socio-demographic variables and nurses' knowledge of pressure ulcer prevention bundle.

Results of the bivariate analysis revealed that nurses who received training, working institution, level of education, and working experience were significantly associated with knowledge of the pressure ulcer prevention bundle.

In the bivariate analysis, variables with a p-value of less than 0.2 were considered candidates for multivariable analysis. In multivariable logistic regression analysis, it was found that training, working institution, and level of education were statistically significantly associated with nurses' knowledge of the pressure ulcer prevention bundle.

"Nurses who attained training were 23.1% less likely to have adequate knowledge of pressure ulcer prevention bundles compared to those who didn't attain training (AOR = 0.231, 95% CI: 0.077-0.695, p = 0.009).

"Nurses working at Muhimbili Orthopedics Institute were nearly ten times more likely to be knowledgeable on pressure ulcer prevention bundle compared to those working in Muhimbili National Hospital and Jakaya Kikwete Cardiac Institute. (AOR = 10.082, 95% CI: 1.578–64.403, P = 0.015).

Also, "Nurses with a diploma in nursing had an odd of being knowledgeable on pressure ulcer prevention bundle that was thirty-three times higher compared to those with degree and master's levels of education" (AOR = 33.334, 95% CI: 2.478–448.479, P = 0.008 at the 95% confidence interval). Demographic variables of Age and Gender were not included in the multivariate analysis due to their P-value was greater than 0.2 in the bivariate analysis. Table 8 below.

Table 8: Logistic regression (bivariate and multivariate) for the association between socio-demographic variables and nurses' knowledge of pressure ulcer prevention bundle.

Variable			Bivariate Analysis				Multivariate Analysis			
		N (%)	COR	p-value	95%CI Low	95%CI High	AOR	p-value	95%CI Low	95%CI High
Age										
	21-30	25(22.3)	0.458	0.432	0.065	3.21				
	31-40	67(59.8)	0.341	0.256	0.053	2.185				
	41-50	17(15.2)	0.133	0.31	0.013	1.39				
	51-60(REF)	3.(2.7)								
Gender										
	Male	40(37.5)	1.53	0.56	0.47	0.34				
	Female (REF)	72(64.3)								
Received training										
	YES	45 (40.2)	1.76	<0.001	0.75	0.41	0.231	0.009	0.077	0.695
	NO (**REF**)	67 (59.8)								
Working institution										
	MOI	28 (25)	6.9	0.004	1.848	25.76	10.082	0.015	1.578	64.403
	JKCI	16 (14.3)	3.3	0.091	0.826	13.18	4.115	0.114	0.711	23.801
	UPANGA	48 (42.9)	2.9	0.066	0.936	7.994	1.65	0.499	0.387	7.041
	MLOGANZILA (**REF**)	20 (17.9)								
Level of education										
	Diploma	55 (49.1)	3.75	0.001	1.517	5.98	33.334	0.008	2.478	448.479
	Degree	48 (42.9)	2.367	0.036	0.159	4.575	12.098	0.061	0.887	165.021
	Master (**REF**)	9 (8)								
Working experience										
	Below 1 year	4 (3.6)	20.86	.	20.86	20.86	491723	0.999	0	.
	1-5 year	34 (30.4)	1.819	0.006	0.533	3.106	3.046	0.214	0.525	17.677
	6-10 year	60 (53.6)	0.678	0.242	-0.459	1.814	2.649	0.259	0.504	13.914
	> 10 years (**REF**)	14 (12.5)								

4.3 Nurses' practice in the implementation of pressure ulcer prevention care bundle.

The practice score was calculated using a five-level Likert scale (Never, Rarely, Sometimes, Often, Always). From never scored as 1 to always scored as 5. All respondents scoring <3 (Never, Rarely, Sometimes) were grouped in the poor practice category and those who scored >3 (Often, Always) were grouped in the good practice category. A total summation of percentages of the good practice group for all 13 questions and the poor practice group for all 13 questions was obtained. To obtain the overall level of the good practice and poor practice groups, the total summation of the percentage was divided by 13 to obtain their mean group respectively. From the above explanation, the mean good practice level obtained was 42.9%, and the poor practice level was 57.1%.

Therefore, Among the 112 respondents who participated in this study, only 48 (42.90%) participants had good practice in the pressure ulcer prevention bundle (Table 9).

Table 9: Practice score on the use of pressure ulcer prevention bundle

variable	category	frequency	%
practice level	Good practice	48	42.9
	Poor practice	64	57.1
	total	112	100

4.3.1 Response from respondents to the practice testing questions.

The analysis shows that 83% of the participants were utilizing specific mattresses (like foam and air mattresses) to avoid pressure loading on patients admitted to the ICU. Moreover, 81.3 percent of the respondents were applying creams or oils to patients' skin to prevent pressure ulcers, and 79.5 percent of the study participants were not dragging patients during the repositioning procedure.

On the other hand, (59.8%) of the respondents were not attending pressure ulcer prevention lectures; also, (50.9%) of study participants were not using the risk assessment scale to evaluate patients at risk of developing pressure ulcers, and (41.1%) of the respondents were not

counseling patients and caregivers during discharge on how to prevent pressure ulcers (Table 10).

Table 10. Nurses practice in pressure ulcer prevention bundle.

	Frequency	
Items	**Done**	**Not done**
1. I do skin assessments under the direction of the hospital's standard nursing care.	82 (73.2%)	30 (26.8%)
2. To evaluate patients who may develop pressure ulcers, I use an assessment scale.	55 (49.1%)	57 (50.9%)
3. I keep a record of everything related to the assessment of pressure ulcers.	74 (66.1%)	38 (33.9%)
4. I take care of patient skin as part of my regular duties.	84 (75%)	28 (25%)
5. To prevent pressure ulcers, I use materials that release pressure in locations where bones are visible.	81 (72.3%)	31 (27.7%)
6. To prevent pressure ulcers, I apply creams or oils to patients' skin or advise caregivers to do the same.	91 (81.3%)	21 (18.8%)
7. I provide undernourished patients with food and vitamins.	83 (74.1%)	29 (25.9%)
8. I monitor a bedridden patient's food consisting of protein and calories.	82 (73.2%)	30 (26.8%)
9. When I'm repositioning patients, I try not to drag them.	89 (79.5%)	23 (20.5%)
10. I utilize specific mattresses, like foam and air, to avoid pressure loadings.	93 (83%)	19 (17%)
11. I turn the patient’s position every two hourly	81 (72.1%)	31 (27.7%)
12. I often attend pressure ulcer prevention lectures.	45 (40.2%)	67 (59.8%)
13. When a patient is released from the hospital, I counsel him or his caregivers on how to prevent pressure ulcers.	66 (58.9%)	46 (41.1%)

Bivariable and multivariable logistic regression for the association between socio-demographic variables and nurses' practice of pressure ulcer prevention bundle.

The factors associated with practice findings showed that nurses who received training were significantly associated with the practice of the pressure ulcer prevention bundle and other variables were not significantly associated.

In the bivariate analysis, variables with a p-value of less than 0.2 were considered candidates for multivariable analysis. In multivariable logistic regression analysis, it was found that the "Nurses who received training were 2.76 times more likely to practice pressure ulcer prevention bundles than those who did not receive training. The adjusted odds ratio (AOR) was 2.758, with a 95% confidence interval (CI) of 1.18 to 6.437, and the result was statistically significant (P = 0.019)." Other demographic variables (Gender, working experience, working institution, and level of education were not included in multivariate analysis due to their P-value was greater than 0.2 in bivariate analysis. Table 11 below.

Table 11: Logistic regression (bivariate and multivariate) for the association between demographic variables and nurses' practice on PUPB.

VARIABLE		N (%)	Bivariate analysis				Multivariate analysis			
			COR	P-VALUE	95% CI LOW	HIGH	AOR	P-VALUE	95% CI LOW	HIGH
Gender	MALE	40 (37.5)	1.41	0.394	0.403	0.727				
	FEMALE (REF)	72 (64.3)								
Working experience										
	< 1 year	4 (3.6)	1.33	0.8	0.144	12.3				
	1-5 year	34 (30.4)	3.2	0.7	0.88	11.6				
	6-10 year	60 (53.6)	1.5	0.482	0.47	4.92				
	>10 years (REF)	14 (12.5)								
Education level										
	Diploma	55 (49.1)	4	0.6	0.91	18.1				
	Degree	48 (42.9)	2	3.2	0.448	8.96				
	Masters (REF)	9 (8)								
Working institution										
	MOI	28 (25)	1.33	0.6	0.42	4.22				
	JKCI	16 (14.3)	1	1	0.26	3.7				
	UPANGA	48 (42.9)	1.667	0.342	0.581	4.778				
	MLOGANZILA (REF)	20 (17.9)								
TRAINING ON PUPB										
	YES	45(40.2)	0.287	0.002	0.468	0.104	**2.758**	**0.019**	1.18	6.437
	NO (REF)	67(59.8)								

4.4 Barriers to implementing pressure ulcer prevention bundle.

About 112 respondents who participated in the study responded to 12 closed-ended questions concerning barriers to the implementation of the pressure ulcer prevention care bundle. “Yes,” responses were converted into percentages, and mostly scored barriers were cited.

About (83%) 93 of the study participants reported that insufficient pressure ulcer prevention bundle was a barrier to pressure ulcer prevention bundle, while 84 (75%) of participants reported the absence of courses offering specialized training on preventing pressure ulcers in the workplace, and about (19.6%) 22 of study participants reported that lack of patient cooperation was a barrier to pressure ulcer prevention. This information is summarized in Table 12 below.

Table 12. Respondents stated to have barriers in the pressure ulcer prevention bundle.

	Barrier in pressure ulcer prevention bundle (112 Respondents)	
BARRIER	YES (%)	NO
Insufficient pressure ulcer bundle	93 (83%)	19 (17%)
lack of risk assessment tools in the units	81 (72.3%)	31 (27.7%)
Absence of preventative tools	70 (62.5%)	42 (37.5%)
Heavy workload	76 (67.9%)	36 (32.1%)
Lack of time	70 (62.5%)	42 (37.5%)
Improper use of tools	76 (67.9%)	36 (32.1%)
Lack of job satisfaction	48 (42.9%)	64 (57.1%)
Difficult to understand the tool	63 (56.3%)	49 (43.8%)
Ineffective communication	39 (34.8%)	73 (65.2%)
Absence of courses offering training	84 (75%)	28 (25%)
Family caregivers are not cooperating	26 (23.2%)	86 (76.8%)
Lack of patient cooperation	22 (19.6%)	90 (80.4%)

CHAPTER FIVE

5.0 DISCUSSION.

5.1 Discussion.

This study aimed to examine nurses' practices, knowledge, and barriers to implementing pressure ulcer prevention care bundles in intensive care units in selected referral hospitals in Tanzania.

5.1.1 Demographic characteristics.

Based on the characteristics of nurses that were the subject of the current study, the majority of the nurses that were examined were female and the majority of nurses' ages ranged between 25-55 and the mean age was 36 years. This result was in the same line as a study conducted in Egypt. (49) Stated that a large number of participants were female nurses with an age greater than 30 years. Regarding the level of education, the majority of participants had a diploma in nursing, and their level of working experience was greater than five years. Furthermore, the majority of nurses didn’t attain any training courses regarding pressure ulcer prevention. This finding corresponds to a study conducted in Egypt. (50), it turned out that most of the nurses who participated in the study had worked in intensive care for more than five years, and most of them had never received pressure ulcer prevention training. The study findings concerning the prevalence of nurses with diplomas are reliable in many developing countries, and this is because diploma programs serve as the main pathway to nursing certification.

Therefore, to properly care for the patients in the ICU, we need more nurses who have received training in the pressure ulcer prevention bundle. This will enable the proper application of these guidelines, thereby preventing pressure ulcers from occurring in patients admitted to ICUs.

5.1.2 Nurses’ knowledge of pressure ulcer prevention care bundle.

Assessments and preventing patients admitted to intensive care from getting pressure ulcers require proper understanding and utilization of this bundle. Moreover, to develop a preventative program, the clinical ability to determine the degree of risk of pressure ulcer development is

essential to the prevention of PU. Therefore, nursing professionals should have adequate knowledge to enhance their capacity to implement this guideline.

In assessing nurses' knowledge about pressure ulcer prevention bundles, the results of the current study show that only a small percentage of the nurses who participated in this study had sufficient knowledge about pressure ulcers. The finding is supported by a study conducted in Egypt exploring the effect of preventive bundle guidelines on nurses' knowledge and compliance regarding pressure ulcers among critically ill patients in an intensive care unit. (32), and a study conducted in Uganda which revealed that nurses had average knowledge of pressure ulcer prevention (41), A similar study conducted in Ethiopia correlates with this finding that the nurses' level of knowledge was below the anticipated (17). The best explanation for this is that nurses working in intensive care units faced various obstacles, such as inadequate training and limited tools in their work fields.

Regarding the knowledge of nurses who received training, the results show that training helps to increase the level of knowledge regarding pressure ulcer prevention bundles compared to those who didn't receive any courses. So, in this study, nurses who agreed to participate and had already received training concerning pressure ulcer prevention had more knowledge than those who hadn't received any training. This is supported by the study conducted in Malaysia. (20) Together with a study conducted in Ethiopia, that the level of knowledge during post-training was high compared to pre-training on pressure ulcer prevention (17). Thus, the conclusion drawn from this data is that nurses' understanding of pressure ulcer pressure bundles was influenced by training.

Moreover, the results show that nurses' level of education affected the level of knowledge of those who agreed to participate in the study. The findings showed that nurses with a diploma were thirty-three times more knowledgeable compared to nurses with other levels of education (degree and master's level) this could be because diploma holders have more experience caring for critically ill patients than nurses with other educational levels, and they have received more training overall. These findings are different from the results of the study conducted in Ethiopia (17). This indicates that nurses with a degree level were twice as likely as those with

a diploma to have sufficient knowledge about pressure ulcer bundle prevention and that nurses with more than ten years of experience were four times more likely to have sufficient knowledge than those with a diploma in nursing (17).

Regarding the association between nurses' knowledge of the pressure ulcer prevention bundle and the demographic characteristics of study participants, it shows that there were statistical significance and positive associations between knowledge scores and educational qualifications, working institutions, and training courses. This is consistent with the finding reported by a previous study conducted in Egypt which stated that participants were working and that there were positive correlations with high statistical significance between nurses' years of experience, educational level, and those who received training and their knowledge scores. (50).

As a result, the discussion above makes clear that nurses' correct comprehension and application of pressure ulcer prevention care bundles for critically ill patients admitted to intensive care units were greatly influenced by the training and those with a diploma in nursing.

5.1.3 Nurses' practice in the implementation of the pressure ulcer prevention care bundle.

Practice toward the pressure ulcer implementation bundle requires nurses who are knowledgeable and well-oriented with the proper use of guidelines. The result of this study shows that more than half of nurses working in intensive care units who agreed to participate in the study had poor practices toward pressure ulcer prevention. This is different from the study conducted in Malaysia which shows that most of the nurses who participated in the study had a satisfactory level of practice in the prevention of pressure ulcers. (20). This is because more than half of the participants don't know the presence of proper guidelines used in pressure ulcer prevention, and they also didn't receive any training toward the implementation of this bundle.

Moreover, respondents who received training on the pressure ulcer prevention bundle had statistical significance and a positive association with the participant's practice on the implementation of the protocols. This is consistent with a study conducted in Egypt which

reported that there were positive correlations with high statistical significance between nurses' training courses at the post- and follow-up protocol implementation and their practice score (50). One possible reason for the current results could be attributed to the training received by nurses, which may have enhanced their ability to assess and effectively use the bundle for patients in ICUs.

All in all, effectiveness in the implementation of the pressure ulcer prevention care bundle requires proper orientation of these tools to prevent critical patients from getting pressure ulcers.

5.1.4 Factors associated with barriers hindering nurses in the implementation of the pressure ulcer prevention care bundle.

Proper implementation of the pressure ulcer prevention bundle by nurses in intensive care units is affected in many ways; it can be due to institutional or personal barriers. The result of this study reveals that most of the barriers hindering nurses in the utilization of these guidelines are from the organization, namely, insufficient pressure ulcer bundles in the units, the absence of courses offering specialized training on preventing pressure ulcers in the workplace, lack of risk assessment tools in the units, improper use of tools, and heavy workload. These outcomes are similar to those of the study conducted in Ethiopia, Jordan, and Uganda. (41,42,51), reported that the absence of training for nurses, lack of guidelines in the units, and heavy workload are among the barriers preventing nurses from properly utilizing the pressure ulcer prevention care bundle**.** This could be due to a lack of ongoing training within the institutions; tools were not displayed and placed in the patient file. Thus, it is critical to prioritize continual training within the units and ensure that the units have instruments for preventing pressure ulcers.

Thus, as the discussion above makes clear, to prevent patients from developing pressure ulcers, nurses working in intensive care units (ICUs) need to receive ongoing training on these guidelines. This training should be supported by ongoing organizational monitoring to ensure that patients at risk are properly identified and that the guidelines are implemented.

5.2 Study limitation and mitigation

5.2.1 Limitation.

1. There were issues with this study's data collection process. Specifically, some participants had trouble answering the questionnaires because they were too busy taking care of patients or were simply exhausted.
2. An additional limitation noted was that the study was limited to MNH (UPANGA AND MLOGANZILA), JKCI, and MOI hospitals, which limited the generalization to the entire population of all healthcare facilities in the nation. Consequently, it is worthwhile to investigate knowledge, practice, and barriers regarding pressure ulcer prevention using a larger sample that represents all Tanzanian healthcare facilities.
3. The cross-sectional design of this study makes it more difficult to establish causality. The study acknowledges the need for longitudinal research in establishing the connection between practice, knowledge, and related factors.

5.2.2 Mitigation.

The principal investigator made sure that questionnaires were filled in within the required time by helping some of the participants who had challenges caring for their patients.

CHAPTER SIX.

6.0 CONCLUSION AND RECOMMENDATIONS.

6.1 Conclusion.

The presence of a pressure ulcer prevention bundle and risk assessment instruments (Braden scale) are crucial in preventing pressure ulcers in patients admitted to intensive care units, particularly when they are implemented effectively. Despite the limitations, this study is crucial in establishing baseline data regarding Tanzanian referral hospitals' nurses' knowledge, practices, and barriers to the pressure ulcer prevention care bundle. It was found that respondents who participated in the study knew the existence of the tools, but the general knowledge and practice of all participants who agreed to participate in the study were not enough to prevent the development of pressure ulcers in patients admitted to ICUs. Also, the presence of barriers affects the implementation of this tool for nurses caring for critically ill patients in ICUs, so carefully planning and delivering education to nurses in intensive care units helps to enhance their expertise on this tool and reduce obstacles that prevent pressure ulcers from occurring.

6.2 Recommendations.

1. To conduct continuous professional education training programs for all nurses working in intensive care units to improve their knowledge and practice and minimize barriers affecting the utilization of pressure ulcer prevention care bundles.

2. The pressure ulcer prevention care bundle should be available in the units of the organization where nurses are employed so that they can review it promptly and with caution when assessing patients.

3. An observational study focused on the assessment and observation of nurses providing patient care in intensive care units can be conducted to ascertain the knowledge and practice of nurses.

4. To conduct this study again in lower-level healthcare facilities to evaluate the nurses' preparedness to use this bundle.

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APPENDIX 1: INFORMED CONSENT FORM.

Greetings, I am Twalibu Abdallah Hussein, a researcher from Muhimbili University of Health and Allied Sciences, and a postgraduate student studying critical care and trauma nursing. My study titled Nurses' Knowledge, practice and Barriers in implementing pressure ulcer prevention care bundles in Selected Referral Hospitals**.** The aim of this study is "to assess nurses' knowledge, practices, and barriers in the utilization of pressure ulcer prevention bundle in intensive care units at MNH (Upanga and Mloganzira), MOI, and JKCI.

Participation in the study: You are kindly invited to take part in the study, which is specifically intended for nurses who work in intensive care units. Participation is completely voluntary, and there are no negative consequences, it will not affect your work or cause any discomfort and you may decide not to participate in the study without any problem. Also, there is no personal benefit to receive or costs to you during participating in this study.

Confidentiality: While participating in this study confidentiality is highly assured to you and your information will not be disclosed or shared with any persons and will be used for obtaining general outcomes, the result obtained will be published in an article to contribute the knowledge to this area of research, Moreover, the questionnaires won't contain your name.

Risk to participant: Participation in this study has no risk, and you are welcome to ask any questions you may have if you don't understand anything. Sign this consent form if you agree to participate in the study.

I have read and comprehended the information on this form, and all of my questions have been satisfactorily addressed with appropriate clarity. I thus give my permission to take part in this research after privacy has been established.

Signature of Participant Date

_____ _____

Contact Person: The principal investigator, Twalibu Abdallah Hussein (0752484400), Email; twalibua@gmail.com. You may contact me at any time if you have any challenges.

APPENDIX 2: DATA COLLECTION TOOLS.

Participant Unique Identification Number: _____

Date: _____

Socio-demographic characteristics of nurses working in government hospitals of Tanzania

No	**Questions** **Please read the questions carefully and answer as required in the Answer column.**	**Answers** **Please tick the only one correct answer in your own words as required by the question.**
	Variables	**category**
1	Sex	1) male
		2) female
2	Age in years	
3	Working institution	1) MOI
		2) JKCI
		3) MNH Upanga
		4) MNH Mlonganzira
4	Place of working (ICU)	1) MOI ICU
		2) JKCI ICU
		3) MNH Maternity ICU
		4) MNH Surgical ICU
		5) MNH Medical ICU
		6) MNH Mloganzira ICU
nurse's level of working experience		
5	Year of experience	1) Below 5 years

		2) 6-10 years
		3) Greater than 10 years
Education level among nurses working in ICU		
6	Have you received a seminar on pressure ulcer prevention bundle?	1) Yes 2) No
7	Educational status	1) Diploma
		2) Degree
		3) Masters

Tools used to assess patients in ICUs

1.	Which tools are you using in pressure ulcer prevention	……..
2.	Which tools are you using in assessing patients at risk of developing pressure ulcers?s	……..

Nurses Knowledge about the elements of the Pressure ulcer prevention bundle

1	How many components are present in the pressure ulcer prevention bundle?	a) 2 b) 3 c) 4 d) 5 e) 6
2	What are the components of the pressure ulcer prevention bundle	a) Risk Assessment, Skin Assessment, Support Surfaces, Nutrition and Repositioning b) Risk Assessment, Nutrition, Skin Assessment.

		c) Skin Assessment, Support Surfaces, Repositioning, Nutrition. d) Prophylactic sacral dressing, heels elevated off the bed using a pillow, Nutrition.
3	How many components are present in the risk assessment tool?	a) 3 b) 4 c) 5 d) 6
4	Which are components of risk assessment tools	a) Sensory function, moisture, activity, mobility, nutrition, shearing force, and friction. b) Moisture, activity, mobility, nutrition, shearing force, and friction, Skin Assessment c) Sensory function, moisture, activity, mobility, nutrition d) Sensory function, moisture, activity, mobility, nutrition, reposition.
5	Which category does a patient fit into if their Braden score is 11?	a) Mild risk. b) Moderate risk. c) High risk. d) Very high risk.
6	Which criteria make up an extensive skin assessment?	a) Temperature b) Turgor c) Color d) Moisture level e) Skin integrity

		f) All of them
7	When should patients' skin examinations be finished?	a) Admission to the unit b) Every shift c) Change in previous wound status d) All of the above
8	Should a hospital evaluate every patient for the possibility of developing a pressure ulcer at the time of admission?	a) Yes b) No
9	How is a skin assessment conducted?	a) One nurse documents while the other assesses the patient's skin b) One nurse supports the patient on the opposite side of the bed while the other assesses the patient's skin on the other side of the bed c) Both nurses stand on the same side of the bed and assess the patient's skin together
10	What is the minimum height at which a bed must be raised to prevent pressure ulcers?	a) 60 degree b) 45 degree c) 30 degree d) 90 degree
11	What safety precautions need to be followed to keep patients' skin in good condition?	a) Clean the skin at the time of soiling. b) Applying cream c) Proper skin assessment in every shift
12	Repositioning bedridden patients should occur every	a) Two hours b) Three hours c) Four hours

		d) Six hours
13	Which diet is essential for keeping patients from developing pressure ulcers? (select one)	a) Protein b) Fat c) Carbohydrate d) Vitamin
14	Where the turning schedule should be placed	a) at the bedside b) at the patient file c)Nursing station
15	What safety measures should be implemented when transferring patients to avoid pressure ulcers? (select one)	a) preventing friction (not dragging the patients) b) do not drop the patients c) put on safety gears
16	Dryness or exposure to excessive moisture are the most common factors associated with skin damage.	a) Yes b) No c) don't know
17	Repositioning frequency is based on	a) Tissue tolerance b) Level of activity/mobility c) General medical condition d) Skin condition e) all of the above.

Nurses practice in pressure ulcer prevention bundle

Read properly the question below		**Please tick the appropriate answer**				
	questions	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
01	I do skin assessments under the direction of the hospital's standard nursing care.					
02	To evaluate patients who may develop pressure ulcers, I use an assessment scale.					
03	I keep a record of everything related to the assessment of pressure ulcers.					
04	I take care of patient skin as part of my regular duties.					
05	To prevent pressure ulcers, I use materials that release pressure in locations where bones are visible.					
06	To prevent pressure ulcers, I apply creams or oils to patients' skin or advise caregivers to do the same.					
07	I provide undernourished patients with food and vitamins.					
08	I monitor a bedridden patient's food consisting of protein and calories.					

09	When I'm repositioning patients, I try not to drag them.					
10	I utilize specific mattresses, like foam and air, to avoid pressure loadings.					
11	I turn the patient's position every two hours.					
12	I often attend pressure ulcer prevention lectures.					
13	When a patient is released from the hospital, I counsel him or his caregivers on how to prevent pressure ulcers.					

Barriers to pressure ulcer prevention bundle

Please carefully read each statement, then tick the box corresponding to the frequency with which you believe that this situation or circumstance prevents the pressure ulcer prevention bundle in your actual practice.

Read properly the question below.		**Please tick the appropriate answer.**	
	Questions	**YES**	**NO**
1.	Insufficient clinical guidelines or protocols exist to prevent pressure injuries in the workplace.		
2.	lack of risk assessment tools in the units		
3.	Absence of preventative tools (such as specialty mattresses)		
4.	Heavy workload		
5.	Lack of time because of staffing shortage to perform preventive care.		
6.	Improper use of tools and equipment as a result of inadequate staff training.		
7.	Lack of job satisfaction		
8.	The pressure injury risk assessment scales are difficult to understand.		
9.	Ineffective communication among team members.		
10.	Absence of courses offering specialized training on preventing pressure ulcers in the workplace		
11	Family caregivers at the hospital are not cooperating.		
12	Lack of patient cooperation in applying preventive measures		

APPENDIX 3: ETHICAL CLEARANCE (MUHAS)

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/2158 Date: 09/04/2024

MUHAS-REC-04-2024-2158
TWALIBU ABDALLAH HUSSEIN
School of Nursing
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: NURSES' KNOWLEDGE, PRACTICE AND BARRIERS IN IMPLEMENTING PRESSURE ULCER PREVENTION CARE BUNDLES IN SELECTED REFERRAL HOSPITALS.

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 09/04/2024
EXPIRATION DATE OF APPROVAL: 09/04/2025

STUDY DESCRIPTION:
Purpose:

The purpose of this cross-sectional study is to assess nurses' knowledge, practices and barriers in implementing pressure ulcer prevention care bundle in the intensive care units in selected referral hospitals in Dar es Salaam. Tanzania.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015363.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

4th April 24

Dr. Kasusu Nyamuryekung'e.

Chairperson, MUHAS Research and Ethics Committee



APPENDIX 4: PERMISSION LETTER FROM MNH – JKCI

UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

JAKAYA KIKWETE CARDIAC INSTITUTE
(JKCI)

In reply please quote:
Ref No: AB.123/307/01K/31 23/04/2024

Twalib Abdallah Hussein
Reg. HD/MUH/T.483/2022
MSc. Critical Care and Trauma in Nursing - MUHAS

RE: PERMISSION TO CONDUCT RESEARCH AT JKCI

Reference is made to your letter requesting to do a research study entitled **"Nurses' knowledge, practice and Barriers in Implementing Pressure Ulcer Prevention Care Bundles in Selected Referral Hospitals"** here at JKCI.

This letter serves as an official document that permits you to do the above-mentioned task as requested. However, in accordance with your request, your designated JKCI co-supervisor will be **Robert Aloyce**.

It is our sincere hope that you will adhere strictly to the rules and regulations governing good clinical practice. Your compliance with these standards will ensure the integrity and ethical conduct of your study.

Best Regards,

JAKAYA KIKWETE CARDIAC INSTITUTE
P. O. Box 65141
Dar-es-Salaam
JKCI

Dr. Pedro Pallangyo
Head of Research, Training and Consultancy.
CC: ALL DIRECTORATES & Head of Units; Robert Aloyce

Jakaya Kikwete Cardiac Institute (JKCI); Upanga East Plot No. 1048, Kalenga Street, Malik Road, P. O. Box 65141 - Dar es Salaam; Telephone Number + 255 -22- 2152392Email:info@jkci.or.tz, Website: ww.jkci.or.tz.

APPENDIX 5: PERMISSION LETTER FROM MNH – MOI

UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI)

Ref.P.A. 290/338/01/94

17th April, 2024

Muhimbili University of health allied sciences

Department of clinical nursing

Dar -es Salaam

Tanzania.

RE: APPROVAL FOR CONDUCTING RESEARCH STUDY

Reference is made to your letter with reference number **HD/MUH/T.483/2022** dated on the 15th April 2024 for conducting research study **about** ***''Nurses' Knowledge Practice And Barriers In Implementing Pressure Ulcer Prevention Care Bundles In Selected Referral Hospitals''***

On behalf of the Management I would like to officially inform you that, permission has been granted to your student **TWALIBU A. HUSSEIN** to conduct study at Muhimbili Orthopaedic Institute (MOI). Supervisor Mr. Moses Moses

It's my hope that your stay at MOI will be fruitful. For any clarification contact CRTM +255713764522.

Dr. Joel J Bwemelo, CRTM

For: MOI Executive Director

P.O. Box 65474

DAR-ES-SALAAM

Cc: Directorate of postgraduate studies - MUHAS

Cc: Supervisors

APPENDIX 6: PERMISSION LETTER FROM MNH - MLOGANZILA

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL
MLOGANZILA

In reply please quote
Ref. No.: JA.294/428/01B/180

02/05/2024

Head of Department,
OPD, Emergency and Critical Care
Muhimbili National Hospital-Mloganzila

RE: PERMISSION TO COLLECT DATA AT MNH - MLOGANZILA

Name of Principal Investigator	**Twalibu A. Hussein**
Title	**"Nurses Knowledge, Practice and Barriers in Implanting Pressure Ulcer Prevention Care Bundles in Selected Referral Hospital".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisors	Dr. Menti Ndile Mr. Peter Shirima
Period	02nd May 2024-30th June 2024

Approval has been granted to the above principal investigator to collect data at MNH-Mloganzila. Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Ng'amilo Mbwalila

Ass. Head Clinical Research, Training and Consultancy Unit

c.c. DNS
cc. Twalibu A. Hussein

Mloganzila, Kibamba – Ubungo, P.O. BOX 65000, Dar es Salaam, Tanzania
Telephone: +255-22-2222215715, Telephone: +255-22-2215701,
Email: info@Mloganzila.or.tz, Website: www.mloganzila.or.tz

APPENDIX 7: PERMISSION LETTER FROM MNH - UPANGA

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote;

Ref. No.: MNH/CRTCU/Perm/2024/170 Date: 16th April, 2024

Block Manger,
- Maternity I & II
- Mwaisela

Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name Student	**Twalibu A. Hussein**
Title	**"Nurses Knowledge, Practice and Barriers in Implanting Pressure Ulcer Prevention Care Bundles in Selected Referral Hospital".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisor	Dr. Menti Ndile (MUHAS)
Co – supervisor	**Dr. Kalinga Aroso** (MNH)
Period	16th April, 2024 to 30th June, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Dr. Kalinga Aroso** (MNH) supervisor.

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Charles K. Pallangyo
For: Head of Clinical research, Training and Consultancy Unit

P.O. Box 65000 DAR-ES-SALAAM

c.c DNS
c.c Dr. Kalinga Aroso
c.c **Twalibu A. Hussein**

Upanga West, Kalenga Street, Plot No. 1048D/3, P.O. BOX 65000, Dar es Salaam, Tanzania
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