EFFECT OF AN EDUCATIONAL INTERVENTION ON NURSES' KNOWLEDGE, COMPLIANCE AND BARRIERS REGARDING IMPLEMENTATION OF A SURGICAL SITE INFECTION PREVENTION BUNDLE AT MZUZU CENTRAL HOSPITAL IN MALAWI

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By

VIOLET MOYO

A Dissertation Submitted 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

OCTOBER, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled ***Effect of an educational intervention on Nurses' Knowledge, Compliance and Barriers Regarding Implementation of a Surgical Site Infection Prevention Bundle at Mzuzu Central Hospital in Malawi***, in 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.

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

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To the management and staff of Mzuzu Central Hospital for the moral support rendered during the time of data collection at the site.

DEDICATION

This work is dedicated to my children, Lindie Stacy Gondwe and Tumbikani Gondwe. Life took a turn-around of events without my presence at home, but my little giants soldiered on. May you achieve greater things in this life.

To all the critical care and emergency nurses in Malawi thriving to bring about change in critical care settings of Malawi.

ABSTRACT

Background

Surgical site infections are the second largest category of health care associated infections. Infection prevention care bundles, such as the surgical site infection prevention bundle is a well-known strategy to reduce surgical wound infections amongst hospitalized patients. Despite their potential to reduce surgical wound infections, a lack of understanding and awareness of the surgical site infection prevention bundle amongst nursing staff remains a challenge in sub-Saharan Africa, hence inability to integrate them into clinical practice.

Study Aim: To test the effect of an educational intervention on nurses' knowledge, compliance and barriers regarding implementation of a surgical site infection bundle and associated barriers at Mzuzu Central Hospital in Malawi.

Materials and Method: A one group pre-post-test quasi-experimental research design was employed at Mzuzu Central Hospital. A stratified random sampling technique was used to recruit 90 nurses from eight departments dealing with surgical patients. A pre-post-test questionnaire was used for data collection. The study measured three variables, knowledge, compliance and barriers with knowledge being tested three times at three different time points, pretest, immediate pos-test and follow up test at four weeks. Data was analysed using SPSS version 25. Both descriptive and inferential statistics were used to analyse the data. Chi-Square test was used to determine the association between sociodemographic characteristics and knowledge. Repeated measures ANOVA were used statistically determine changes in the average mean scores for a pretest, immediate posttest and a follow-up posttest at four weeks. P-values of 0.05 were set as a cut of point for significant findings.

Results: Only 8% of the nurses had adequate knowledge on SSI prevention strategies and only 1% of the participants was aware of the SSI prevention bundle in a pretest assessment. There was however significant improvement in the knowledge level immediately after the education intervention to 97% and 100% during a follow up test at one month after the intervention. The mean scores were compared and the mean was higher for follow up results (M=14.78, SD=1.819), as compared to the immediate post test results (M=12.36, SD=1.691) and the

pretest (M=5.96, SD=1.550). The difference in means was statistically significant at 1%. There was also improved compliance ratings also after the intervention compared to before the education session. The mean score before the intervention was 20.09 and increased to 30.00 after the educational intervention. There was a statistically significant difference in nurses' ratings before and after the intervention with a p-value of 0.0000. The most reported barriers in this study were: unavailability of resources 67(82%), lack of interprofessional collaboration 56(69%), workload 47(57%) and absence of guidance from departmental leaders 45(55%).

Conclusion: The findings of this study suggest that providing an education intervention to nurses not only improves their knowledge level, but also improves their compliance to guidelines in practice. The barriers identified in this study highlights critical areas for improvements in healthcare setting to ease guideline compliance and implementation.

Key words

Barriers, compliance, knowledge, nurses, surgical site infection bundle

ABBREVIATIONS

CDC ……Centers for Disease Control and Prevention

CPD ……..……...….Continuous Professional Development

ECDC ……....…… European Center for Disease Prevention and Control

HAIs ...……..……..…..……Hospital Acquired Infections

HDU …….…….…. High Dependency Unit

ICU ……..……..... Intensive Care Unit

IPC ……...……..…… Infection Prevention and Control

MOH …… ……...… ...Ministry of Health

MUHAS ……. Muhimbili University for Health and Allied Studies

MZCH ……...…….. Mzuzu Central Hospital

SSIs …….. Surgical Site Infections

WHO ……..World Health Organization

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OPERATIONAL DEFINITIONS

Barriers: Referred to any factor, perception or situation that acts as a hindrance to an effective implementation of the bundle (1).

Care Bundle: Care bundles are a collection of three to five evidence-based practices that are consistently implemented together to enhance the quality of care to patients (2)**.**

Compliance: Adherence to the guidelines by implementing specific elements as stipulated in the care bundle (1).

Critical setting: Refers to healthcare environments where patients with life-threatening conditions are monitored (3).

Evidence-based practices: refers to interventions, strategies or approaches in healthcare that have been proven to demonstrate improved patient outcomes through scientific research, experience and patients' preferences (4)**.**

Healthcare Associated Infections/ Nosocomial Infections: A contagion that is contracted when receiving treatment in a healthcare facility that was not present during the time the person made an initial visit to the facility (5).

Knowledge: In this study refers to the information, understanding and expertise that nurses use to provide effective care to surgical patients (6)**.**

Perioperative care: Defined as being the period from the time a decision is made to perform surgery on a patient to the postoperative care of the patient in the hospital and includes three stages, preoperative, intraoperative and postoperative care of a patient (7).

Surgical Site Infection: Is defined as a wound infection that develops within 30 days post-surgery or 90 days following the insertion of a surgical implant following an invasive medical care (8).

Surgical Site Infection Prevention Bundle: A care bundle consisting of evidence-based elements to prevent surgical site infections (9).

CHAPTER ONE

INTRODUCTION

1.1 Background

Hospital-acquired infections (HAIs) have grown to be a major global public health concern due to the increased cost, morbidity, and mortality they are associated with (10). The World Health Organization (WHO) estimates that seven patients from high-income countries and fifteen patients from middle and low-income countries (LMICs) will contract one healthcare-associated infection (HAI) during their hospital stay for every 100 hospitalized patients (5). In LMICs, surgical site infections (SSIs) are the most common HAI, while they are the second most common HAI in Europe and the US (11). A surgical site infection is defined by the European Center for Disease Control (ECDC) as a wound infection that develops within 30 days post-surgery or 90 days following the insertion of surgical implants following an invasive medical care (8).

Every year, between 160,000 and 300,000 SSIs develop in the United States. These infections are linked to high hospital costs and longer hospital stays. (12). Data from 2018 to 2020 in the European nations showed 19,680 developed SSIs from 1,255,958 different procedures. The incidence of SSIs ranged from 0.6% to 9.5%, contingent upon the type of surgery that was performed (8). The occurrence of SSIs in LMICs is relatively high (13–16). In sub-Saharan Africa, SSIs are the leading HAIs for hospitalized patients and its cumulative incidence ranges from 2.5 to 30.9% (15). In Ethiopia the incidence of SSIs was 19.1% (17) in Rwanda, SSIs incident rate was at 10. 9% (18) and in Tanzania SSIs rates were between 10% to 26% (19–22) which is relatively high.

It is believed that 70% of SSIs can be prevented using evidence-based guidelines and prevention require integration of standardized measures before, during and after surgery. SSI care bundle is a group of evidence-based practice interventions which when performed together lead to patients' better outcomes for perioperative patients (23). Bundled care interventions can be individualized to each facility and support organizational change towards

quality improvement in clinical settings (24). The implementation of evidence-based practices involves integrating the best available evidence interventions, with healthcare providers' clinical expertise and individual patient characteristics (25,26).

Bundle elements for preventing SSIs include: administration of parental antibiotic prophylaxis 60 minutes before incision, bathing the patient with antimicrobial soap or antiseptic solution, avoiding removal of hair or where need be using clippers to remove hair on the anticipated incision site, using an alcohol based disinfectant for skin preparation before surgery, controlling blood glucose perioperatively, maintaining normal temperatures perioperatively and maintaining a sterile field (10). Nurses have a major role in preventing surgical site infections, hence integrating SSIs strategies in their daily routine is of great importance in improving patient outcomes (1). However, adherence to standard practices in preventing SSIs amongst nurses is low (27,28). Studies have revealed that implementation of guidelines is affected by lack of knowledge, unawareness of the guidelines, lack of resources, lack of leadership support, lack of training as well as shortage of staff (29–32).

It is essential for nurses to be knowledgeable with evidence based guidelines for preventing SSIs in order to provide patients undergoing surgery with high quality nursing care (33). However globally, published data has shown that nurses lack knowledge on evidence based guidelines in preventing SSIs (29). Proportionally, in China about 39% of nurses were knowledgeable about prevention of SSIs (34), in Ethiopia it was found to be at 40.7 % (35) and the same proportion was found in Pakistan (36), in Uganda the proportion was found to be at 48.5% (37), this just confirms that nurses' knowledge on SSI prevention is very low. Training interventions are an ideal strategy for improving knowledge and enhancing implementation of preventive measures (29,38). It is recommended that integrating an educational intervention and follow ups during implementation phase of the guidelines improves guideline uptake and also enhance professional development for the nurses thereby improving better outcomes for patients (38–40).

Despite the availability of national guidelines on preventing SSIs in Malawi, implementing the guidelines is insufficient as nurses lack adequate knowledge, skills and training. The lack of

evidence-based training and awareness on strategies of preventing SSIs constitutes a serious hindrance to preventing SSIs healthcare settings such as MZCH. There was no published data in Malawi at the time of this study that assessed knowledge, compliance and barriers amongst nurses regarding implementation of SSI bundle to prevent SSI infection. This study will serve as a prototype in the usage of bundled care to increase guideline utilization to prevent SSIs.

1.2 Problem statement

Surgical site infections (SSIs) are a common surgical complication and one of the most frequent HAI in Europe, America and in LMICs (41). The projected global 30-day cumulative occurrence of SSIs is estimated to range from 11% to 50% (42). In comparison to high-income nations, LMICs have a higher frequency of SSIs (15). In African countries, SSIs occur in 10% of procedures; and it is associated with a 9.7% case fatality rate (7). The effects of SSIs have been extensively documented in comprehensive surveys that outline the outcomes of such surgeries, these implications include prolonged hospitalization, diminished quality of life, elevated mortality rates and augmented healthcare expenses (8,10,42).

In Malawi, Queen Elizabeth Central Hospital reported a relatively high prevalence rate of healthcare-associated infections (HAIs) at 11. 4%, with SSIs being among the most common (43). In critical care settings in Malawi, surgery is a major contributor to morbidity and mortality (43–45). The average rates of postoperative infections in Malawi were at 2.69% which was higher compared to its neighboring country Zambia (45). Data on surgical site infections at Mzuzu Central Hospital is scanty due to poor reporting, however, being a low-income country surgical site infections are considered to be prevalent in Malawi. A study conducted at MZCH on prevalence and distribution of bacterial isolates demonstrated an increase in bacterial burden from different units. Pus from wound and ear infections were the most frequent samples and the majority of them were collected in the outpatient department, male surgical ward, paediatric ward and female surgical ward (46) exhibiting a higher risk of SSIs incidences in the forementioned surgical departments.

Nurses play a crucial role in implementing evidence-based practices to prevent SSIs. However studies indicate that a significant proportion of nurses lack adequate knowledge on SSI

prevention (34–37). Adherence to guidelines throughout the perioperative period is essential for SSI prevention (40). Several studies that were designed and conducted in other countries by integrating an educational program to improve knowledge, skills and guideline utilization by healthcare workers have proven to be a success in preventing SSIs (27,47–50). Research is continuously producing better practices, but it is difficult for nurses to keep their knowledge up-to-date which delays the adoption and application of evidence-based practices in their workplaces (38,40).

Care bundles, the SSI bundle inclusive is a new concept in Malawi that has not been well introduced and assessed amongst nurses in practice. Through unpublished nurses' knowledge regarding SSI prevention in Malawi is insufficient. SSI prevention is complex and demands for a diversified approach (51), hence an education intervention was used in this study to enhance knowledge and compliance amongst nurses on SSI prevention. This study therefore aims to evaluate the effect of an educational intervention on nurses' knowledge, compliance and perceived hinderance to implementing an SSI bundle at Mzuzu Central hospital.

1.3.1 Broad research question

What is the nurses' knowledge, compliance and perceived barriers regarding implementation of the surgical site infection bundle at Mzuzu Central Hospital?

1.3.2. Specific research questions

1. What is the knowledge level of nurses regarding the surgical site infection prevention bundle before and after educational intervention?
2. What are the self-reported compliances of nurses regarding implementation of the surgical site implementation bundle before and after an educational intervention?
3. What are the perceived barriers to an effective implementation of the surgical site infection prevention bundle among nurses?

1.4 Objectives

1.4.1 Broad research objective

To evaluate nurses' knowledge, compliance and barriers regarding implementation of a surgical site infection bundle at Mzuzu Central Hospital in Malawi.

1.4.2 Specific objectives

1. To assess the knowledge level of nurses regarding the surgical site infections bundle before and after intervention.
2. To determine the self-reported compliances of nurses regarding implementation of a surgical site infection prevention bundle before and after an educational intervention.
3. To identify perceived barriers to implementation of a surgical site infection prevention bundle amongst nurses.

1.5. Significance of study

This was a pre- and post-interventional study which assessed nurses' knowledge, compliance and barriers regarding implementation of an SSI prevention bundle at Mzuzu Central Hospital. Findings in this study will help improve patient outcomes by preventing complications that are associated with sepsis and septic shock in surgical patients. The education intervention may also have had an impact on nurses working in critical care settings to recognize the early signs of deterioration in patients hence detecting the risks for SSIs and its complications in time. The study findings may aid hospital managers identify resource gaps and other challenges in implementing SSI bundle and therefore plan in advance to enhance guidelines compliance. It may also help educational institutions identify gaps in the curriculum of surgical nursing and emphasize teaching based on evidence-based practices that have proved to improve patient care. The findings from this study may help policymakers to plan for strategies that would promote compliance to SSI guideline by the nurses. Lastly, this study has prompted further areas for research to improve SSI prevention.

1.6 Theoretical Framework: The Health Belief Model

1.6.1 Description of the Health Belief Model

In the 1950s, Godfrey Hochbaum, Irwin Rosenstock, and Rosenstock and Kirscht established the health belief model (52). The model, which is used to forecast health behaviors, is based on the idea that an individual's desire to alter their behavior is a result of their own health-related assumptions (53). The primary components of the theory that have been applied in this investigation are perceived severity, perceived benefits, perceived vulnerability, and perceived barriers and the calls for action.

In this study, the HBM constructs were adopted to guide the researcher in the formulation of objectives and development of an educational intervention aimed at promoting knowledge, compliance and overcoming barriers during implementation of the SSI bundle.

On perceived susceptibility and perceived severity, nurses' knowledge and perceptions about the susceptibility and severity of patients to surgical site infections is crucial for implementing practice change from routine care to providing evidence-based practice to patients. By exploring participants knowledge and misconceptions on patients' susceptibility to SSIs, as a researcher the educational intervention was tailored towards emphasizing the importance of complying to SSI infection prevention guidelines.

On perceived benefits, this construct was used on emphasizing the benefits of SSI prevention. Nurses were informed on how preventive actions are beneficial to patients in terms of reduced SSI infection rates, faster recovery times to patients hence reduced hospital stay and costs. The researcher ensured emphasis is made during delivery of the training session in order to motivate nurses to adhere to standardized care.

Identifying barriers, as another construct in the HBM, that hinder participants from complying with the SSI bundle is essential for developing further interventional activities. Addressing these barriers can directly help mitigate obstacles to compliance during the implementation phase.

Cues to action are described as those activities that prompt individuals to take preventive measures. In this study these include, providing training to the participants on SSIs and prevention using the SSI bundle, providing the participants with educational materials such as flyers illustrating the SSI bundle and also support visits by the researcher during the implementation phase. Incorporating these cues may help participants to translate their knowledge into action and comply to the SSI bundle interventions.

Several modifying factors can have an influence on knowledge and the effectiveness of the implementation of the SSI bundle by the nurses before and after intervention. For example, the level of education, previous knowledge on SSI, age can have a significant influence on the understanding and implementation of the SSI bundle.

1.6.2 Conceptual Framework

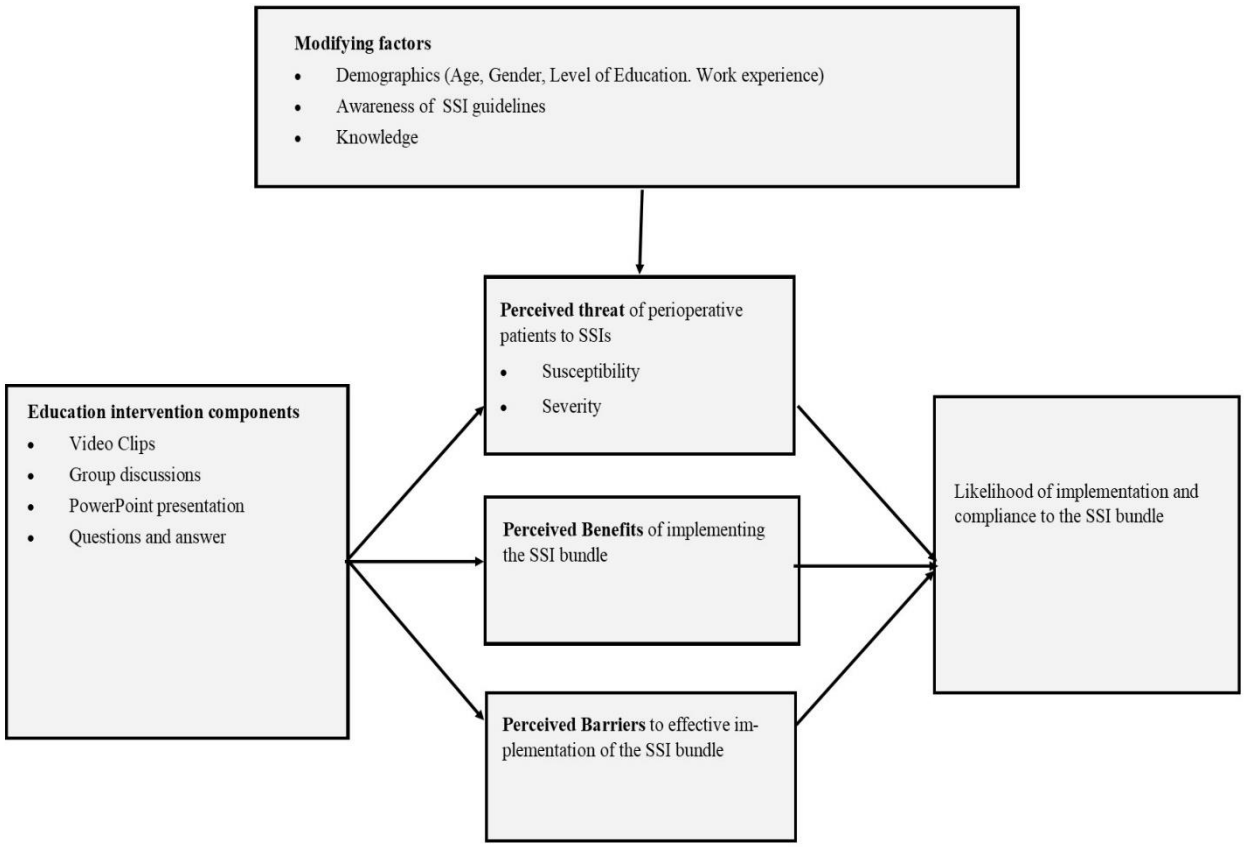


Figure 1: Conceptual illustration of health belief mode

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and Pathophysiology of SSIs

SSIs are infections that develop at the site that surgery was done. Primarily, SSIs are present at the skin area where an incision was made, and it can also involve tissue under the skin or deep space or organ and implants (8). According to ECDC classification of SSIs there are three classifications of SSIs: infections on the superficial skin which is tissue around the incision, deep incisional SSI (which involves muscle of fascia) and space or organ SSIs that involve body parts of the anatomy that were maneuvered in the course of surgery. Occasionally, most of the SSIs happen within the first thirty days following surgery, but usually happen around the 5^{th}-10^{th} day post operatively (14).

According to the 2018 WHO report, the risk of SSIs is directly related to the pathogenicity of the bacterium present at the skin site and its ability to compromise the host's immune response at the wound site. The patient's skin flora specifically staphylococcus aureus is believed to be the typical cause of surgical infection and is responsible for 20% to 30% of SSI. This is due to the possibility of endogenous bacteria contaminating the exposed tissues following an incision of the skin or mucous membranes (9,51).

2.2 Knowledge of Nurses on SSI bundle

Infection control of SSIs and improving patient outcomes are critical tasks for nurses(54). Overall, nurses have little understanding of about preventing SSIs (29) . When evidence based practices are followed perioperatively, the incidence of SSIs can be dropped by half (1) It is imperative that nurses possess an understanding of SSIs and their role in preventing them (49).

In order to render high quality nursing care and enhance patient safety, it is vital that nurses are aware of the relevant evidence based guidelines regarding prevention of SSIs (40). SSIs have a number of risk factors that contribute to its incidence. The risks are classified as intrinsic and extrinsic factors (13,48). These risks include; age, malnutrition, smoking,

surgeries lasting more than hours, contaminated and dirty wounds thus open fractures inclusive, patients with underlying comorbidities, abdominal surgeries, patients temperatures lasting more than go minutes, high blood glucose levels (7,8,14,55). These factors are modifiable if nurses take the necessary assessments before, intra and after surgery to prevent complications. These tasks include and not limited to the SSI bundle elements; ensuring patients take a preoperative shower with soap, administering a prophylactic antibiotic one hour before surgery, not removing hair and using clippers on a proposed surgical site, goal directed fluid therapy by achieving a mean arterial pressure of 65mmHg and systolic pressure of 90mmHg and above, targeting blood glucose level of less than 200g/dl in all patients (9,10,14,39).

Knowledge of the risks and guidelines of SSIs by nurses while taking care of surgical patients is essential in providing high quality nursing care (55). Nurses are required to use standards of SSI prevention and control to prevent contamination of surgical wounds. This activity requires a collaborative team work in all departments that are involved in taking care of surgical patients, thus pre, intra and post operatively. However, globally studies have shown that nurses knowledge on SSI prevention is inadequate (29,34,36). Proportionally, in China only 39% of nurses were knowledgeable about prevention of SSIs (34), in Ethiopia it was found to be at 40.7 % (35) and the same proportion was found in Pakistan (36). In Uganda the proportion of nurses having knowledge on SSI prevention was found to be at 48.5% (37), and this just confirms that nurses' knowledge on SSI prevention is very low. In Malawi at the time of this study, there was no published data on the proportion of nurses with knowledge on SSI prevention.

In a study conducted by Teshar et al. in 2015, it was found that factors associated with nurses knowledge and practices in preventing SSIs included work experience, level of education, workload, training on SSI prevention and adherence to patient safety guideline (35). It is therefore recommended that the most recent evidence based practices for preventing SSIs should be regularly introduced to nurses. Nonetheless, there is discrepancy between what is now being practiced about SSI prevention and the evidence that is currently available (35).

Awareness of the availability of guidelines to prevent SSI is the first step to knowledge translation (55). Nurses should continually engage themselves in learning in order to remain up to date with current practices of SSI prevention (56). Education of nurses can improve their knowledge and practices in promoting implementation of SSI prevention practices (38,56), hence this study also used an education intervention to enhance nurses knowledge and compliance in SSI prevention at MZCH.

2.3 Compliance of nurses towards Prevention of SSIs

WHO guidelines provide with evidence-based recommendations in preventing surgical infections and implementing the SSI prevention bundle (9). Bundle elements for preventing SSIs include: administration of parental antibiotic prophylaxis 60 minutes before incision, bathing the patient with antimicrobial soap or antiseptic solution, avoiding removal of hair or where need be using clippers to remove hair on the anticipated incision site, using an alcohol based disinfectant for skin preparation before surgery, controlling blood glucose perioperatively, maintaining normal temperatures perioperatively and maintaining a sterile field (7,57) The empirical data and global experience demonstrate that implementing the various components of the WHO guideline recommendations in a complementary and concurrent way, leads to a successful and long-lasting improvement in patient outcomes and healthcare practices (24). All the components of the bundle elements for the improvement strategy are essential, and none of them can be regarded as optional in general (23). On the other hand, the strategy for implementation is meant to be flexible without compromising its integrity or its intended outcome hence certain components may receive greater attention than others based on the local circumstances and resources available (24).

Compliance with SSI prevention guidelines amongst nurses in clinical settings remains a significant challenge as highlighted by several studies (30,58,59). Studies from high-income countries, such as those conducted in the United States and Europe, show that compliance rates can be as low as 40%-60%, depending on the specific preventive measures (29,39). In Uganda, Ethiopia and Kenya, studies have shown that compliance with SSI is low (35,37,60). Studied in LMICs highlighted that while nurses understood the importance of infection

prevention protocols, there were critical lapses in practice due to both resource constraints and knowledge deficits (1,29,36,39).

Nurses compliance with preventing surgical site infections can be influenced by many factors such as workload, time, inadequate resources and lack of communication (1). Additionally lack of standardized protocols, education, awareness might again contribute to variations in adherence to infection prevention measures (38,40). A supportive environment that emphasizes the importance of infection prevention control practices, positively influences compliance whereby unclear polices may hinder nurses from consistently following recommended protocols. These challenges can be addressed through comprehensive training and availability of sufficient resources to help improve nurses' compliance (40). Interventions such as implementing the SSI bundle in institutions on specific cases have shown better outcomes on patients through education and regular audits. Overall, these studies underscore the need for targeted interventions that address challenges faced by nurses including lack of resources, knowledge deficits and other organizational barriers.

2.4 Barriers to effective implementation of the SSI bundle

The timely and successful execution of a care bundle is essential to maximizing its effectiveness (61). However staff utilizing bundles are invariably faced with challenges in their work environments (26). Operationalizing surgical site infection guidelines and translating them to routine healthcare practice is a challenge (54). Literature indicates that years of work, education level, workload, training, organizational culture, and lack of understanding of guidelines influence guideline utilization (26,30).

A Chronic Obstructive Pulmonary Disease (COPD) bundle implementation team at North West London hospital were recruited in study to explore the challenges the teams faced in implementing the COPD bundle. From the focus groups that were conducted, implementation team members from five hospitals narrated a range of challenges identified in other initial studies, however there were also other challenges that were not previously identified. According to the study results, the team faced difficulties that were related to specific skills

and knowledge. A lack of communication, staff shortage and overworked personnel were major obstacles to the COPD bundle implementation (30).

In a similar study in North Eastern Nigeria, research was conducted to evaluate the barriers and facilitators of HCWs adherence to standard practices of preventing infections. Participants reported that the level of compliance was dependent on the availability of resources such as personal protective equipment (PPEs), availability of human resource and discomfort with the use of PPEs. Staff attitude was found to be another contributor to non-compliance to infection prevention protocols (62). Therefore, identifying specific barriers to change during implementation of a change could enable the successful implementation of standard procedures.

CHAPTER THREE

RESEARCH METHODS AND MATERIALS

3.1 Research Design

This research utilized a quasi-experimental design involving a single group with both pre-test and posttest assessments. Quasi-experimental research involves establishing causal effect about the impact of an independent variable on a dependent variable (63). Quasi-experimental designs are ideal in cases where researchers want to determine if an intervention has had some effect on participants (64). In this study, the researcher tested a dependent variable (knowledge) before and after intervention with an independent variable (education intervention) in order to assess nurses' knowledge on the SSI prevention before and after training by comparing pretest and post-test scores.

The one-group pretest and posttest in this study involved five steps:

(i) Administering a pretest to measure the baseline knowledge of nurses about prevention of SSIs using the SSI bundle before intervention (training session)

(ii) Intervening with training through lecture, group discussions.

(iii) Immediate administration of a post-test to measure knowledge of nurses regarding the SSI prevention bundle acquired immediately after an intervention.

(iv) Distribution of a printed guideline on SSI bundle prevention in the participating departments

(v) Administration of a follow-up posttest at four weeks post intervention to measure retained knowledge. Additionally, the researcher also assessed self-reported compliance and barriers nurses encountered during the implementation phase of the SSI bundle.

Scientifically, collecting data at several points in time is essential in determining the intervention's lasting impact, generally observed in conventional methodologies with pretest, posttest, and follow-up evaluations (65).

Table 1: Study Variables

Dependent Variable	**Independent Variable**	**Dependent Variable**
Measure pre-knowledge level	• 60 minutes educational intervention • Sociodemographic characteristics, (age, sex, work experience, level of education, previous training on SSIs	Measure post-knowledge level

3.2 Study Setting

This research took place at Mzuzu Central Hospital (MZCH), a government referral hospital located in the Northern Region of Malawi within the city of Mzuzu. Mzuzu Central Hospital provides tertiary healthcare services for the entire population of northern Malawi which is projected at 2,532,270 (National Statistical Office, 2018). MZCH serves as a critical healthcare facility, providing specialized care to a diverse patient population for both adults and children in the Northern part of Malawi. MZCH has a bed capacity of 338 and on average admits 3841 general surgical patients per year. Within the hospital, the study specifically focused on nurses working in general surgery departments and their HDUs, orthopedic wards, major operating theaters, orthopedic theaters and the intensive care unit. The diverse inclusion of the departments was necessary in this study to ensure a collaborative approach in the care of the surgical patients pre, intra and post operatively. From WHO and CDC recommendations on SSI prevention, evidence-based guidelines require integration of standardized measures before, during and after surgery (5,11).

3.3 Study population

The study targeted nurses working in adult general surgery wards and their HDUs, major operating theaters, orthopedic theaters, orthopedic wards and the intensive care unit at Mzuzu Central Hospital (MZCH). This inclusion criterion was important as it ensured that the participants had a comprehensive understanding of their working environment and standard operating procedures in their respective departments. By specifically targeting this group of nurses, the study aimed to gather valuable insights and perspectives from individuals who are directly involved in taking care of patients who are prone to developing surgical site infections. Below is the distribution of nurses in the listed departments.

Table 2: Distribution of nurses in the listed departments.

NO.	**Department**	**No. Of Nurses**
1	Major Operating Theatre	18
2	Female Surgical Ward	22
3	Male Surgical Ward	24
4	Orthopaedic Ward	15
5	Minor Theatre	7
6	ICU	23
7	Gynaecology Ward	22
8	Private ward	15
	Grand Totals	**146**

Inclusion Criteria

The term inclusion criteria refers to the criteria that describes the characteristics of the study population (66). It therefore identifies the participants who qualifies as study participants for the study. The following were the participants characteristics:

- Nurses working in the listed departments; Female surgical ward, male surgical ward and their HDUs, major operating theater, orthopedic theater, orthopedic ward and ICU.
- Nurses who had worked in the proposed departments for more than 2 months. This is to ensure that by this time new nurses to the department are well oriented and conversant with the routines and practices of their department.
- Nurses who had expressed willingness to take part in the research.

Exclusion

- Nurses who fit the above description but had declined to willingly sign and take part in this study.
- Nurses and managers who were involved in testing the data collection tool, to prevent bias in reporting knowledge.
- Nurses who were unable to commit to the study timeline and study intervention procedures.
- Participants who failed to complete the questionnaire were excluded.

3.4 Sample Size Estimation

Using the online Statistics for Psychologists Program (https://www.ai-therapy.com/psychology-statistics/terms/), the sample size for this study was calculated to be 90 participants. Using a power analysis (Cohen, 1992), the sample size (n–90) was determined by taking into account an alpha error rate of 0.05 (two tailed), a small effect size (Cohen's d) of 0.3, and a power of 80%. Based on empirical distributions of impact sizes from related

educational research that thought it would be of practical consequence, an effect size of 0.3 was selected (67) and also bearing in mind the ability to train a controllable sample.

3.5 Sample selection and procedure

A sample is a subset of the population of interest that has been strategically chosen so that the people within it accurately reflect the traits of the target population (68). Stratified random sampling was used to ensure an equal representation of the target population from each department. A probability proportional size (PPS) from each department is shown in the table 2 below. From the calculated proportions, convenience sampling was used to get the study sample. Convenience sampling involves selecting individuals who are readily available and accessible to the researcher at the time of data collection (69). Convenience sampling technique was chosen to counter with the limited time of carrying out and finish this study within a specified time-frame of the academic year. Not only that but also considering numbers of the study population who were suiting the inclusion criteria.

Table 3: Probability proportional size

NO.	**Department**	**No. Of Nurses**	**Proportional calculation**	**Sample from each department**
1	Major Operating Theatre	18	18/146*90=11.0	11 Nurses
2	Female Surgical Ward	22	22/146*90=13.5	14 Nurses
3	Male Surgical Ward	24	24/146*90=14.7	15 Nurses
4	Orthopaedic Ward	15	15/146*90=9.2	9 Nurses
5	Minor Theatre	7	7/146*90=4.3	4 Nurses
6	ICU	23	23/146*90=14.1	14 Nurses
7	Private Ward	15	15/146*90=9.2	9
8	Gynaecology ward	22	22/146*90=13.5	14
	Grand Totals	**146**		**90 Nurses**

3.6 Data Collection Methods

3.6.1 Data Collection Tool

The data collection tool was a self-administered questionnaire, designed by the researcher based on the published data and updated guidelines of SSI prevention from WHO, CDC, Malawi IPC guidelines (9,10,70,71) The data collection tool measured three variables, knowledge, perceived compliance and perceived barriers. The data gathering tool had four parts, with part A consisting of sociodemographic characteristics of the participants which captured i.e. their age, level of education, and years of experience.

Part B composed of eighteen multiple-choice questions with one right answer, to test the knowledge of nurses in relation to SSI prevention strategies. Part B was tested at three different times with the same questions, thus before intervention, immediately after intervention and at 4 weeks after intervention. A correct answer was scored I and an incorrect answer 0, all scores were summed up and converted into percentages and presented into two categories: poor knowledge <50% and good knowledge >50% (72).

Part C assessed self-reported compliance by the nurses before and after implementation of the SSI bundle. Nurses used retrospective reporting of their compliance practices before and after the intervention. Self-reported compliances were assessed at 4 weeks after the education intervention together with a follow up posttest on knowledge. To measure compliance, a retrospective pretest questionnaire design using a 3-likert scale was used. The retrospective pretest design is popularly used to assess learners self-reported changes (73–75). In this design, data collection occurs simultaneously for before and after rather than gathering information at the beginning and or at the end of the intervention as in the normal pre-post test. The retrospective pre-post method gathers data only at the completion of the intervention by asking participants to self-assess what they know from two viewpoints: before and after participating in the study (76).

In this study, participants were required to retrospectively rate their compliance levels before and after the education intervention. The post-test question is the first question and examined

perceived compliance that has resulted from the education session. Subsequently, the participants were asked to recall their pre-education compliance. This second question is actually the pretest. It was asked at the end of the study together with the posttest perceived compliances, when the participants have had enough knowledge to answer the questions correctly. For the test items on compliance, the questionnaire consisted of 11 items with responses ratings of 1, 2 and 3. From the ratings 1=never, 2= sometimes and 3=always to measure the perceived compliance of the nurses during implementation of the SSI bundle after intervention (1).

The third variable barriers, which was Part D of the questionnaire assessed barriers to compliance encountered during implementation of the SSI bundle. Participants were asked to tick their perceived hurdles that they encountered during the implementation of the SSI bundle using a 4-point rating system: strongly agree, agree, disagree, and strongly disagree. It had 10 items. In the analysis, strongly agree and agree was combined for a positive answer, and disagree and strongly disagree for negative.

3.6.2 Data Collection Procedure

Nurses were approached during morning handovers because that is where a good number of nurses can be found and eligible participants were approached face to face and an information leaflet was given to them. Once the nurses understood the objectives of the study, nurses willing to participate submitted their names to their ward in charges. After the sample size was achieved, schedules and invitations of the training were sent through in-charges on the date and venue of the training. During the training, objectives of the study were explained again and participants would sign a consent form. The participants then underwent a pretest assessment. Thereafter an education intervention introduced to the participants. Immediately after the education intervention, participants underwent a posttest.

The researcher conducted three educational intervention sessions, each session consisting between 30 participants. A lesson plan was developed and checked by the educator to ensure consistency in delivering the lesion in all the groups. The education intervention involved a one hour of power point presentation and discussion. After completion of all the education

sessions, each department was provided with a printed guideline and the PPT was shared to departmental heads for further discussions at departmental level. The training sessions were conducted within the same week from the first training so that it did not affect the timing of the follow up posttest.

Data was collected in three phases, with the knowledge being tested three times (before intervention, immediately after intervention and a follow up test at 4 weeks using the same questions) 90 participants completed the pretest and immediate posttest activity. Perceived compliance was assessed using a retrospective post and pretest questionnaire design at 4 weeks, and perceived barriers assessed once as well at 4 weeks post intervention. 82 participants completed the follow up post test.

The researcher played an active role in data collection and during the training to ensure consistency and standardization across the process. A research assistant, who is a nurse educator working in surgical department at MZCH, was part of this in obtaining informed consent, planning the training, taking note of challenges encountered during data collection and also ensuring questionnaire completeness by the participants.

3.6.3 The intervention

The education intervention was developed based on the current guidelines by WHO 2018, CDC 2020 and the Malawi National Guidelines (2020) and other literature on SSI prevention (8,9,69,70). The sections included in the presentation included: Assessment and identification of risk factors of developing SSIs, identifying signs and symptoms of SSIs, management of patients perioperatively to prevent SSIs, method of skin and hand preparation as well as complications of SSIs.

The participants underwent an educational intervention with a pre and posttest assessment on knowledge. The intervention involved a power point presentation and discussion. The presentation was reviewed and supervised by two nursing education specialists working at MZCH. The pre and post exams lasted for 20 minutes, while the presentation and discussion lasted between 1hour to 2hours. The presentation was taking place in hall within the hospital

in the afternoon hours, as participants felt it was the most flexible time for both in the morning and night shifts. After the training sessions, participants were later provided with a printed guideline for reference during practice in their departments.

Table 4: Phases of the educational intervention

Phases	**Actions**	
PHASE 1	Permission	Permission was granted from all relevant authorities as per appendix.
	Introduction of the study, Selection of participants and obtaining consent	The nurses were approached in their departments during morning handovers. Introductions and the aim of the study and study objectives were explained to the nurses. After the nurses understood the study aim, with the help of the department manager, nurses willing to participate were provided with a consent form, also taking into consideration sample targets from each department.
	Training groups	The sample population for this study was 90. Participants were divided into smaller manageable groups for teaching, 30 in each training session. The training sessions were done in the same week on different days to ensure consistent days for a follow up test at 4 weeks. There was no interruption in care of the patients as nurses alternated on who to attend the session as others took care of the patients. The training was taking place in a hall within the hospital setting of MZCH.
	Pre intervention Data Collection	In the pre intervention, the researcher with the help of a research assistant, administered a questionnaire which had knowledge questions. It comprised of 18 multiple choice questions. This was designed to assess nurses baseline level of knowledge on SSI prevention bundle before the intervention. The participants were

		assigned a unique identification number written on a piece of paper and randomly picked from a bowl and write the identification on the questionnaire in place of their names i.e. SSI 1, SSI 2 to SSI 90. They were given 20 minutes to answer the questionnaire and the researcher and assistant researcher attended to problems encountered in the test.
	Training	The training will include a video on best practices of SSI prevention and a picture of an infected wound following surgery. Participants were then engaged in a discussion based on their current practices on caring for a surgical wound. A PowerPoint presentation and discussion included the definition of SSIs, the burden of SSIs globally and local, assessment and identification of risk factors of developing SSIs, identifying signs and symptoms of SSIs, management of patients perioperatively to prevent SSIs, method of skin and hand preparation as well as complications of SSIs, introduction and definition of an SSI bundle in the setting based on WHO and Malawi National guidelines on SSI prevention. The participants were also provided with a hair clipper and how it operates to remove hair in preventing SSIs compared to other methods of hair removal. The presentation was conducted by the researcher and supervised by a nurse educator specialist. Additional information was supplemented by the head of clinical and managers in the surgical department. The presentation took a maximum of 60 minutes.
	Immediate Post-intervention Data	Immediately after the training session, a posttest was given to participants to assess knowledge acquired immediately after

	Collection	intervention. This was done to evaluate how well the nurses have absorbed and understood the training material right away. This also acted as immediate feedback about the effectiveness of the training.
PHASE 2	Implementation	The implementation phase took four weeks for participants to put to practice what they learnt. A printed laminated poster on SSI prevention bundle was placed in strategic places in the wards and theaters to act as reference for participants during this phase of bundle implementation.
PHASE 3	Follow-up post-test and assessment of self-reported compliance and barriers	The last phase of the intervention was conducted four weeks after intervention and had four parts. The first part was the one that was used to assess baseline knowledge before intervention and assessed knowledge level immediately after intervention. It is also during this phase that the researcher assessed compliance retrospectively and barriers that nurses encountered during the implementation phase. Compliance was assessed twice to have a comparison of compliance ratings before the training and if there were changes in compliance after training. Since this was also an implementation study, hence challenges are inevitable. This study examined barriers that participants encountered during implementation of their newly acquired knowledge once at the end of the study at 4 weeks.

3.6.4 The validity and reliability of the data collection instrument

In this study, the main types of validity that were used were face validity, content validity and construct validity (77). The questionnaire was reviewed and scrutinized by supervisors of this research. It was also presented to a team of experts, two nursing educators and two critical care nurses as well as experienced medical and surgical nurses to measure its content validity. Minor modifications were done according to the experts' recommendations. Internal consistency reliability of all items of the data collection tool was assessed using a Cronbach's Alph test; it was 0.8 for knowledge, 0.78 for compliance and 0.77 for barriers, indicating that the questionnaire was credible (78).

3.7 Data Analysis

The study employed quantitative data analysis procedures which included both descriptive and inferential statistics. Scores were extracted from questionnaires to Excel and quantified as percentages. Quantitative data was analyzed using the Statistical Package for Social Scientists (SPSS) software version 25. Descriptive statistics were used to analyze findings from sociodemographic variables, levels of compliance and perceived barriers of participants. Means, standard deviation, frequencies and percentages were be presented in charts, graphs and tables. The association between sociodemographic factors (such as age, gender, years of work experience, and educational attainment) and the dependent variable (nurses' level of knowledge) were examined using Pearson's chi-square test and Fisher's exact test.

To compare the mean scores the dependent t-test were used to measure knowledge mean scores at different times: before and after intervention. On the other hand, repeated measures ANOVA were used to statistically determine changes in the average mean scores for a pretest, immediate posttest and a follow-up posttest at four weeks. In order to declare a statistically significant link between independent and dependent variables, p-values of less than 0.05 were used as the cut-off point.

3.8 Ethical considerations

This study was approved by the MUHAS Research and Ethics Committee (MUHAS-REC-03-2024-2092) and the National Health Sciences Research Committee of Malawi (#24/03/4412). Letter of approval was also attained from the site as attached to this document. During the study, informed consent in written form were obtained from participants after providing them with a written information leaflet on the objectives and nature of the study. Participants were assured of anonymity and were provided with code numbers to write on the questionnaire by selecting a piece of paper randomly from a bowl. Participants were assured that there were no anticipated risks in this study and that they were free to opt out of the study at any stage if they felt they were subjected to any harm.

3.9 Dissemination plan

The findings of this study will be disseminated locally at the study site to staff and management of Mzuzu Central Hospital. A copy of the thesis will be placed in the MUHAS Library, and other copies will be sent to the Department of Human Resource Management and Development at Capital Hill in Lilongwe Malawi and the National Health Research Council at Ministry of Health Malawi.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the key study results and findings of the study that sought to find out nurses' knowledge, compliance and barriers regarding implementation of a surgical site infection prevention bundle at Mzuzu central hospital in Malawi. The first section presents the socio demographic characteristics of the study participants. Thereafter, a presentation in summary form of the research findings of the study in relation to key questions of the study on knowledge, compliance and barriers. To that effect, effort is made to present the range of responses that were obtained for each of the four key research questions as presented in chapter one.

4.2 Questionnaire return rate

The study had a total sample size of 90 nurses and 90 questionnaires were distributed to the participants for pre and immediate posttest and they were all returned representing 100% return rate. A follow up questionnaire was distributed to 90 participants of which only 82 nurses completed representing 91% response rate. The reasons for not completing the questionnaire were mainly unavailability of the participant due to annual and school leave, incompleteness and off days. Nevertheless, this did not affect the demographic characteristics between those who completed the follow up and those who did not.

4.3 Socio-demographic characteristics of participants

The study had a total of 90 participants and 37 (41%) of the study participants were between the age of 30-39. On gender, 63 (70%) were females and 58 (65%) were diploma holders. From the participants list, 36 (40%) of the nurses had more than 11 years work of experience. From the study findings it was observed that out of the total participants who participated 72% have ever had a training on infection prevention protocols and only 81% of the participants have never had trainings on SSI prevention. 99% of the study participants were not aware of the SSI prevention bundle.

The table below shows the distribution of data on socio-demographics.

Table 5: Socio-demographic characteristics of participants

Variable	Measure	N (%)
Age	20-29 years	25 (28)
	30-39 years	37 (41)
	40-49 years	24 (27)
	50 years above	4 (4)
Gender	Male	27 (30)
	Female	63 (70)
Educational Qualification	Masters	2 (2)
	Degree	30 (33)
	Diploma	58 (65)
	Certificate	
Work Experience	Less than a year	10 (11)
	1-5 years	28 (31)
	6-10 years	16 (18)
	11 years and above	36 (40)
Training on infection prevention protocols	Yes	65 (72)
	No	25 (28)
Training on prevention of surgical site infections	Yes	17 (19)
	No	73 (81)
Awareness of the surgical site infection prevention bundle	Yes	1 (1)
	No	89 (99)

4.5 Knowledge level of nurses on SSI bundle before and after intervention.

During the pretest, participants scored highly in identifying signs of infection from an incision area 81(90%) and scored less in best method of preoperative shaving 5(6%). During the immediate posttest, the participants performed well on best method of perioperative shaving 89(99%) and least performed in benefits of warming devices on intra and postoperative patents 11(12%). Four weeks after the intervention, nurses scores were highest in identifying risk factors for developing SSIs 82(100%) and best method of perioperative shaving 82(100%), and least scored in benefits of warming devices on perioperative patients 39(48%).

Table 6: Frequency distribution of Nurses Knowledge towards prevention of SSIs

	Pre-Test	Post Test	4 weeks later
Responses	Correct N (%)	Correct N (%)	Correct N (%)
Risk factor for surgical site infections	56 (62)	87 (97)	82 (100)
Role of preoperative antibiotics play in surgical site infection prevention	20 (22)	31 (34)	45 (55)
Most effective method of hand preparation to prevent SSIs	11 (12)	76 (84)	48 (59)
Common sign of surgical site wound infection	81 (90)	80 (89)	81 (99)
NOT a component of preoperative bundle intervention for SSI prevention	20 (22)	42 (47)	68 (83)
SSI bundle elements to be complied to	7(8%)	78(86%)	71(86%)
How long should an antibiotic be prolonged for prophylaxis	21 (23)	18 (20)	49 (60)
Where a proposed surgical site has	18 (20)	86 (96)	75(92)

hair			
Best method of perioperative shaving	5 (6)	89 (99)	82 (100)
When should prophylactic antibiotics be given	61(68)	87(97)	78 (95)
Antiseptics to be used on surgical site when preparing the skin for surgery	10 (11)	81 (90)	68(83)
Maintaining normothermia is part of the SSI bundle;	7 (8)	50 (56)	72(88)
The benefits of warming strategies include **Reducing blood loss**	7(8)	11 (12)	39(48)
Targeted MAP to prevent SSIs 65 mmHg	20 (22)	85(94)	70 (85)
Blood glucose monitoring should be monitored throughout on.	52 (58)	87 (97)	80(98)
The goal of blood glucose level to enhance prevention of surgical site infections	32 (36)	62 (69)	65(79)
Primary purpose of early detection and management of SSIs	55(61)	45(50)	53(65)
How can surgical teams effectively implement bundle interventions to prevent SSIs	42(47)	59(66)	74(90)

Overall knowledge assessment results during phases of intervention

Only 8% of the nurses had adequate knowledge on SSI prevention strategies-very low compared to other studies. There was however significant improvement in the knowledge level immediately after the education intervention to 87 (97%) and 82 (100%) during a follow up test

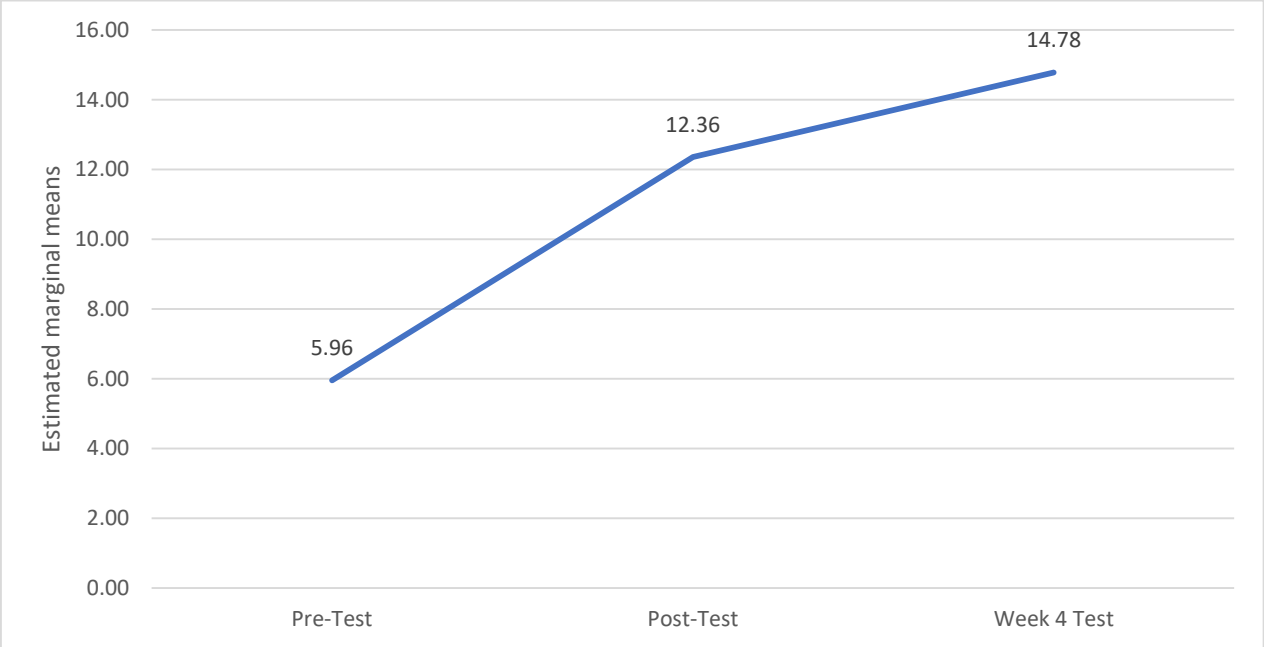
Table 7: Overall knowledge assessment results during phases of intervention

Level of Knowledge	**Measures**								
	Pre-test, n=90			**Post-test, n=90**			**Follow up test, n=82**		
	F.	%	Mean	F.	%	Mean	F.	%	Mean
Fail	83	92%		3	3%		0	0%	
Pass	7	8%	5.96	87	97%	12.3	82	100%	14.78
Totals	**90**	**100%**		**90**	**100%**		**82**	**100%**	

The Mean scores were compared for 2 variables with sample size 90. The mean score during **Immediate Post test** was higher (M=12.36, SD=1.691) than for **Pretest** mean score (M=5.96, SD=1.550). The nurses' knowledge was again assessed four weeks post intervention. The mean was higher for **follow up results** (M=14.78, SD=1.819), as compared to the immediate post test results, The difference in means was statistically significant at 1%. The results suggest that nurses' knowledge was significantly improved after posttest than in the pretest and it further improved after the interventions this is evident after the follow up.

Table 8: Paired Differences in knowledge mean scores before, immediate and after intervention

Variable	Mean	n	Std. Deviation	Std. Error Mean	P-value
Pre-Test Scores- Immediate post test score	5.96	90	1.550	.163	0.001
Immediate Post-Test- Follow up Score	12.36	90	1.691	.178	
Pre- test - Follow up test scores	14.78	82	1.819	.201	



Knowledge Level Scores: Level 1= Pretest, 2= posttest, 3= Follow up test

Figure 2: Knowledge means score levels

Repeated ANOVA

A repeated measures ANOVA was conducted to examine the effect of an education intervention amongst nurses regarding prevention of SSIs. Normality checks were carried out on the residuals which were approximately normally distributed. A repeated measures ANOVA with a Greenhouse-Geisser correction showed that mean scores differed significantly between time points (F (1.886, 152.749) = 708) p< 0.001. Post hoc tests using the Bonferroni correction revealed that each pairwise difference was significant (p<0.001). There was a significance in scores over SSI knowledge from pretest to follow up test, indicating that participation in the education training and providing materials for reference in the departments increased nurses' knowledge on SSI prevention.

Table 9: Repeated ANOVA

Tests of Within-Subjects Effects							
Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Knowledge level	Greenhouse-Geisser	3376.984	1.886	1790.749	708.000	.000	.897
Error Knowledge level	Greenhouse-GeisserQ3	386.350	152.749	2.529			

Association between sociodemographic factors and nurses' knowledge

The study sought to establish the relationship between the sociodemographic characteristics and nurses' knowledge using Pearson chi square test. The study findings established that out of the four socioeconomic characteristics, there was statistically significant relationship between work experience and nurses' knowledge (p<0.017). This indicates that work experience does influence nurses' knowledge on SSI prevention bundles. The result is significant at 5%.

Table 10: Pearson Chi square test and Fisher's exact test

Demographics	Categories	Yes	No	P-Value	
Age	20-29	1	24	0.452	0.322
	30-39		37		
	40-49		24		
	50 years above		4		
Gender	Male	1	26	4.84	1.00
	Female		63		
Educational Qualification	Masters		2	0.757	1.00
	Bachelor's Degree		31		
	Diploma		56		
Work experience	Less than a year		10	0.017	0.090
	1-5 years	1	28		
	6-10 years		15		
	11 years and above		36		

4.6 Nurses self-reported compliances before and after an education intervention

The second objective that was assessed in this study was nurses self-reported compliances before and after the intervention. Compliance in this study mainly focused on nurses reflecting retrospectively on their behavior and practice before intervention and their practice changes after the intervention. The least complied standard practice before intervention was on the best method for perioperative shaving (4%) as the ones that were always using clippers, and checking glucose before and after surgery (4%). Nurses showed good practice before intervention on checking for signs and symptoms of infection on an incision (56%). After the

training, the least complied practice was the use of clippers. The results indicate that only 38% of the participants were able to always use clippers where hair removal was absolute.

From the results, it also shows that before the intervention participants sometimes followed certain practices as part of their routine work. Hence in these items, after the intervention their compliance ratings increased tremendously. The most improved practice after the intervention was not removing hair from a proposed surgical site 10% to 88%. However, some compliance items received very minimal changes after intervention.

Table 11 shows the nurses perceived compliance before and after an education intervention regarding the implementation of surgical site infection prevention bundle among nurses.

Table 11: Nurses perceived compliance before and after education intervention

	ITEMS	**AFTER TRAINING**			**BEFORE TRAINING**		
	RATINGS	**1 Never**	**2 Sometimes**	**3 Always**	**1 Never**	**2 Sometimes**	**3 Always**
		n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
1.	I encourage my patients to take a pre-operative shower with an antimicrobial agent before surgery		**4 (5)**	**78(95)**	**20 (24)**	**50 (61)**	**12 (15)**
2.	I ensure patients are assessed of risk factors to developing SSIs before going for surgery	**2 (2)**	**12 (15)**	**68 (83)**	**35 (43)**	**41 (50)**	**6 (7)**
3.	I ensure patients undergoing surgery are given a prophylactic antibiotic one hour before surgery		**5 (6)**	**77 (94)**	**20 (24)**	**39 (48)**	**23 (28)**
4.	I check all my patients for their glucose levels before and after surgery	**4 (5)**	**17 (21)**	**61 (74)**	**42 (51)**	**37 (45)**	**3 (4)**

5.	I wash my hands with an antimicrobial soap and apply handrub before wearing sterile gloves	**2 (2)**	**26 (32)**	**54 (66)**	**43 (52)**	**30 (37)**	**9 (11)**
6.	I ensure that chlorhexidine gluconate and alcohol-based solution are used for skin preparation on patients before incision	**9 (11)**	**13 (16)**	**60 (73)**	**37 (45)**	**22 (27)**	**23 (28)**
7.	I ensure I do not remove hair on a proposed surgical site	**2 (2)**	**8 (10)**	**72 (88)**	**49 (60)**	**25 (31)**	**8 (10)**
8.	Where necessary I use hair clippers for removing hair on proposed surgical site 30 minutes before incision	**39 (48)**	**12 (15)**	**31 (38)**	**61 (74)**	**18 (22)**	**3 (4)**
9.	I ensure warming devices are used perioperatively to prevent hypothermia on patients	**3 (4)**	**17 (21)**	**62 (76)**	**13 (16)**	**56 (68)**	**13 (16)**
10	I ensure I provide adequate fluid resuscitation of surgical patients perioperatively.	**1(1)**	**7 (9)**	**74 (90)**	**12 (15)**	**37 (45)**	**33 (40)**
11	I ensure that I assess the surgical wound for signs of infection before discharging a patient	**1 (1)**	**3 (4)**	**78 (95)**	**5 (6)**	**31 (38)**	**46 (56)**

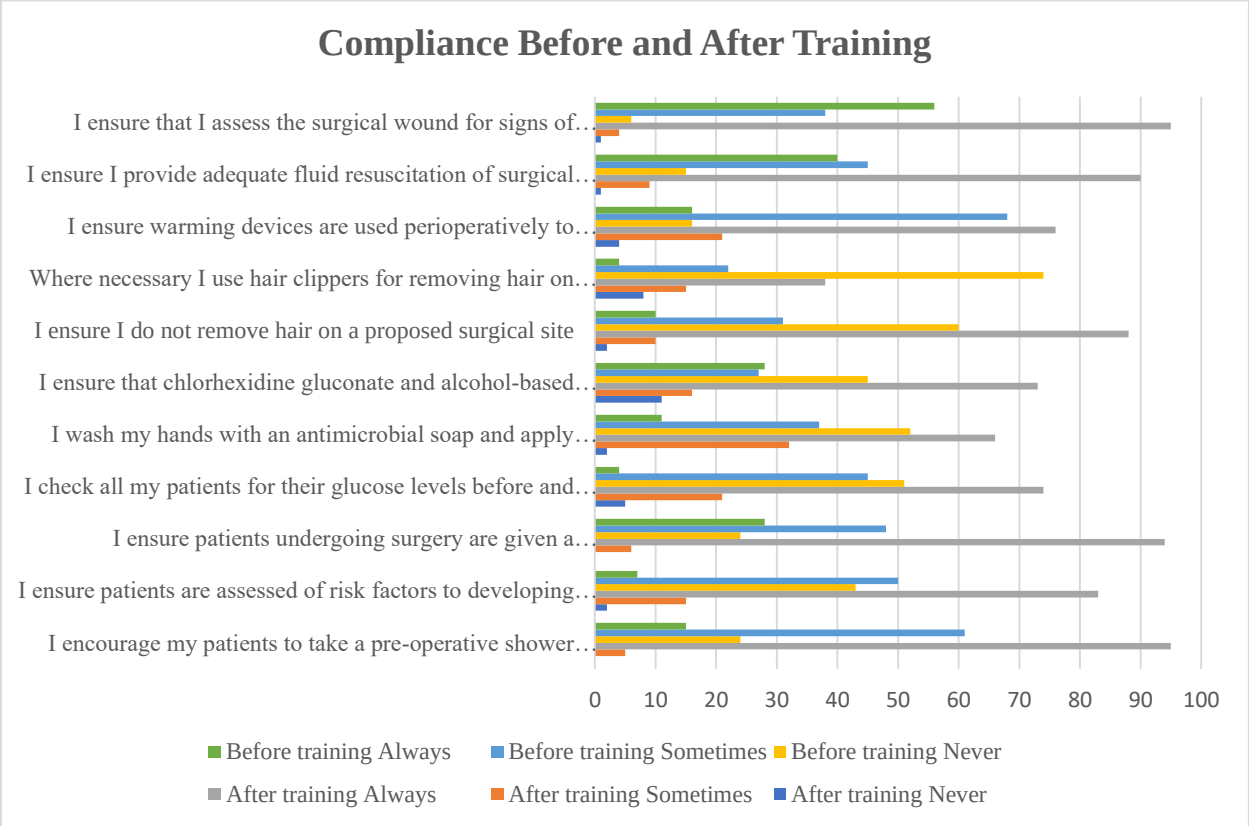


Figure 3: Nurses compliance before and after training

Wilcoxon Signed Rank Test on nurses' compliance before and after an educational intervention

For all questions, the p-value was 0.0000, which is less than 0.05. This indicates that there was a statistically significant difference in nurses' responses before and after the intervention. Also, the mean responses increased after the intervention, suggesting that the intervention had a positive impact on nurses' perceived compliance with the practices described in the questions.

Table 12: Wilcoxon Signed Rank Test on nurses' compliance before and after an educational intervention

Serial #	Question Items for nurses compliance during implementation of the SSI bundle	Mean Response Before training	Mean Response After Training	Mean DF in Response	Wilcoxon Signed Rank Test
1	I encourage my patients to take a pre-operative shower with an antimicrobial agent before surgery	1.90	2.95	1.05	0.0000
2	I ensure patients are assessed of risk factors to developing SSIs before going for surgery	1.65	2.80	1.16	0.0000
3	I ensure patients undergoing surgery are given a prophylactic antibiotic one hour before surgery	2.04	2.94	0.90	0.0000
4	I check all my patients for their glucose levels before and after surgery	1.52	2.70	1.17	0.0000
5	I wash my hands with an antimicrobial soap and apply handrub before wearing sterile gloves	1.59	2.63	1.05	0.0000
6	I ensure that chlorhexidine gluconate and alcohol-based solution are used for skin preparation on patients before incision	1.83	2.62	0.79	0.0000
7	I ensure I do not remove hair on a proposed surgical site	1.50	2.85	1.35	0.0000

8	Where necessary I use hair clippers for removing hair on proposed surgical site 30 minutes before incision	1.30	1.90	0.61	0.0000
9	I ensure warming devices are used perioperatively to prevent hypothermia on patients	2.00	2.72	0.72	0.0000
10	I ensure I provide adequate fluid resuscitation of surgical patients perioperatively.	2.26	2.89	0.63	0.0000
11	I ensure that I assess the surgical wound for signs of infection before discharging a patient	2.50	2.94	0.44	0.0000

4.7 Barriers to implementing a SSI prevention bundle amongst nurses

The third objective of this study was to examine the perceived barriers in implementing surgical site infection prevention bundles among the nurses at Mzuzu Central Hospital. On barriers, participants mostly agreed on unavailability of hospital resources as a major barrier to bundle implementation 67(82%), followed by lack of interprofessional collaboration 56(69%), workload 47(57%) and absence of guidance from departmental leadership 45(55%). The participants least agreed that bundle elements of SSI prevention are not easy to implement 8(10%). Table 13 shows the study findings on barriers of implementing the SSI bundle at MZCH.

Table 13: Barriers in implementing SSI bundle

	BARRIER	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
1	The workload affects my ability to use the guidelines of SSI prevention	9 (11%)	38 (46%)	30 (37)	5 (6%)
2	Some interventions of the bundle elements are not the nurses' role.	2 (2)	23 (28)	33 (40)	24 (29)
3	Absence of guidance from departmental leaders on preventing surgical site infections affects utilization of the guidelines	11 (13)	34 (42)	29 (35)	8 (10)
4	Hospital resources are not readily available to effectively utilize the guidelines/ recommendations of SSIs prevention	17 (21)	50 (61)	11 (13)	4 (5)
5	Lack of interprofessional collaboration makes it difficult to implement the guidelines	16 (20)	40 (49)	20 (24)	6 (7)
6	Organizational systems, policies do not provide a facilitating environment to promote implementation of the guidelines recommendations	3 (4)	17 (21)	44 (54)	18 (22)
7	Implementing surgical site infection prevention bundle adds	5 (6)	18 (22)	38 (46)	21 (26)

	extra costs for my department				
8	The cultural beliefs of patients make it difficult to implement the SSI bundle	9 (11)	16 (20)	38 (46)	19 (23)
9	The bundle elements are not easy to implement		8 (10)	46 (56)	28 (34)
10	There was no team work amongst the nursing team in my department during implementation of the bundle elements	2 (2)	13 (16)	46 (56)	21 (26)

CHAPTER FIVE

DISCUSSION

Generally, the knowledge of nurses regarding prevention of SSIs in this study were particularly low. Only 8% of the study participants were knowledgeable on standard practices for SSI prevention. These results were on the lower side compared to other studies which also reported knowledge gaps in SSI prevention amongst nurses from different countries (34,36,37,55). The findings of this study also revealed a critical gap in awareness of the SSI prevention bundle guidelines despite being developed in 2020. This can be attributed to low specialists training in low resource countries such as Malawi (79). The findings from this study also shows that the education intervention significantly increased nurses' knowledge and awareness regarding the surgical site infection prevention bundle. The mean pretest score of 6 increased to 12.36 immediately after the intervention, demonstrating the effectiveness of the training. Moreover, the follow up posttest mean score of 14.78 indicates not only retention of knowledge but also further improvement, suggesting ongoing learning and application in practice. Consistent with the findings of this study, a plethora of other studies have also provided evidence on effectiveness of an education intervention to improve knowledge (38,80–83).

The implementation of a formal training programme is therefore ideal for improving guideline uptake, empower nurses with skills adequate knowledge and appropriate attitudes (38). It has however been discovered by other studies on knowledge retention, that knowledge retention tend to decline over time (80,81,83), as a result there is need to devise means of retaining knowledge after training. These results highlight the importance of continuous education and support in improving clinical practice to nurses. In this present study, a printed guideline was provided to nurses after the education intervention, and there was a significant improvement in the mean score after intervention. Other strategies may include refresher trainings, continuous professional development to support the primary training (38,83).

The study also sought nurses to report their compliance levels in implementing the SSI bundle. Much as retrospective reporting of compliance by nurses presents several challenges in

accurately assessing the true impact of the educational intervention, the findings in this study suggest improved compliances in managing surgical patients to prevent SSIs providing encouraging evidence of the intervention's effectiveness. Before the intervention, the compliance scores were notably lower, indicating gaps in adherence to recommended practices. After the intervention, there was substantial increase in these scores, reflecting enhanced adherence to the SSI bundle protocols. The structured educational session likely enhanced nurses understanding of the importance of each component of the SSI bundle leading to better compliance. This finding is consisted with previous research showing that educational interventions can lead to significant improvements in healthcare practices (56,84,85).

However, not all areas showed uniform improvements, with some practices lagging i.e. the use of clippers and glucose checks due to unavailability of necessary resources to complete these tasks. This mixed outcome highlights both the effectiveness of the educational intervention and the persistent challenge posed by resource constraints. The unavailability of resources creates a gap between knowledge and practice as nurses may be well informed and willing to comply with protocols, but without the necessary tools, their efforts are hampered (86).

The results also showed that there was an association between work experience and knowledge ($p=0.017$). These findings are consisted with those reported by (38,72) who found that young and less experienced nurses scored lower in their knowledge related items compared to the older, more experienced nurses.

The analysis of barriers encountered during the implementation of the surgical site infection prevention bundle in this quasi-experimental one group educational intervention study provides critical insights into the challenges faced by healthcare professionals. Amongst others, the highest-ranking barriers reported by the participants in this study were: unavailability of resources, lack of interprofessional collaboration, workload and lack of guidance from departmental leaders.

The most frequent reported barrier was unavailability of resources. The un availability of resources such as clippers, glucosticks and antiseptics not only hampers the implementation

process but also demotivates staff (86). This aligns with other studies that found that unavailability of resources is a major setback in implementation studies (26,59).

5. Implications to practice

The study findings have several significant implications for clinical practice particularly in the implementation of interventions aimed at improving surgical site infections. These implications highlight the importance of integrating education, resources availability and interprofessional collaboration to achieve sustained improvements in clinical outcomes.

Regular educational sessions should be integrated into routine practices to keep healthcare professionals updated on best practices and new guidelines (38,61). Incorporating SSI prevention training into continuous education sessions can help maintain high levels of knowledge among nursing staff. This will enable nurses to be well conversant with the latest SSI prevention guidelines.

The persisted challenge of resource unavailability needs urgent attention by ensuring a proactive approach to resource management to ease guideline compliance. It is believed that implementing team based approaches to SSI prevention can foster better communication and coordination amongst healthcare professionals (59). A critical component to a successful implementation of change is interprofessional collaboration where professionals from different disciplines work together towards a common goal. Collaboration improves communication amongst team members ensuring that everyone is informed and aligned with the change objectives.

The improvements observed shortly after the intervention and during follow up tests indicate potential for long term effects in changing behaviour and practice if sustained efforts are made. Therefore, managers should focus on maintaining these efforts through regular refreshers, ongoing support and continuous evaluation of practices.

Through this study, it was established that nurses were not aware of care bundles of preventing surgical site infections despite availability of the guideline. This depicts the gaps that exist between availability of evidence-based practices and dissemination of information to

implementers. Hence guidelines should be timely disseminated to implementers and gatekeepers of the guideline.

5.3 Limitations

Compliance ratings were self -reported, therefore a risk of overrating above the actual compliance. Participants were however assured of anonymity, privacy and confidentiality of their responses to encourage honest responses.

The time from intervention to a follow up assessment was short, not allowing enough time for the researcher to provide adequate mentorship and direct observations of the bundle implementation to validate compliance.

This study was unable to evaluate long term knowledge retention and if the printed guideline would sustain nurses' knowledge for a longer period of time. Sustaining knowledge not only retains adequate knowledge, but also maintains good standards in clinical practice

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The finding of this study showed significant improvements in mean knowledge scores in pretest, immediate posttest and follow up posttests. Self-reported perceived compliances were also positive with participants reporting better adherence practices of SSI prevention after the intervention. This highlights the positive impact of the educational intervention suggesting that increased knowledge translates to better adherence to SSI prevention protocols.Despite the positive outcomes, participants identified several barriers to effective implementation of the SSI bundle at MZCH. The four main barriers being workload, lack of interprofessional collaboration, lack of guidance of departmental leadership and unavailability of resources. These findings are a perfect reminder to policy makers for the need of comprehensive approach to SSI prevention that goes beyond education and knowledge retention. This calls for addressing systematic issues and fostering a supportive environment to nurses when change is introduced in clinical practice.

5.2 Recommendations

Based on the findings of this study, the following recommendations are proposed for various stakeholders.

Clinical Practice

Nurses should engage in regular training sessions and refresher courses as part of their continuous professional development so that they are up to date with evidence-based practices. Nurses should join journal clubs where updated information on evidence-based practices can be shared and how the same information can be utilized in their own setting to improve practice and patient outcomes

Nursing leadership should actively support SSI bundle implementation by making it a priority in their departments. Managers should ensure that all departments handling surgical patients

have standardized, easily accessible SSI prevention bundle protocols. Visual reminders like printed laminated cards which were used in this study, should be placed in strategic locations within wards and operating theaters. Not only that, Hospitals should also regularly monitor compliance of guidelines and provide feedback to reinforce adherence and promptly address gaps in following SSI prevention guidelines.

Hospital Management

Management should ensure adequate allocation of hospital resources to ensure that the necessary supplies and equipment for SSI prevention are readily available. It is essential that managers prioritize the procurement of essential resources in SSI prevention are readily available. Apart from the general infection prevention protocols trainings, management enforcements should also focus on increasing awareness and implementation of other care bundle practices aimed at preventing healthcare associated infections in critical care settings.

Management should aim at developing mentorship and peer education programs within the hospital settings where experienced nurses can coach junior staff, thereby providing hands on guidance in infection prevention techniques.

Nursing Education

Curriculum developers should aim at integrating regular SSI prevention bundles into nursing education curricula hence ensuring that all nursing students are exposed to evidence based practices of SSI prevention.

Policy Makers

A comprehensive approach to guideline dissemination is essential, therefore policy makers should work on effective communication on new guidelines dissemination to all staff. These may include and not limited provision of accessible procedure manuals, training and orientation as well as posters and signage of the guideline.

Policy makers should also ensure to train more clinical specialist nurses to improve healthcare quality in practice leading to better patient outcomes.

Policy makers should frequently engage departmental leaders as gatekeepers of guideline implementation. Their active involvement in patient care can set a positive example and enhance adherence amongst staff.

To promote research and innovation in SSI prevention strategies and facilitate the dissemination of findings to improve clinical practice, it is therefore recommended that from this study, further research should aim at in cooperating other professional disciplines for an effective implementation of other change projects.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Participant's Identification Number: _____

Date: _____

PART A: Socio-demographic characteristics of participants

Age	20-29 years	
	30-39 years	
	40-49 years	
	50 years above	
Gender	Male	
	Female	
Highest Qualification	Masters	
	Degree	
	Diploma	
	Certificate	
Department		
Work Experience	Less than a year	
	1-5 years	
	6-10 years	
	11 years and above	
Training on infection prevention protocols	Yes	

	No	
Training on prevention of surgical site infections	Yes	
	No	
Awareness on the SSI bundle or Malawi national guidelines on preventing SSI	Yes	
	No	

PART B: KNOWLEDGE OF NURSES ON PREVENTION OF SURGICAL SITE INFECTIONS

1. Which of the following is a risk factor for surgical site infections?
    a) Race
    b) Vigorous physical activity
    c) Surgeries lasting 2hrs
    d) Age above 30 years
2. What role do preoperative antibiotics play in surgical site infection prevention?
    a. They have no impact on SSIs
    b. They prevent pus formation
    c. They promote cellular and vascular proliferation
    d. They delay post operative wound infection
3. What is the **most effective** method of hand preparation to prevent SSIs?
    a. Scrubbing with antimicrobial soap and applying alcohol based handrub
    b. Scrubbing with chlorhexidine and applying alcohol based handrub
    c. Scrubbing with antimicrobial soap
    d. Putting on sterile gloves
4. Which of the following is a common sign of surgical site wound infection?
    a. Clear drainage from the wound
    b. Redness and swelling
    c. Blood from the wound
    d. Decreased heartrate

5. Which of the following is **NOT** a component of preoperative bundle intervention for SSI prevention

    a. Proper skin preparation

    b. Administration of prophylactic antibiotics

    c. Surgical site marking

    d. Removing hair from a proposed surgical site

6. Tick the pre operative SSI bundle elements to be complied to on surgical patients?

BUNDLE ELEMENT	
Bathing patients with antimicrobial before surgery	
Hair removal on the surgical site	
Elevation of the patients head of bed 30-45 degrees	
Administration of routine prophylactic antibiotics	
Deep vein thrombosis prophylaxis	
Blood glucose check on all pre and post operative patients	

7. In the presence of drains for surgical patients, how long should an antibiotic be prolonged for prophylaxis?

    a. One week

    b. 72 hours

    c. 48 hours

    d. Stat dose

8. Where a proposed surgical site has hair;

    a. Do not remove hair

    b. Use hair removal

    c. Remove hair

    d. Report to surgeon

9. What is the best method of perioperative shaving?

    a. Hair remover

    b. Clippers

    c. Surgical blade

    d. Scissors

10. When should prophylactic antibiotics be given?
    a. 24 hours before surgery
    b. 1 hour before surgery
    c. 1 hour after surgery
    d. Half an hour before or after surgery

11. Which antiseptics should be used on surgical site when preparing the skin for surgery?

    a. Chlorhexidine and an alcohol-based solution

    b. Chlorhexidine and povidone iodine

    c. Hydrogen peroxide and alcohol-based solution

    d. Hydrogen peroxide and Povidone Iodine

12. Maintaining normothermia is part of the SSI bundle;

    a. Postoperatively

    b. Perioperatively

    c. In children

    d. Intraoperatively

13. The benefits of warming strategies include

    a. Promoting patient comfort

    b. Reducing blood loss

    c. Preventing hypoglycemia

    d. Preventing bacterial colonization

14. What is the targeted MAP to prevent SSIs?

    a. 80 mmHg

    b. 75 mmHg

    c. 65 mmHg

    d. 60 mmHg

15. Blood glucose monitoring should be monitored throughout on ……. patients pre and 48 hours post operatively.

    a. Pediatrics

    b. Diabetic

    c. All

    d. Obese

16. What should be the goal of blood glucose level to enhance prevention of surgical site infections?
    a. 210mg/dl
    b. 190mg/dl
    c. 50mg/dl
    d. None of the above
17. What is the primary purpose of early detection and management of SSIs?
    a. To prevent patients' discomfort
    b. To reduce healthcare costs and prolong hospital stays
    c. To promote surveillance for data reporting on SSIs
    d. To prevent complications
18. How can surgical teams effectively implement bundle interventios to prevent SSIs?
    a. Priotizing individual tasks
    b. Developing individual unit protocols
    c. Collaborating and communicating effectively
    d. Ignoring evidence-based practices

PART C: COMPLIANCE OF NURSES TOWARDS IMPLEMENTATION OF THE SURGIGAL SITE BUNDLE

	ITEMS	**AFTER TRAINING**			**BEFORE TRAINING**		
	RATINGS	**1 Never**	**2 Sometimes**	**3 Always**	**1 Never**	**2 Sometimes**	**3 Always**
1.	I encourage my patients to take a pre-operative shower with an antimicrobial agent before surgery						
2.	I ensure patients are assessed of risk factors to developing SSIs before going for surgery						
3.	I ensure patients undergoing surgery are given a prophylactic antibiotic one hour before surgery						

4.	I check all my patients for their glucose levels before and after surgery						
5.	I wash my hands with an antimicrobial soap and apply handrub before wearing sterile gloves						
6.	I ensure that chlorhexidine gluconate and alcohol-based solution are used for skin preparation on patients before incision						
7.	I ensure I do not remove hair on a proposed surgical site						
8.	Where necessary I use hair clippers for removing hair on proposed surgical site 30 minutes before incision						
9.	I ensure warming devices are used perioperatively to prevent hypothermia on patients						
10	I ensure I provide adequate fluid resuscitation of surgical patients perioperatively.						
11	I ensure that I assess the surgical wound for signs of infection before discharging a patient						

PART D: BARRIERS AFFECTING IMPLEMENTATION OF THE SURGICAL SITE INFECTION PREVENTION BUNDLE

	BARRIER	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
1	The workload affects my ability to use the guidelines of SSI prevention				
2	Some interventions of the bundle elements are not the nurses' role.				
3	Absence of guidance from departmental leaders on preventing surgical site infections affects utilization of the guidelines				
4	Hospital resources are not readily available to effectively utilize the guidelines/ recommendations of SSIs prevention				
5	Lack of interprofessional collaboration makes it difficult to implement the guidelines				
6	Organizational systems, policies do not provide a facilitating environment to promote implementation of the guidelines recommendations				
7	Implementing surgical site infection prevention bundle adds extra costs for my department				
8	The cultural beliefs of patients make it difficult to implement the SSI bundle				
9	The bundle elements are not easy to implement				
10	There was no team work amongst the nursing team in my department during implementation of the bundle elements				

APPENDIX 2: INFORMATION LEAFLET

TITLE OF THE STUDY: EEFECT OF AN EDUCATIONAL INTERVENTION ON NURSES' KNOWLEDGE, COMPLIANCE AND BARRIERS REGARDING IMPLEMENTATION OF A SURGICAL SITE INFECTION PREVENTION BUNDLE AT MZUZU CENTRAL HOSPITAL-MALAWI

Aim of this study: To evaluate the effect of an educational intervention on nurses' knowledge, compliance and barriers in implementing a surgical site infection prevention bundle at Mzuzu Central Hospital.

Investigator: Violet Moyo, Mzuzu Central Hospital, P/Bag 209, Luwinga, Mzuzu.

vaicmoyo@yahoo.com, Cell: 265999171339

NHSRC Contacts

The Chairperson

National Health Sciences Research Committee (NHSRC)

Ministry of Health Research Department Area 2/124

P.O. Box 30377

Lilongwe 3

MALAWI

MUHAS Contacts

The Director of Research and Publications, MUHAS

P.O Box 65001

Dar es Salaam, Tanzania.

Tel: 255 0222152489

Email: drp@muhas.ac.tz

Introduction: You are being invited to participate in research study as titled above. I am Violet Moyo a post graduate student from Muhimbili University for Health and Allied studies pursuing a Masters degree in Nursing specializing in Critical Care and Trauma. Before you can decide to participate in this study, it is essential that you understand the purpose, potential risks, benefits and your rights for this study. Furthermore, your participation in this study is completely voluntary.

Purpose

The purpose of this research project is to evaluate how successfully an education program supports the implementation of a surgical site infection prevention bundle. The study will assess nurses understanding, adherence and challenges encountered during implementation of a surgical site bundle.

Study Procedure

In the first phase you will be provided with a questionnaire in order to assess your baseline understanding of preventing surgical site infections using the SSI bundle

Following the completion of the survey you will undergo an education training on how to prevent SSIs using the SSI bundle.

Subsequently, you will be given a period of four weeks and a leaflet after the training so as to practice your skills on SSI prevention

Lastly after the practice period, you will be asked to complete a follow up questionnaire to evaluate any changes in your knowledge and also report any challenges you encountered during the practice period.

Anticipated Benefits

Your participation will contribute to improving patient safety and outcomes by identifying areas of improvement in preventing SSIs. Additionally, you will have an opportunity to enhance your knowledge and skills in this area.

Anticipated Risks and Discomfort

The researcher anticipates no risks or discomfort in taking part in this study. Every effort will be made to minimize any inconveniences.

Ethical Approval

This study has received ethical clearance from Muhimbili University and Allied Health Research and Ethics Committee, National Health Sciences Research Committee (NHSRC), Ministry of Health Research Department and the study site ethics committee at Mzuzu Central Hospital.

Reimbursement

The training will be done during normal working and CPD hours, and the researcher is a student, hence there will be no reimbursement for participating in this study.

Confidentiality

Data collect from you will be kept in a lockable place and only accessible to the researcher. Your anonymity of your identity will be adhered to by ensuring you do not write down your names. Questionnaires will be identified by codes only known by yourself.

Voluntary participation

Your participation in this research is voluntary and you have the right to withdraw from participating at any time.

Where to get assistance

Any concerns regarding this study, please contact: The Chairperson, Muhimbili University Research Ethics Committee, P,O Box 65001, Dar es Salaam. Tanzania. Additionally, you can also contact me, Violet Moyo 265999 171 339 or Email vaicmoyo@yahoo.com.

Further assistance can be obtained from, The Chairperson, National Health Sciences Research Committee (NHSRC), Ministry of Health Research Department Area 2/124, P.O. Box 30377, Lilongwe 3, MALAWI, The Director, Mzuzu Central Hospital, P/Bag 209, Luwinga, Mzuzu, and also The Director of Research and Publications, MUHAS, P.O Box 65001, Dar es Salaam, Tanzania. Tel: 255 0222152489, Email: drp@muhas.ac.tz

Yours Faithfully,

Violet Moyo**.**

APPENDIX 3: CONSENT FORM

I …… confirm that I have fully been informed by the researcher ……. about the nature of the study titled **"Effect of an educational intervention on nurses' knowledge, compliance and barriers regarding implementation of a surgical site bundle at Mzuzu Central Hospital."**

I have read and understood the information leaflet and I am voluntarily giving my consent to participate in this study. I understand I can withdraw my consent at any stage.

Name of Participant ……..Signature ……

Contact …… Date …….

Researchers signature…….. Date …….

Witness …… Date ……

Study Site: Mzuzu Central Hospital

APPENDIX 4: ETHICAL APPROVAL LETTER, 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/2092 Date: 11/03/2024

MUHAS-REC-03-2024-2092

VIOLET MOYO
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: NURSES' KNOWLEDGE, COMPLIANCE AND BARRIERS REGARDING IMPLEMENTATION OF A SURGICAL SITE INFECTION PREVENTION BUNDLE AT MZUZU CENTRAL HOSPITAL IN MALAWI

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: 11/03/2024
EXPIRATION DATE OF APPROVAL: 11/03/2025

STUDY DESCRIPTION:
Purpose:

The purpose of this one group pretest and posttest quasi-experimental study is to evaluate nurses' knowledge, compliance and barriers regarding implementation of a surgical site infection bundle at Mzuzu Central Hospital in Malawi.

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/.



Dr. Nahya Salim Masoud,

Chairperson, MUHAS Research and Ethics Committee

APPENDIX 5: ETHICAL APPROVAL CERTICICATE, MALAWI



CERTIFICATE OF ETHICS APPROVAL

This is to certify that the National Health Science Research Committee has reviewed and approved the study titled:

Study Title: **Protocol #24/03/4412: Nurses Knowledge, Compliance and Barriers Regarding Implementation of a surgical Site Infection Prevention Bundle at Mzuzu Central Hospital in Malawi**

Investigator: Violet Moyo

StartDate: 17/05/2024

End Date: 16/05/2025

Date of issue: 17/05/2024

Dr. Martias Joshua
Chairperson-NHSRC

National Health Sciences Research Committee
2024 -05- 17
APPROVED

Mrs. Chikondi Chimbatata
NHSRC -Administrator

APPENDIX 6: APPROVAL LETTER FROM SITE

Telephone: 01320916/878
Fax: 320223/320973/878
Email:
mzuzucentraldirector@gmail.com



In reply please quote No. ....
The Hospital Director
Mzuzu Central Hospital
P/Bag 209
Luwinga
Mzuzu 2

21th March, 2024.

Violet Moyo, MSc
Mzuzu Central Hospital
Private Bag 209
Luwinga:

Cell: +265999171339
Email: vaicmoyo@yahoo.com

Dear Violet Moyo,

LETTER OF SUPPORT TO CONDUCT A RESEARCH AT MZUZU CENTRAL HOSPITAL

Reference is made to your email received on 14th March, 2024 in which you are seeking permission to conduct a research study titled ***"Nurses Knowledge, Compliance and Barriers Regarding Implementation of Surgical Site Infection Prevention Bundle at Mzuzu Central Hospital in Malawi"*** at Mzuzu Central Hospital (MCH). MCH Research Committee has now reviewed your study protocol and I am pleased to inform you that permission has been granted. You can use this letter as evidence of support from an institution (MCH) when seeking ethical clearance from COMREC/NHSRC/NCST or any other recognized Institutional Review Board (IRB).

Note: Please take note that MCH policy requires that you pay a financial contribution to the institution which is pegged at 5% of your total research budget before you can start implementing your study at the facility. If the study will be implemented in multiple sites an appropriate amount shall be determined taking into account the number of sites in which the study is to be implemented. Payment is strictly through National Bank of Malawi, Mzuzu Central Hospital Research and Partnership Account, Current account number **1004797902**.

When you are ready for data collection at MCH you will be required to present this letter, ethical approval letter from a recognized ethical review body and evidence of payment of the stipulated fees to the Chairperson of MCH Research Committee before you can begin data collection. We trust that you shall strictly adhere to study procedures as outlined in your study protocol.

Dr. Ted Bandawe.
The Hospital Director

THE DIRECTOR
MZUZU CENTRAL HOSPITAL
22 MAR 2024
PRIVATE BAG 209
LUWINGA, MZUZU 2