ADHERENCE TO WORLD HEALTH ORGANIZATION GUIDELINES ON PREVENTION OF SURGICAL SITES INFECTIONS AMONG NURSES IN KARATINA SUB-COUNTY HOSPITAL IN NYERI, KENYA

ROSELINE MUTHONI GAKUANYI

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE DEGREE IN NURSING OF
MOUNT KENYA UNIVERSITY

OCTOBER 2022

DECLARATION AND APPROVAL

Declaration by the Student

This thesis is my original work and has not been presented for a degree in any other university.

Signature: ……. Date: ……

ROSELINE MUTHONI GAKUANYI

MSCN/2017/67812

Approval by the supervisors

This work has been submitted with our approval as the university supervisors.

Signature: ……. Date: ……

Prof. Catherine Syombua mutunga

South Eastern Kenya University

Signature: ……. Date: ……

Dr. Josphat Njuguna

Senior Lecturer

DEDICATION

This thesis is devoted to my Son Mike Hector Mwenda for his perseverance and bearing while I was developing this thesis.

ACKNOWLEDGEMENT

First, I would like to give thanks to God almighty for giving me the strength for enabling and giving me unending thrive thorough the research. I wish to acknowledge my supervisors, Prof. Catherine Mwenda and Dr. Josphat Njuguna, who collectively worked diligently to enable me to compile this Thesis. Special thanks to the academic and support staff of Mount Kenya University who have facilitated my acquisition of knowledge and wisdom during my time of stay at the university. I also appreciate the karatina sub county hospital for taking their time and consenting to this reaserch and for giving me their ample time during data collection. Much appreciation goes to National Commission for Science and Technology body and all the respondents who took time off to assist me in my research and subsequent thesis endeavour.

ABSTRACT

Surgical Site Infection (SSI) is the leading cause of morbidity and mortality. A surgical site infection (SSI) occurs within 30 days of surgery or one year if an implant is used. The invasive nature of the procedures break the first line of defense for the body making the patient vulnerable to infections especially by pathogens such as Escherichia coli, staphylococcus aureus , and klebsiella. A study by US department of health reported 2-4% cases develop SSI with 3% resulting in mortality and a study by Tarwadi 2016, in AKU, Kenya revealed 4.9%cases resulted in SSI. The levels of the morbidities have not had significant decline since the inception of guidelines on their prevention. Therefore, this study sought to assess the adherence to WHO blueprints on the prevention of SSIs among nurses and to establish the nurse-related as well as facility-associated factors that influence the protocols to the compliance. This study was based upon the following specific objectives; to assess the level of adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County, to assess the nurse-related factors influencing the adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County, to assess facility-linked factors that influence adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County. To accomplish this, the study was shaped by the theory of planned behavior. On methodology, a descriptive cross-sectional design was employed to help in describing variables under study. The study population entailed nurses working in surgical, outpatient, theatre, and maternity departments at Karatina SubCounty Hospital in Nyeri, Kenya with a total of 98 nurses sampled through proportional stratified purposive method taking part in the study. The data was gathered through an observational checklist as well as a self-administered questionnaire. A pretest was conducted at Mukurweini Sub-county hospital in Nyeri which offers similar services to Karatina sub-county hospital. Data analysis was realized through descriptive statistics which incorporated calculating frequencies, percentages, mean, as well as standard deviation using data from SPSS version 25.0. The results showed that there were more male nurses who adhered to the SSI prevention guidelines than female($p<.001$), the availability of hospital policies on SSI prevention significantly contributed to high level of adherence($p <.001$).These outcomes were presented in tables, pie charts, and bar graphs. The results will be vital to informing strategies that need to be adopted to lower the cases of SSIs based on identified areas of noncompliance or recommendations. On analysis, it was observed that the majority of the nurse's level of adherence was low at 55.1% (n=54). Increase in age was found to be significantly associated with low adherence level to the guidelines. The nurses' age, gender, has advanced training, more years of experience and nurses knowledge on infection prevention influence adherence level to WHO guidelines on infection prevention. The study recommended that the human resource management to evaluate their staffing and employ younger nurses as their work force.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

ACS **:** American College of Surgeons

AHA **:** American Heart Association

CDC **:** Centers for Disease Control and Prevention

HAI **:** Hospital Acquired Infection

HCW **:** Health Care Workers

NCK	**:**	Nursing Council of Kenya
NCTI	**:**	National Commission of Technology and Innovation
NICE	**:**	National Institute for Health and Clinical Excellence
SSI	**:**	Surgical Site Infection
TBP	**:**	Theory of Planned Behavior
WHO	**:**	World Health Organization

CHAPTER ONE

INTRODUCTION

This chapter provides the study background to the study, statement of the problem, justification of the study, significance of the study, objectives of the study, hypothesis, meaning, scope as well as the limitations and delimitations of the study.

1.1 Background to the study

An infection at the surgical site (SSI) develops within 30 days of surgery or one year if an implant is inserted. The National Healthcare Safety Network of the Centers for Disease Control and Prevention (CDC) classifies surgical site infections based on the depth and tissue spaces involved. Surgical site infections are divided into three categories: superficial incisional, deep incisional, and organ/spaces surgical site infections (Horan et al., 2018).

Following surgical operations, SSIs are a common source of morbidity in most healthcare facilities. They lead to the majority of nosocomial infections, lengthy hospitalizations, and a significant economic burden, according to Laloto, Gemeda, and Abdella (2017). SSI is described as morbidity happening either near or at the surgical site usually within 30 days post operation or 1 year where an implant is inserted. On a global scale, SSIs make from 2.5 to 40% of the disease burden. Intra-abdominal surgeries constitute up to 20% of the morbidities in Western countries with the overall rates for clean surgeries ranging from 2-5%. African countries have rather high infection rates, with up to 5.6 infections per 100 procedures recorded in some countries. In total, Africa has the biggest number of cases, which can reach as high as 30.9 percent of the global total of cases. For instance, a country such as Ethiopia has recorded cases estimated to range from 10.9% - 75%.

SSIs are mostly preventable, but they continue to be a major source of death, morbidity, and increased economic burden. Those that develop SSIs have a 60% chance of proceeding to the Intensive Care Unit (ICU). The possibility of mortality is also doubled as opposed to other patients who do not develop the conditions. Globally, those affected end up spending an estimated cumulative 3.7 million days receiving care in the facilities. The economic burden is also estimated to be around 1.6 billion dollars in additional costs of drugs and care. A study done by Curcio, Cane, Fernández, & Correa (2019) puts the estimated cost at 15,800- 43,900 dollars per SSI.

In low and middle-income countries, SSI is still one of the most common healthcareacquired infections, with incidence rates ranging from 0.4 to 30.9 per 100 patients undergoing surgery, and a pooled incidence rate of 11.8 percent per 100 patients undergoing surgery, which is significantly higher than proportions seen in developed countries (World Health Organization, 2018). The emergence of drug-resistant bacteria such as Methicillin-resistant Staphylococcus aureus and other resistant bacterial strains, as well as a lack of antibiotic stewardship guidelines and inadequate infection prevention and control guidelines, have all exacerbated the situation in these countries (Asaad and Badr, 2019; Allegranzi et al., 2018; Weinshel et al., 2018). In addition, an Ethiopian research on SSI discovered that practically all Gram-positive bacteria and 95.5 percent of Gram-negative bacteria were resistant to more than two antibiotics (Mulu et al., 2019).

Numerous improvements have been affected by different organizations and agencies to help lower the disease burden that accrue from SSIs. For instance, WHO came up with guidelines targeted at ensuring that SSIs are prevented and diagnosed to reduce the associated mortality and morbidity .However, the efforts seem not to produce the outcomes anticipated. For instance, advancements in behaviors relating to the operating

room, ensuring sterility of instruments, as well as good choice of incision sites have been adopted and implemented across the globe. According to Curcio, Cane, Fernández, & Correa (2019), improvements in hand cleanliness, observance of aseptic techniques, decolonization, screening for potential careers, and proper utilization of prophylactic antibiotics assists lower the rates of SSI. Nonetheless, the approaches have produced little fruits. WHO recommends that periodic surveillance and providing feedback be done as the efforts can lower SSIs by up to 50%.

In Kenya, a study done in Thika Hospital by Aiken, et al., (2018), concluded that with the necessary training, anesthetists and surgeons adopted consistent mechanisms that were crucial in wound care. In this case, the investigators also sought to evaluate the effectiveness of telephones calls towards discovering the development of postdischarge morbidities. With an approval rate of 95%, the calls had 70% sensitivity to in the study. Thus, effective surveillance of the morbidities could not be realized through telephone. Nonetheless, the process can be performed in low-income facility settings with committed staff, thorough training, and alterations in the monitoring approaches. This study is informed by the fact that despite the utilization of the guidelines in many countries, the adherence levels remains poorly studied.

WHO Guidelines, 2018 take account the scientific evidence, cost and resource implications on patient values and preferences and cover the three phases;

Preoperative measures include use of antimicrobial soap, showering, clipping hair, antibiotic prophylaxis and a proper surgical hand scrub. Intra operative measures include providing warming devices, 80% administration of oxygen, irrigating incision wound with povidine and use of tricosan-coated sutures. Postoperative remedies include oxygen administration for 2 to 6 hours after surgery, asepsis utilized during wound cleaning.

1.2 Statement of the Problem

Recent data from U.S. Department of Health and Human Services & Agency for Healthcare Research and Quality (2019), indicate that over 10 million clients are admitted to go through different surgical procedures annually. This numbers account for a quarter of all hospital stays. The morbidities reported involve numerous procedures including orthopedic, obstetric, neurosurgery, as well as laparotomy procedures. On the other hand, numerous numbers undergo minor surgical procedures in the outpatient centers across the globe. Among the total procedures conducted in various settings, about 2-4% of clients develop SSIs. The institutions also note that 3% of the cases result in mortality.

A study by Frances Lin et al (2019) indicates 50% of nurses are unaware of the SSI care bundles and their adherence was sub optimal. Another study in Egypt by Mohsen. M.M (2020) conducted on 450 nurses from selected hospitals indicated low adherence to SSI care bundle at13.01% which indicated poor practice about SSI prevention. A similar study by Zucco , Lavano (2019) indicated that up to 60% of SSI would be reduced by checking nurses compliance to the WHO Guidelines on SSI prevention.

A study by Cheadle (2013) indicates that SSIs occurred in a third of patients undergoing risky procedures such as stoma reversals. On the other hand, the less invasive procedures prove to have the least number of associated SSIs and morbidities. This is specifically because patients with stomas are highly colonized with skin flora as opposed to those with minor bruises. Another study done by Tarwadi, (2016) at Aga Khan University Hospital (AKUH) revealed that 4.9% out of the 243 cases sampled for evaluation resulted in SSI. Procedures such as ORIF, arthroscopies and arthroplasty were the main cases

examined. Moreover, Klebsiella and staphylococcus aureus were the key pathogens responsible for the cases.

In Karatina sub-county hospital, the levels of SSIs have been persistent over the years. The data available for the last 3 years paint a picture of an unresolved problem despite the existence of checklists as demonstrated in the table below.

Table 1: Prevalence of SSI in Karatina Sub-County Hospital

Year	Pathogens Responsible	Total SSI Cases	Total Operations	Percentage
2017	Staphylococcus Aureus Eschelichia Coli Pseudomonas Aeruginosa	143	1298	11.01%
2018	Staphylococcus Aureus Eschelichia Coli Pseudomonas Aeruginosa	147	1327	11.07%
2019	Staphylococcus Aureus Eschelichia Coli Pseudomonas Aeruginosa	148	1325	11.16%

Source: Adopted from Health Records reports on Nosocomial Infections surveillance,Karatina Sub-county Hospital, Nyeri County, 2017-2019.

Although checklists in surgical procedures remain the baseline to ensuring patient safety and advanced surgical care, their adoption and utilization remain low across many settings. For instance, timely administration of prophylactic antibiotics can help lower the morbidity cases. However, the real-world utilization of available checklists remains highly challenging to many facilities such as Karatina sub-county hospital. Despite the efforts put in place by the hospital administration, it remains an underachievement considering the data shown in the table above. The WHO blueprints on avoidance of SSIs remains top on consideration for any institution seeking to solve the issues.

1.3 Justification of the study

SSIs continue to persist in numerous instances despite the implementation of practices considered good at the institutional level. They also constitute the bulk of HAIs which are associated with prolonged hospital stay, heavy economic burden, admissions in ICU, as well as lifelong complications especially in developing countries.

Despite the fact that surgical site infection is an issue in Kenya, there is a lack of knowledge about the microorganisms involved and their antibiotic susceptibility profiles. The limited papers that have been published do not offer a clear picture of the volume and scope of SSI pathogens in a hospital context. Given this knowledge, antibiotic selection for SSI therapy was based on the prevalent antibiogram and causative agent.

Karatina Sub-county Hospital reflects the general scenario of many public healthcare institutions entrusted to observe the WHO Guidelines on the avoidance of SSIs. Therefore, conducting a study here will help paint the picture of such institutions across the country. Particularly, nurses are the key HCWs responsible for overseeing the implementation of the safety guidelines advocated for by WHO. They also constitute the largest portion of HCWs taking care of surgical sites. Thus, they form the best group to assess the level of adherence to the Guidelines.

1.4 Significance of the Study

The outcomes of this analysis will greatly help nurses, patients, policy-makers, and other HCWs involved in surveillance and control of SSIs. For the nurses serving in Karatina sub-county hospital and other facilities, the findings will assist them appreciate the relevance of adhering to WHO bundles on prevention of SSIs. This will help improve patient experience and outcome preoperatively, intra-operatively, as well as post-

operatively. Furthermore, this will serve as a wakeup call to those nurses involved in training nurses to help deliver on compliance to the Guidelines. For the hospital administration, the outcomes are crucial to help them seal the loopholes in infection prevention guidelines. To other researchers, this will serve as a reference material for similar studies that will be done in a developing country setup.

1.5 Study Objectives

1.5.1 Broad Objectives

To explore the determinants of the adherence to WHO Guidelines on the prevention of Surgical site infections among nurses in Karatina, sub-county hospital, Nyeri County.

1.5.2 Specific Objectives

i. To assess the level of adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

ii. To assess the nurse-related factors influencing the adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

iii. To assess facility-related factors that influence adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

1.6 Research Questions

i. What is the level of compliance to the WHO Guidelines on avoidance of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

ii. What are the nurse-related factors influencing the adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

iii. What are the facility-related factors influencing compliance to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

1.7 Hypothesis

H_{01} There is no statistically significant relationship between nurse-related factors and the level of adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

H_{02} There is no statistically significant relationship between the facility -related factors and level of adherence to WHO Guidelines on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County?

1.8 Study Limitations

The study is geographically narrowed to Karatina sub-county Hospital in Nyeri County. In terms of context, the investigation is limited to adherence to WHO Guidelines on prevention of SSIs. On the other hand, only nurses are involved in the study despite there being many HCWs playing a role in patient care before surgery, intra-operatively, as well as post-operatively. The rationale is that nurses are the primary care givers for patients during the stated periods.

1.9 Study Delimitations

The study will utilize a stratified random sampling method to help in generalizing the outcomes. This is because; nurses are rotated across all departments periodically to avoid

monotony and burnout. Therefore, every nurse working at the facility is expected to contribute in prevention of SSIs. In addition, an investigation of facility-linked factors and nurse-related factors will help broaden the view on the issue concern.

1.10 Operational Definition of Key Terms

Adherence: Adherence can be described as the commitment or attachment to which nurses follow WHO guidelines when taking care of surgical sites to prevent infections

Guidelines: WHO guidelines on avoidance of surgical site infections.

Pre-test: This can be termed as the preliminary testing in research whose main aim is

to ascertain that the tool (questionnaire) to be administered to the sample population will yield valuable results.

Registered Nurse: A nurse is a health care worker who has met the minimum training requirements of either a diploma, Bachelors, Mastered or even doctorate studies and has a valid practicing license from the regulatory body (Nursing Council of Kenya) to take care of the sick.

Surgical Site Infection (SSI): SSI is described as morbidity happening either near or at the surgical site usually within 30 days post-op or 1 year where an implant is inserted.

Variables: The study focuses on evaluating the adherence to WHO blueprints on prevention of SSIs among nurses in Karatina Sub-county hospital. Therefore, the independent variables becomes nurse-related factors which may include things such as level of training, specialization, and gender. The facility-related factors may incorporate items such as policies within an institution, surveillance practices, and availability of training opportunities. The intervening variables are patient-associated (comorbidities, age) and regulatory policies by the government.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section offers a broader picture of the situation on the ground with a comprehensive review of literature on studies done on SSIs. To provide more valuable information, the section will focus on latest data within the last 5 years. The key is to provide a glimpse of the magnitude of the problem and to offer insights on possible gaps identified by scholars.

2.2 Theoretical Framework

The study will take into consideration the Theory of planned behavior (TPB) which was theorized in 1990 by (Goldratt Kalender, Günay, & Vayvay, 2014). It is founded on establishing the weakest areas derailing the improvement of systems and performance. The theory of planned behavior (TPB) is a psychological concept that establishes a link between ideas and behaviors. In accordance with this concept, an individual's behavioral intentions are molded by three fundamental components: attitude, subjective norms, and perceived behavioral control (or lack thereof). TPB helps in structuring the problems identified and even adopting a solution focused on addressing the issue. According to the theory, every system or organization has an associated bottleneck that prevents it from reaching the expected level of performance (Kalender, Günay, & Vayvay, 2014). As such, the obstacles that come on the way of accomplishing or adhering to the recommended practices becomes constraints which lead to negative repercussions.

It asserts that the perception of behavioral control and the desire to consume are the factors that affect real consumption. The three factors identified by Velarde (2012) are subjective norm, attitude, and perceived behavioral control. Each factor has its own set of beliefs and characteristics, which are discussed in more detail in the following section. In this approach, 'person-centered' techniques are combined with a ‘systemcentered' perspective, in which organizational factors are considered as antecedents to patient safety being compromised. Individual responsibility for patient safety and harm avoidance is stressed in both approaches. According to this theoretical framework, initiatives aimed at improving patient safety necessitate systematic assessments and integrative interventions that target various elements in the healthcare system's hierarchy, including the patient, the healthcare provider, the task, the work environment, and the

organization and management. It is possible that this framework, as well as similar risk and safety management frameworks, will be useful in the examination of patient injury, the identification of prospective dangers, and the discovery of approaches to prevent recurrence instances.

According to the TPB, in addition to attitudinal and normative elements, a third component, perceived behavioural control (PBC), has an influence on behavioural intentions and real behavior as well as on actual behavior. When it comes to circumstances in which persons do not have total control, the TPB adjusts the TRA to account for this. Human action is guided by three types of considerations, according to the TPB: a) behavioural beliefs about the likely outcomes of the behavior and evaluations of these outcomes; b) normative beliefs about the normative expectations of others and motivation to meet these expectations; and c) control beliefs about the resources and opportunities possessed (or not possessed) by the individual, as well as anticipated obstacles or impediments toward performing the behavior (Ajzen, 1991). The idea is applicable to this research because nurses must adhere to the recommendations recommended by the World Health Organization in order to reduce SSIs. This necessitates a precise specification of the restrictions that must be met in order for the bundles to be implemented. Accordingly, a detailed examination of the three important areas of pre-operative, intra-operative, and post-operative care must be conducted to identify the reasons that contribute to the failure of these areas to be used effectively. In this scenario, identifying the restrictions, which will be accomplished via evaluating nurse's practices, will aid in the development of suggestions that, if followed, can result in a reduction in the number of SSIs and the related mortality and morbidity that they cause.

2.3 Empirical Literature

2.3.1 WHO Guidelines on prevention of SSIs

The World Health Organization (WHO) first developed Global blueprints on avoidance of SSI in 2016. The current guidelines were last updated and published in 2018. It incorporates 29 detailed recommendations covering preoperative, intraoperative, and postoperative periods. The team of experts developed the measures founded on research. The blueprints are founded on the fact that majority of SSIs can be avoided as long as proper adherence to clinical guidelines is followed (World Health organization (WHO), 2018). However, no healthcare facility can declare itself free of such infections. Nonetheless, WHO provides research-informed measures to help the individuals healthcare institutions largely avoid most of the morbidities.

During the preoperative time, clients are encouraged to shower with antimicrobial soap or just with ordinary soap, depending on the recommendations provided. It is recommended that 2 percent mupirocin decolonization be used in individuals who are known carriers of Staphylococcus aureus and who are scheduled to receive orthopedic or cardiac surgery before surgery (WHO, 2018). When it comes to hair removal prior to surgery, using a clipper rather than shaving is advised rather than shaving, but only when the treatment is absolutely necessary. Antibiotics for prophylaxis should also be administered around 120 minutes before the therapy to ensure that an infection does not develop. Additional hand hygiene precautions include washing hands with water and an antibacterial wash or using an alcohol-based hand massage to keep them clean. It is recommended that mechanical preparation of the colon be carried out concurrently with the delivery of prophylactic antibiotics to adults while undergoing colorectal surgery on the colon. Nutritionally improved food supplements may be administered to underweight clients through the enteral or oral routes, depending on their specific requirements and

preferences. It is also not advisable to discontinue the use of immunosuppressive medications. In addition, the plans recommend that all surgical instruments and other materials that will be employed in the surgical intervention be decontaminated and disinfected prior to being used. In addition, the operating room should be well cleaned prior to the procedure taking place (WHO, 2018).

A major emphasis of the suggestions is that laminar airflow ventilation systems should be avoided at all costs during the intraoperative phase, especially in the case of clients who are receiving an arthroplasty procedure. Operation-related clothing and drapes should be sterile and disposable to avoid contamination of the operating room. Nonwoven gowns and surgical drapes are also recommended for use during surgery. The use of plastic sticky incise drapes, which are made of plastic, is strictly discouraged. As part of this process, it is also required to prepare the skin, which should be accomplished using alcohol-based solutions, such as those containing Chlorhexidine gluconate. Once the treatment has been performed, antimicrobial sealants should not be applied to the wound. Bundles that should be employed should include blood glucose control as well as a fraction of inspired oxygen (FIO2) of at least 80% (World Health Organization, 2018). This method necessitates the use of a warming device, which is also required. Prior to closing the incision, it is also advised that the region be irrigated with povidone aqueous iodine to prevent infection. The use of protection devices is suggested while doing filthy abdominal procedures since the wound might get infected. Aside from that, negative pressure wound care should be used in surgical wounds that are at high risk of infection. Trichlorosan-treated sutures are those that are recommended for use in surgical procedures. The aseptic method should be maintained at all times throughout the surgical process itself, in addition. In the postoperative period, the guidelines recommend that prophylactic antibiotics should not be given at this period but prior to surgery as

highlighted. Wound drain should be removed as dictated by the surgical guidelines. On the other hand administration of FIO2 should continue for 2-6 hours following the procedure (WHO, 2018). Other practices such as cleaning and dressing of the wound should be done appropriately without utilization of advanced dressings.

2.3.2 Level of Adherence among Nurses to SSI Guidelines

Health Research & Educational Trust (HRET) (2019) estimates that the United States conducts over 15 million surgeries per year. However, around 2%-5% of the cases ends up developing SSIs which is equated to represent 160,000 to 300,000 morbidities. Nonetheless, the HRET acknowledges that majority of the cases are preventable in if infection prevention bundles as advocated by WHO can be implemented properly. In a collaborative effort between HRET and AHA, a study conducted between 2015 and 2016 incorporating around 1500 healthcare facilities led to 18% decline in SSIs. The 792 morbidities prevented saved on the cost that accrue to treating such cases by over 16 million dollars. HRET concludes that SSI prevention is possible if only researchbased strategies can be adopted by following the guidelines in place.

In order to review the existing research on the subject, a study conducted to investigate the incentive factors that encourage the adoption and compliance with SSI standards among nurses in Italy may also be used to evaluate the available research on the subject. The findings of this study will be used to inform the development of future research on the subject. According to the results, in this specific case, 55 health 36 health facilities participated in the survey, which included 1313 nurses, with a response rate expected to be 99.4 percent, with a response rate assessed to be 99.4 percent, according to the data (Zucco, Lavano, Nobile, Papadopoli, & Bianco, 2019). Preoperative surgery site shaving was followed by 53.8 percent of nurses, 9.7 percent wore gloves on a regular basis, and

28.9 percent were not aware of the availability of care packages, according to the results of the study. On the other hand, an overwhelming 91 percent of those who answered the survey said that they practiced hand hygiene before to and after invasive procedures were carried out. The authors reach the conclusion that the gaps that have been identified are the result of a lack of training in effective preventative measures on the part of the participants.

In another study, Meeks et al. (2011) attempted to examine the amount of compliance with SSI prevention packages as well as the predictability of outcome measures. The conclusions of the research contained information from two county-level hospitals. Researchers focused their attention on women undergoing hysterectomy, colorectal surgery, and abdominal vascular therapy, among other procedures. Researchers discovered that 62 percent of the patients (n=442) had received proper antibiotic prophylaxis, according to the conclusions of the research. Nonetheless, the authors point out that other factors, such as cooperation and collaboration, might have an impact on the adherence to the designs and rules that have been established. It is also possible that joint efforts to remedy the gaps discovered throughout the research will be successful in their endeavors.

As reported by Leaper, Tanner, Kiernan, Assadian, & Edmiston (2014), the incidence rate of surgical site infections (SSIs) in England is 15.7 percent, making them the third most common healthcare-associated morbidities (HAI). The research was carried out with an approval rate ranging from 4.8% to 7.7%. The authors, on the other hand, recognize that the rates may have been greater due to the fact that the study was limited to individuals who were not in secondary care. This has been exacerbated by a consistent failure to adhere to national and international rules, which may help to avoid such morbidities from occurring in the first place. Following surgical operations, compliance

rates with the SSI standards were found to be between 10 and 20 percent, according to data collected throughout the nation. The available information, on the other hand, shows that compliance is at an overwhelming 95-100 percent level. The records must be thoroughly scrutinized since, despite the many encouraging reports in the nation, there has been a minimal drop in the rates of SSIs in the country. Most crucially, the authors predict that the adoption of WHO surgical site checklists, as well as other designs such as those recommended for by the NICE, would result in a considerable decrease in the number of surgical site infections.

Another research done between 2017 and 2018 among customers having gastrointestinal surgery with 445 patients may also be utilized to shed light of the adherence to SSI recommendations on the ground. According to the report, roughly 10 percent of all procedures undertaken will end up acquiring SSIs at some time in a referral center in Southern Iran. When dispersed as per economic development of nations, those that highly developed have around 9.4 percent prevalence, middle- income countries at 14 percent , and low-income countries at 23.2 percent . The findings demonstrated that the post-surgery infections fell from 6.76 percent before treatments to 3.03 percent for those who got the interventions (Mahmoudi, Ghouchani,

Birjand, Bananzadeh, & Akbari, 2019). (Mahmoudi, Ghouchani, Birjand, Bananzadeh, & Akbari, 2019). The major aspect driving the investigation was the prescription of prophylactic antibiotics for individuals undergoing the operation. In this example, the technique is attributed to have contributed to the great reduction of the morbidity in which the confidence interval was established at $p<0.001$ (Mahmoudi, Ghouchani,

Birjand, Bananzadeh, & Akbari, 2019). (Mahmoudi, Ghouchani, Birjand, Bananzadeh, & Akbari, 2019). The period of hospitalization was also decreased greatly in this instance as well as the expenditures that accrue to the longer stay. However, the research did not

consider the efficacy of the adoption of alternative techniques of surgical site care such as those advised for the WHO.

Another study, Pyrek (2017), indicated that the prevalence of SSIs among all morbidities occurring in a hospital setting in the United States is 20 percent of all such morbidities. The diseases improve the likelihood of causing mortality by 2-11 percent when compared to other persons who are not suffering from the illnesses in question. The majority of consumers, on the other hand, recover from their morbidities with little or no implications. Furthermore, when compared to other hospital acquired infections (HAIs) in the country, surgical site infections (SSIs) account for roughly 3-5 billion dollars in expenditure (Pyrek, 2017). (Pyrek, 2017). As a consequence, they are the most costly HAIs. The surge in hospitalization, on the other hand, is predicted to climb by roughly 10 days, which translates to around 20,000 dollars (Pyrek, 2017). (Pyrek, 2017). In spite of this, the author believes that the great majority of SSIs are avoidable. Although there are no perfect standards when it comes to avoiding SSIs, adopting criteria such as those advocated for by the World Health Organization (WHO) or the American College of Surgeons (ACS) may help cut the morbidity by twice. Hair removal from the surgical site, the use of antibiotic sutures, surgical gloves, washing, and the use of local and topical antibiotics are all suggested (Pyrek, 2017). (Pyrek, 2017). However, many institutions have not completely embraced the adoption and implementation of the procedures indicated in the plans, due to the existence of institutional and, most likely, national regulations controlling the care of such patients. Ismaili (2017), conducted a study in Oman revealing that workload was one of the most critical factors affecting the adherence to the prevention of SSIs. When Health Care Workers (HCWs) register high number of operations, compliance to the recommended measures becomes a big issue to be observed. The constant lack of time in such settings becomes a key barrier to the

implementation of research-founded guidelines and principles. Delays and even cancellations of surgical procedures also contributed significantly to the non-adherence on the two facilities under study. This led to delays in timely administration of antibiotics as well as skin preparations and showering. In addition, emergencies also altered the implementation of research-founded principles in the care of patients awaiting surgical procedures as well as the maintenance. Notably, low or absence of skills and knowledge on SSI prevention guidelines also promoted the rise in post-surgery morbidities. Numerous surgeons and nurses acknowledged to have insufficient education and training attributed to morbidity control which contributed to ineffective morbidity control among surgical patients.

Another research by Anderson & Sexton (2019), reveals that SSIs account for 38 percent of nosocomial infections. The US records over 30 million surgical operations yearly of which 2 percent end up getting the morbidities. However, according to the research, application of recommendations such as those given forth by CDC led to 27 percent decrease in the incidence of SSIs within a year. The measures include glucose monitoring, removal of hair on surgical areas, prophylactic antibiotics, as well as thermoregulation. In a separate research documented by the aforesaid authors which integrated more than 400,000 customers having surgical procedures showed a substantial decrease in SSIs after getting at least two treatments (Anderson & Sexton, 2019). (Anderson & Sexton, 2019). This means that while there are rules in place among many healthcare institutions, there remains a considerable gap in the adherence of steps to limit the SSIs.

2.3.3 Nurse-Related Factors Influencing the Adherence to WHO Guidelines on prevention of SSIs

Nurses are the central focus of caring for the surgical sites. A study by Lin, et al. (2018) sought to explore the nurse aspect that could contribute to the establishment of SSIs. According to the authors, about 50% of the existing nurses lack knowledge on researchfounded ways of avoiding SSIs. The outcome of the interviews conducted in this case also agreed with the existing literature on the gap that exists. In this case, it was noted that behaviors attributed to seeking information, maintain aseptic process, educating client on wound care, and recording care related to the wound was not done as per the available WHO recommendations. Therefore, the nurses shoulder the responsibility of ensuring they adhere to the set measures such as hand cleanliness, observing aseptic methods, proper documentation, as well as ensuring patients do their part in wound

care.

Another study done by Efstathiou, Papastavrou, Raftopoulos, &Merkouris (2011), involving two large public hospitals in Cyprus further explored factors that led to noncompliance to the standard precautions on SSIs. In this case, 30 nurses sampled across different departments took part in the study. According to the outcomes, the lack of time knowledge, skills, forgetfulness, emergencies, as well as equipment all led to failure by the nurse to comply with appropriate standards. The lack of knowledge and skills needed to prevent SSIs were the key elements the nurse that was responsible for the increasing cases of morbidities. Surgical Site Infection (SSI) is one of the most prevalent healthcare-associated illnesses, accounting for up to 16% of all infections in hospitals throughout the globe. Post-operative morbidity, extended recuperation, delayed

discharge, and increased costs may all be caused by SSIs. To offer high-quality nursing care, nurses must be aware of evidence-based guidelines.

Lin, et al. (2018) discovered that the role of nurses is to keep patients safe and prevent damage while delivering care in both short-term and long-term settings. By evaluating patients, planning treatment, monitoring and surveillance activities, double-checking, offering support, and communicating with other healthcare professionals, nurses must follow organizational methods for recognizing harms and risks. In addition to clear policies, leadership, research-driven safety initiatives, healthcare staff training, and patient participation, nurses' adherence to patient safety principles is required for the success of interventions aimed at preventing practice errors and achieving a sustainable and safer healthcare system.

A research conducted in Nigeria by Olowo-Okere, Ibrahim, Sani, and Olayinka (2018) highlighted the reality that SSIs differ from one institution to the next owing to differences in policies and procedures across facilities and between institutions. A total of 27.6 percent of the 127 customers involved in the research acquired SSIs throughout the course of the trial, according to the findings. Patients who underwent Kirschner wire insertions had the highest rate of morbidity in the institution, accounting for 75% of all SSIs recorded in the facility. But other criteria, including length of hospitalization, wound classification, and presence of other comorbid conditions all led to the development of the Standardized System of Indicators (SSI). Nurses, at all levels of practice, play a critical role in infection control and prevention. To offer high-quality nursing care, knowledge of the underlying evidence-based recommendations for SSI prevention is required.

According to Qvistgaard, Lovebo, &Almerud-Österberg (2019), nurses should use infection control guidelines and precautions to avoid cross contamination from known

and unknown sources of infection, as well as transmission-based measures in unusual instances. Nurses should interact with other health team members to manage and prevent surgical site infection in patients who undergo surgical procedures such as caesarean section, hip arthroplasty, knee arthroplasty, reduction of long bone fracture, or repair of neck of femur. Nurses should stay up to speed on the latest evidence-based practices for preventing surgical site infections. Nurses play an important role in wound care, and their theoretical grasp of basic wound care is likely to have a significant impact on the quality of wound care. As a result, health-care professional education may increase their understanding, boosting the execution of infection-prevention recommendations, which directly contributes to the decrease of health-care-associated infections. In a recent qualitative research, nurses were compared in terms of their knowledge and attitudes toward Evidence-Based Nursing Practice (EBNP) based on their professional roles. The amount of knowledge regarding EBNP in both groups' departmental nurses and charge nurses was insufficient, and nurses' knowledge and abilities in this subject area urgently need to be supplemented. However, when it comes to SSI prevention, there is a disconnect between the best research and practice. The first stage in knowledge translation is to be aware of the evidence. Adherence to and compliance with guidelines and recommendations is influenced by a variety of factors, including personal willingness, culture, economic and social circumstances, and levels of knowledge. Lack of adherence and compliance, on the other hand, goes against the healthcare professional's professional principles, standards, and expectations.

The nurses' perspectives towards infection control can also be a vital element of consideration in SSIs. According to Al-Khateeb, Safadi, Najjar, &Adwan (2018), SSIs make 1-3% of surgical interventions worsen. The study incorporated interviews held in

4 healthcare facilities with 133 nurses and 13 personnel from infection control. According to the results, appropriate perspectives on reduction of SSIs by nurses and the other HCWs were marked by compliance to guidelines, attention to details, teamwork, and positivity in care. The authors also recommend that updates on available clinical guidelines which will contribute to low cases of SSIs as they meet the patient needs.

Another study by Teshager, Engeda, &Worku (2015), conducted in Amhara region of Northwest Ethiopia also sought to assess the practices and knowledge associated with the avoidance of SSIs. The study incorporated 423 nurses situated in the facilities. The outcome revealed that only 40.7% of the respondents had the prerequisite knowledge required in the avoidance of surgical site morbidities. This implies that more than half of the nurses in the two facilities assessed could not guarantee quality care before, during, and after surgical interventions. Other studies done in Nigeria and Italy recorded that only 40% and 38% of nurses had the right knowledge on avoidance of SSIs respectively. On the issue of gender, the outcome reveled that male nurses were more advantage with a three times more likelihood of having the knowledge as opposed to their female counterparts. In addition, nurses who had undertaken training on infection prevention measures were 2 times more likely to demonstrated knowledge on avoidance of SSIs.

Psychological pressure among nurses can also be linked with the failure to lower the cases of SSIs. According to Qvistgaard, Lovebo, &Almerud-Österberg (2019), intraoperative experiences of nurses paint a picture of extreme pressure which HCWs have to endure. In this case, about 30-40% of nurses feel psychologically pressured between either pre or post operatively. The impact is altered judgement and communication which impact negatively on the patient outcomes. Another notable observation was that recorded guidelines put more pressure on the nurses to deliver as opposed to training on the avoidance of SSIs.

Nurses play a critical role in preventing surgical site infections by providing a comprehensive function and a continuum of care. As a result, they may adjust SSI risk factors in their daily practice, such as poor hand hygiene and inadequate skin preparation, to avoid SSI. In the last decade, organizations working in the field of SSI prevention, such as the Centers for Disease Control and Prevention, have proposed numerous sets of recommendations in this area. Nurses, on the other hand, continue to fall short of following the recommended best practices for SSI prevention as outlined in the guidelines. Several studies have found that barriers to proper infection prevention practices among nurses include a lack of knowledge, resources, and SSI preventive guidelines, a lack of direct leadership involvement, a lack of dedicated time for improvement activities, a lack of dedicated time for training and education, poor access to supplies in support of identified and agreed-upon action, poor communication, and a lack of awareness of SSI preventive guidelines (Gilani, 2017).

A study done by Fisalabad by Sadaf, Inayat, Afzal, & Hussain (2018), also sought to assess nurse's practices and knowledge on avoidance of SSIs. The study involved 111 participants working in Allied Hospital. The outcome demonstrated that 88.8% of the nurses were diploma holders, 16.65% were BSN, and 1.11% had masters. However, 32.8% of the nurses did not practice hand hygiene before and after wound dressing. Another 39.9% of the respondents did not find it necessary to practice pre-operative shaving prior to surgical procedures. Shortage of nurses was also cited as a key hindrance to avoidance of SSIs in the setting. Therefore, there is a gap in knowledge among nurses that impacted on patient outcomes.

Another study by Sadia, Azhar, Waqas, & Gilani (2017) in 2 public healthcare facilities in Pakistan concluded that there was a strong correlation between the nurses' level of knowledge and the practices associated with the avoidance of SSIs. In this case, 91.6%

of the nurses who participate in the study had a diploma in nursing while only 8.4% had post RN or BSN qualifications. On matters to do with practice, 35.1 % showed poor compliance to skin care recommendations, 32% of the nurses demonstrated lack of knowledge on importance of shaving, while 42.7% revealed to have poor or no use of antiseptic techniques in wound care. The study confirms the direct relationship between the knowledge aspects among HCWs and the related morbidities in surgical procedures.

2.3.4 Institutional factors affecting adherence to WHO Guidelines on prevention of SSIs

Surgical site infections accounted for 38 percent of all nosocomial infections in surgical patients, according to the CDC's National Nosocomial Infection Surveillance System (Goyal et al., 2015). According to a 2011 study of acute care hospitals in the United States, surgical site infections were tied for first place with pneumonia (Magill et al., 2014). According to a literature analysis, they were also the third most prevalent healthcare-associated illness in Australia and Europe (Mitchell et al, 2017; European Centre for Disease Prevention and Control, 2008).

Healthcare facilities may be a significant source of nosocomial infections. For surgical site-related morbidities, waiting time becomes important to the formation of HAIs. According to Billoro, Nunemo, & Gelan (2019), longer delay made the patient worse and exposed them to acquiring additional comorbidities. In this example, there were 255 clients under examination of whom 42 cases acquired SSIs accounting for around 16.5 percent of infections. The findings coincide with those done in Nigeria and Uganda which suggested the morbidity rates in SSIs at 20.3 percent and 16.4 percent respectively. The authors imply that a period over 7 days before a surgical intervention raises the probability of acquiring SSIs by 2.48 times as contrasted to shorter intervals of less than 7 days. A striking finding was the fact that SSI rates jumped from 10.4 percent in clean

wound to 24.3 percent for the clean-contaminated ones (Billoro, Nunemo, & Gelan, 2019).

The significant implications of SSI necessitate attempts to develop measures for preventing this infection, highlighting the need of identifying these SSI risk factors in order to reduce postoperative sequelae. In addition, there are a few basic but crucial intraoperative preventative steps that may reduce the risk of SSI. For this reason, the World Health Organization (WHO) created certain evidence-based guidelines that took into consideration the balance of benefit and hazard, evidence quality, costeffectiveness, resource availability, and patient values and preferences. Despite the fact that their guidelines include highly rated suggestions, none of them could be founded on high-quality evidence, which is missing in most initiatives. In fact, no available data comes from LMICs, raising questions regarding their efficacy in adopting SSI prevention interventions. Many potential impediments to WHO standards implementation in LMICs exist. Inadequate environmental hygienic conditions, poor infrastructure, insufficient equipment, understaffing, a lack of knowledge and application of basic infection-control measures, prolonged and inappropriate use of invasive devices, overuse of antibiotics, and a lack of local guidelines and policies are all constant challenges (Billoro, Nunemo, &Gelan, 2019).

Between April 2013 and March 2018, Public Health England reported an 8.7% cumulative SSI incidence after large bowel surgery, with data suggesting a considerable rise in SSI incidence following large and small bowel procedures in 2017/18, reaching 8.5 percent and 6.5 percent, respectively (Public Health England, 2018). Public Health England (Public Health England, 2018). Another monitoring report from the Health Protection Scotland (HPS) indicated that 192,007 procedures resulted in 1,883 inpatient SSI cases between January 2003 and December 2010. SSI was discovered in 87.9 percent

of discharged patients following a caesarean section in this surveillance (Health Protection Scotland, 2011).

Another factor that contributes to SSIs is extended operation. According to the authors, procedures that took more than an hour elevated the ire of growing SSIs by more than double the amount of time that operations that took less than an hour did. The situation was exacerbated further by the introduction of preventive antibiotics at an inopportune period. In this particular instance, administering an antibiotic dosage before an hour of surgery raised the likelihood of getting SSIs by 5.05 times higher than administering it within an hour after the operation. According to the findings, around 30-90 percent of antimicrobials were administered inadvertently, and this was shown to be an important factor in the origin of the 16 percent of SSI cases that were observed in Ethiopia. The trial was completed with a success rate of 0.002 percent (Billoro, Nunemo, &Gelan, 2019). In low-income nations, in particular, a lack of resources increases the risk of acquiring morbidities, as contrasted to high-income countries where resources are abundant. Healthcare facilities form the immediate environment through which clients interact with caregivers and other patients in the course of hospitalization.

In a research conducted by Alfonso-Sanchez, Martinez, Martn-Moreno, González, and Bota (2017), all customers who had surgical treatments in 2014 were examined across eight different healthcare institutions across Spain. SSIs were diagnosed in 1267 of the 18,910 customers that were investigated, representing a 6.7% overall incidence of SSI. As a result of their findings, the authors concluded that SSIs were associated with contamination by bacteria and fungus in the environment. This suggests that patients preparing for surgery, those receiving surgery, and those recuperating from surgical procedures were in grave risk in institutions with high exposures to the infections in question. With varied institutional rules on prophylactic antibiotic usage, the immediate

environment of the patient Alfonso-Sanchez, Martinez, Martn-Moreno, González, and Bota have found that the near environment provides a significant risk of contamination (2017). As a result, in every facility, the presence of monitoring measures to address the pathways of surface contamination and eliminate the pollutants is vital.

Another research conducted by Molla, Temesgen, Seyoum, and Melkamu (2019) shown that the location of the incision site might be an essential factor in the development of SSIs. According to the findings of the research, caesarian sections done with a midline skin cut were shown to be 5 times more likely to result in SSIs than caesarian sections conducted with a pfannensteil incision. Its findings were in agreement with those obtained by experts in Pennsylvania as well as Cambodia and Ankara, as well as several sections of sub-Saharan Africa. This suggests that the sort of cut advised by a facility may result in the development of the SSI.... The results may be affected by additional comorbidities such as chorioamnitis and hypertensive diseases, amongst others.

A research conducted in Nigeria by Olowo-Okere, Ibrahim, Sani, and Olayinka (2018) highlighted the reality that SSIs differ from one institution to the next owing to differences in policies and procedures across facilities and between institutions. A total of 27.6 percent of the 127 customers involved in the research acquired SSIs throughout the course of the trial, according to the findings. Patients who underwent Kirschner wire insertions had the highest rate of morbidity in the institution, accounting for 75% of all SSIs recorded in the facility. But other criteria, including length of hospitalization, wound classification, and presence of other comorbid conditions all led to the development of the Standardized System of Indicators (SSI).

Other institutional behaviors, such as behavior in the operating room, choice of antiseptic, scrubbing and skin preparation practices, hand hygiene practices, type of adhesive tapes used and shaving pre-operatively were all found to be associated with significant clinical

significance in SSI in a study by Harrop et al. (2012) Those who adhered to the prescribed measures were found to have a lower rate of morbidity. Facilities that did not adhere to the suggested measures, on the other hand, had high rates of infection. SSIs were shown to be 2.5 times more likely to occur in patients in a research including 234 patients when Gram positive bacteria were the primary pathogens as compared to gram negative bacteria in the study. The authors urge that health-care workers (HCWs) grasp the best practices that have an impact on SSIs and put them into practice in order to lead the provision of optimal care.

2.4 Conceptual Framework

The study was based on the variables represented in Figure 1: conceptual framework relating to adherence to world health organization guidelines on prevention of surgical sites infections among nurses in Karatina sub-county hospital in Nyeri, Kenya. A conceptual framework is a diagrammatic description of the interrelationships between the independent and dependent variables, according to Orodho (2014).

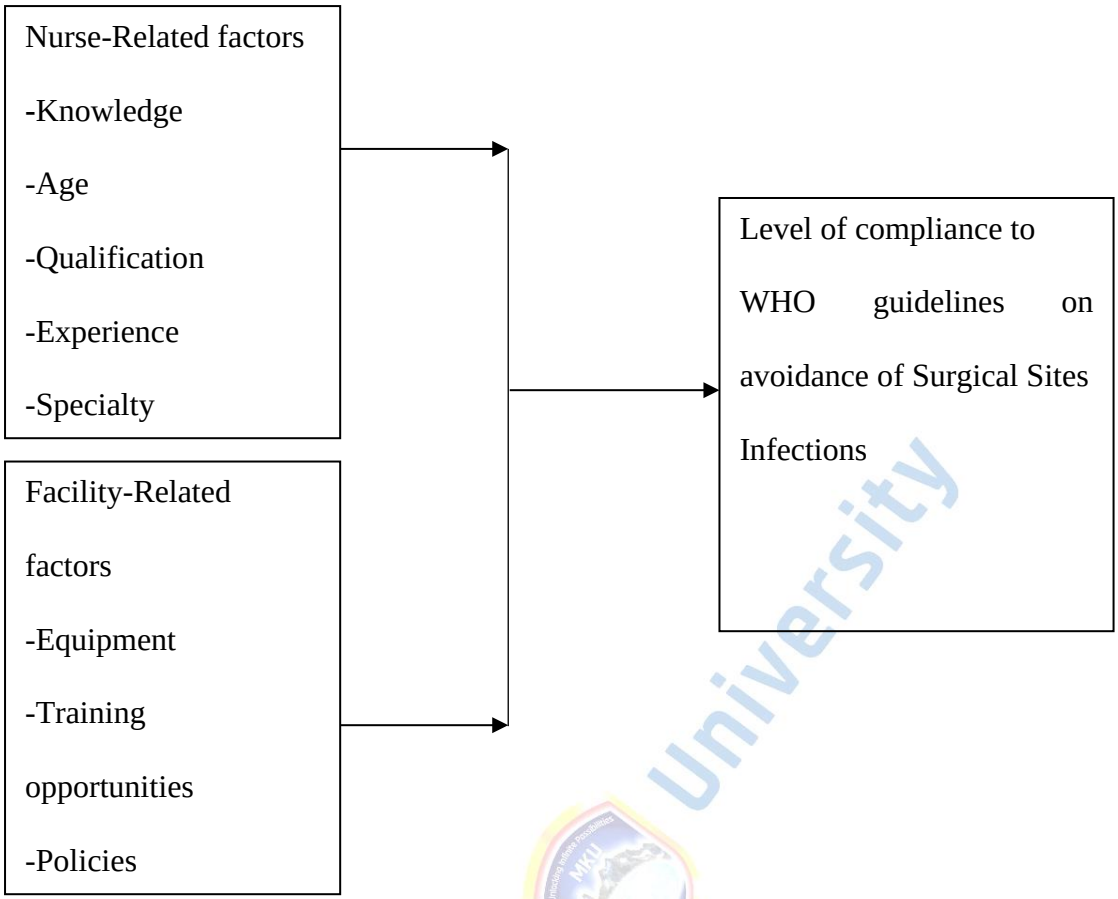


Figure 1: Conceptual Framework

2.4 Summary of Literature

The literature analysis shows the existing gaps in the observance of the measure put forth by WHO. Overall, the level of compliance is unsatisfactory as demonstrated by the reports of SSIs in numerous settings. Factors linked to the nurse such as lack of experience, specialty, gender, and training levels have been associated with the morbidities. On the other hand, facilities have been observed to constitute a notable role in the existence of the infections through poor compliance to the measures as well as lack of funding or resources to facilitate caregiver's duties.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

Research design is used to infer to methods and means applied by a researcher in the process of consolidating various elements in research logically to assist in handling the problem under investigation (Akhtar, 2016). The investigation employed descriptive cross-section study design to assess the level of adherence to WHO guidelines on prevention of SSIs among nurses working in Karatina Sub-county hospital, Nyeri County. Descriptive cross-section study design assesses the conduct of the study subjects at one point in time and describes them without affecting their characteristics. It is considered useful since it leads to a deeper analysis of the topic under investigation with valuable details.

3.2 Study Area and Site

This research was conducted at Karatina Sub-county Hospital, which is part of Nyeri County. There is a wide range of services available, such as diagnostics, prevention, and rehabilitation. In addition to the main county referral hospital in Nyeri, it is also one of the main peripheral hospitals in the county. It is located 126.8 kilometers from Nairobi and 26 kilometers from Nyeri town. The facility is also a key training center for medical students from Karatina University, KMTC-Nyeri, WAKA Medical College, Tumutumu School of Nursing, among other colleges in the region. There are about 164 nurses along with other HCWs who work tirelessly to deliver services in the facility. The bed capacity is about 216 beds. The main cause of morbidity and mortality are non-communicable diseases. The county at large was flagged to benefit from Universal

Health Coverage (UHC) since it was one of the leading in non-communicable diseases.

3.3 Target Population

The study focused on nurses working in Karatina sub -county hospital. This is because in as much as others health workers eg surgeons, doctors and anaesthetists play a role preoperatively, intraoperatively and postoperatively, nurses are the primary care givers in the hospital and are responsible for taking care of surgical sites and thus conversant with the guidelines.

3.4 Study Population

According to (Sekaran, 2010), population is the universe of units from which a sample is to be picked.). On the other, Schindler and Cooper (2006) defined population element as the individual participant or item on which the measurement is made. The study population comprised of nurses serving in maternity, surgical, theatre, and outpatient departments in Karatina Sub-County Hospital. The hospital has a total of 115 nurses distributed across the four departments. Key informants such as those providing records on statistics available on SSIs was also be involved.

3.5 Selection Criteria

The following criterion was applied to select respondents in the study;

3.5.1 Inclusion Criteria

The study incorporated registered nurses working in outpatient, maternity, surgical, and theatre departments in Karatina sub-county hospital, Nyeri County. This is because the 4 departments are the ones directly responsible for taking care of the surgical sites in the hospital. More importantly, only those who gave an informed consent was taken into

account and also only those nurses had worked in the department for over six months period and had a working experience of over one year.

3.5.2 Exclusion Criteria

The study did not consider nurses on leave. Also, nurses who did not consent to participate in the study.

3.6 Variables

3.61 Independent Variables

i. Nurse-associated factors

The elements of focus involved demographic traits such as gender age, and education levels. It also factored training of SSIs, specialization, and experience.

ii. Facility-associated factors

The key aspects examined in this case included the existence of policies on SSI prevention, training programs for nurses on the morbidities, availability of functional equipment, and nurses' workload.

3.6.2 Dependent variable

This incorporated the level of adherence to WHO guidelines on prevention of SSIs. It also incorporated measures taken pre-operatively, intra-operatively, as well as postoperatively as advocated for by WHO.

3.7 Sample size calculation

The specific component addressed the sampling technique and sample size that was applied in the investigation. A sample was drawn from the target population identified (Orodho, 2008: Creswell, 2008). (Orodho, 2008: Creswell, 2008). As per Fraenkel and

Wallen (2000), a sample is a group from which information is taken. What's more, Kombo and Tromp (2006) declare that a good population sample is one that attempts to be as different as could be permitted and should employ a large sample so any conjecture to the full populace is done with confidence. Sampling may be described as choosing some or all of the aggregate on the grounds of which a decision or inference is made (Kothari, 2006). Karatina had 164 nurses employed by the county government to work in the facility as per 2019 hospital records. Thus, the representative sample was obtained utilizing Fishers *et al*., 1998 as illustrated by Mugenda & Mugenda, 2003 as indicated below.

$n = \frac{Z^2 P(1-P)}{d^2}$

Where; n=the desired sample

Z = 1.96 for 95% confidence interval d = degree of precision usually set at 0.05 P = 50% (the most conservative estimate) =0.5

$n = \frac{1.96^2 \times 0.5 (0.5)}{0.05^2}$

$\frac{1.962 \times 0.25}{0.0025}$

$\frac{1.962 \times 100}{3.84 \times 100} = 384$

The sample size was adjusted further utilizing the Equation by Yamane et al., (1967) which is applicable for population less than 10,000 as illustrated by Mugenda & Mugenda, (2003) reveals the following;

$$nf = \frac{n}{1 + (n/N)}$$

Where; nf =desired sample for population less than 10 000 n = desired sample size for population greater than 10 000.

N = estimate of the population size=115

Hence the desired sample size is

$$nf = \frac{384}{1 + (384/115)}$$

$$nf = 384/(1+3.339)$$

$$nf = 384/4.339$$

Sample size = **89**plus 10% for non-respondents = **9**

Sample size is 98 nurses

3.8 Sampling Technique

The hospital administration records revealed that 164 nurses are employed to serve in Karatina sub-county hospital as per December 2019. However, only 4 departments (Maternity, outpatient, surgical, and Theatre are charged with taking care of surgical sites having 115 nurses in these departments.

The most appropriate sampling technique to employ in this study was stratified proportionate random sampling. In this case, the department was considered as strata's from where equal proportions was obtained randomly to ensure a representative sample is obtained. The method gave an equal opportunity for every member of a population to be selected.

In this case, the percentage of the sample population relative to the entire population was calculated as (98/115)*100 = 85.2%.

This implied that each of the four strata/departments in the hospital had85.2% of the nurses taking part in the study. Thus, this was termed as stratified proportionate random sampling as it took into consideration a given proportion of people in a strata who were then selected randomly.

Table 2: Proportionate sampling frame

Department	Total Number of Nurses	Sample (85.2% out of 115)
Surgical Wards	32	27
Outpatient	30	26
Maternity	40	34
Theatre	13	11
Total	115	**98**

Source: Researcher (2019)

3.9 Data collection methods and tools

According to Oso and Onen (2009), research instruments are the gadgets that are utilized to obtain information about a subject. When doing this sort of study, questionnaires are the most effective technique of data gathering (Mugenda & Mugenda, 2009). The investigation tools items were created in order to halt the flow of information in accordance with the study's goals. The study heavily relied on data obtained primarily through self-administered questionnaires and observational checklist. Information regarding nurse-related factors as well as facility-associated factors among nurses in Karatina sub-county hospital was obtained using the questionnaire. This was done in two sections whereby the first one involved assessment of the nurse-associated factors while the second part evaluated the facility-linked factors. On the other hand, the observation

checklist obtained data on the adherence aspect to the WHO guidelines on prevention of SSIs whereby non participant observation method was used. This assisted in determining whether or not there is compliance to the bundles on pre-operative, intra-operative, and post-operative periods.

3.9.1 Validity

Validity is often used in quantitative study to infer to the degree to which accuracy in measuring a concept was achieved. When critiquing or conducting a research, the term is used along with reliability to assess the tools applied in data collection. In content validity, an assessment of whether the tool covered the content or variables it was intended to cover is done. Mugenda and Mugenda (2003) emphasize that data obtained must be pertinent to the research hypothesis by maximizing reliability and validity. According to Cooper and Schindler, a valid instrument is one that correctly assesses the idea under consideration (2005). When the questionnaire was validated using the criteria of self-evident measures, the validity of the questionnaire was confirmed. These measurements demonstrate the amount to which instruments measure what they are intended to assess, which is classed as validity of face and validity of content, respectively. On the other hand, construct validity is determined by the capacity to draw inferences in regards to the test scores (Heale and Twycross, 2015). In this case, to guarantee content validity, the components outlined in the conceptual framework will be assessed in the questionnaire. The checklist will also strictly adhere to the elements outlined in the latest WHO guidelines on prevention of SSIs.

3.9.2 Reliability

Reliability in research studies is often used in reference to consistency of the outcome of determination or measure. In other words, the duplicability of the results obtained when

a similar respondent completes the tool in different times. It usually assesses the homogeneity, equivalence, and stability of the outcome produced especially by similar groups of study (Heale and Twycross, 2015). The study relied on a pre-test done at Mukurweini Sub-county hospital in Nyeri County which largely offers similar services to Karatina sub-county hospital. The pretest sample incorporated 10 nurses which was an equivalence of 10% of the sample size intended to be used in the study. The information was critically analyzed using SPSS.

3.10 Data Analysis and management

3.10.1 Data Entry and Cleaning

The data obtained utilizing the observational checklist as well as the questionnaires were evaluated by the researcher for completeness. Sorting and cleaning was achieved manually whereby the investigator assessed the completed questionnaires and checklists for wholeness. However, since incomplete questionnaires may end up altering the statistical significance of the information obtained, the researcher did a follow-up to ensure the respondents completed them fully. When this was done, systematic arrangement of the questionnaires was done to facilitate analysis. The data was then coded with the help of SPSS program version 25.

3.10.2 Data Analysis and Interpretation

The study employed multinomial analysis and descriptive statistics analysis of data with the aid of SPSS program. The correct answer was given on score and the incorrect answer a score zero. The total score on adherence ranged between zero and twenty; score 0-10 was interpreted as low adherence while a score between 11 -20, as high adherence. Data presentation was based on bar graphs, tables, histograms, and pie charts. The

approach entailed calculating the frequencies, mean, percentages, and standard deviations of data obtained to help interpret the findings. Following the analysis, a Chi-square test was utilized to make inferences on the link between the variables. The confidence interval of all the analysis was set at 95% while the P value applied in this case wills 0.05 or less as an indicator of the significant relationships.

3.10.3 Data storage

All data relating to my study is stored in my personal computer which has restricted access as it is protected by a password.

3.11 Study findings and outcome dissemination plan

The outcomes of this analysis will be utilized during continuous medical education (CME) for nurses and other medical personnel in Karatina sub-county hospital. The researcher will also present the results to the School of postgraduate studies and the Nursing Department at the Mount Kenya University. Upon acceptance of the results, the researcher will publish the findings in a journal to be utilized by researchers in future. In addition, a copy of the outcomes will be availed to Karatina sub-county hospital administration while Mount Kenya University Library will receive the final copy of the research in both soft and hard copies.

3.12 Ethical Considerations

The researcher obtained academic approval to carry on with the research from the School of Postgraduate Studies Ethics and Research Committee at Mount Kenya University as well as Karatina sub-county hospital administration through the medical superintendent and National Commission of Technology and Innovation (NACOSTI).

For the study subjects, an informed consent was obtained following a thorough explanation of the merits and demerits of participating in the study. This was approved by the respondents appending their signature on the consent forms. No participant was coerced whatsoever to take part in the study as they retained the ultimate right to withdraw their participation at their discretion.

The theft or misappropriation of protected invention as well as the generous unattributed literary replication of another's work are considered copyright infringement in certain jurisdictions. The unapproved utilization of concepts or one-ofa-kind strategies obtained by a specific correspondence, for example, an award or an original copy audit, is included with the burglary or misappropriation of protected innovation. All of the researchers that were cited in the study were acknowledged and mentioned within the text of the paper.

In order to facilitate fair and free interactions, the researcher provided the participants with conditions that were both free and fair, which helped to put them at ease. The researcher encouraged people to share information freely and expressed appreciation for their sentiments if they were unable to reveal some sensitive details. By encouraging participants to provide information freely and willingly, the researcher was able to provide them with specifics on the tactics that will be employed throughout the information gathering process. Before taking part in the study procedure, the participants were required to read, comprehend, and sign a permission form.

Furthermore, since the research was completely non-invasive, no damage was done to the participants. The confidentiality of the respondents was also given top attention, since the subjects were not forced to divulge their identities on the data forms, and the researcher preserved their anonymity throughout the whole research process. The data was protected by the researcher to guarantee that it did not get into the hands of

unintended recipients other than the research supervisors and data specialists who were involved in the investigation.

According to the study, the respondents were requested to provide information on data collection tools without disclosing their identity. The contributors to this research were classified using secret codes, which were employed in this investigation. There was no exposed information on the participants, no information in black and white, and no other kinds of communication regarding the events between the researcher and the respondents were used. Because of this, the researcher was much more successful in avoiding biased replies from the respondents.

The data collected from the respondents were treated and deposited in high discretion to elude seepage to unlicensed individuals. It was kept in both hard and soft copies. The researcher did not disclose any composed data to anyone for any purpose.

3.13 Assumptions

The main assumptions in the study are:

1. That all the respondents (nurses) had attained the minimum qualifications set by the regulatory authorities i.e MOH and Nursing Council of Kenya.
2. That the hospital was adequately equipped to implement policies outlined by WHO in prevention and control of SSIs.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter reports the findings of this study based on quantitative data gathered from 98 nurses. The chapter contains analyzed data, data interpretation and presentation and discussion. The study obtained data from 100% (98) respondents from the questionnaire. After data cleaning, it was found that all the questionnaires were duly completed. The findings of each objective are reported separately per objective as highlighted earlier in chapter one. The study sought to establish determinants of the adherence to WHO guidelines on the avoidance of surgical site infections among nurses in Karatina, sub-county hospital, Nyeri County. A summary of socio-demographic characteristics of the respondents will be reported first followed by findings of each specific objective. The first objective to be presented is the nurse's level of adherence to WHO blueprints on prevention of SSIs among nurses working in Karatina subcounty hospital, Nyeri County. This is followed by the nurse-related factors influencing the adherence to WHO blueprints on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County and finally the facility-linked factors that influence adherence to WHO blueprints on prevention of SSIs among nurses working in Karatina sub-county hospital, Nyeri County. The chapter concludes by giving a summary of the results.

4.2 Demographic characteristics of the respondents

The researcher investigated the gender of the nurses working in Karatina Hospital, their level of training, their ages, work experience and if they had a special training in

provision of nursing care to the patients undergoing surgical procedures. The results were varied and Table 3 gives a summary of the demographic characteristics. Each of these results is illustrated after the table.

Table 3: Nurses demographic characteristics

Demographic characteristic		**Frequency**	**Percentage**
Age in years	21-30	2	2
	31-40	35	35.7
	41-50	24	24.5
	>51	37	37.8
	Total	**98**	**100**
Gender	Male	14	14.3
	Female	84	85.7
	Total	**98**	**100**
Highest level of education	Certificate	17	17.3
	Diploma	71	72.4
	Higher diploma	2	2
	Bachelors' degree	8	8.2
	Total	**98**	**100**
Special training in nursing	Yes	6	6.1
	No	92	93.9
	Total	**98**	**100**
Work experience	1-5 years	1	1
	6-10 years	22	22.4
	11-15 years	21	21.4
	>15 years	54	55.1
	Total	**98**	**100**

Source: Field Data (2021)

4.2.1 Gender

All the 98 respondents reported their gender to be either male or female. From analysis of these results, 85.7% (84) respondents were female while 14.3% (4) were male. This implies that in the profession there are more female nurses than male nurses.

Figure 2 shows the distribution of gender in percentages.

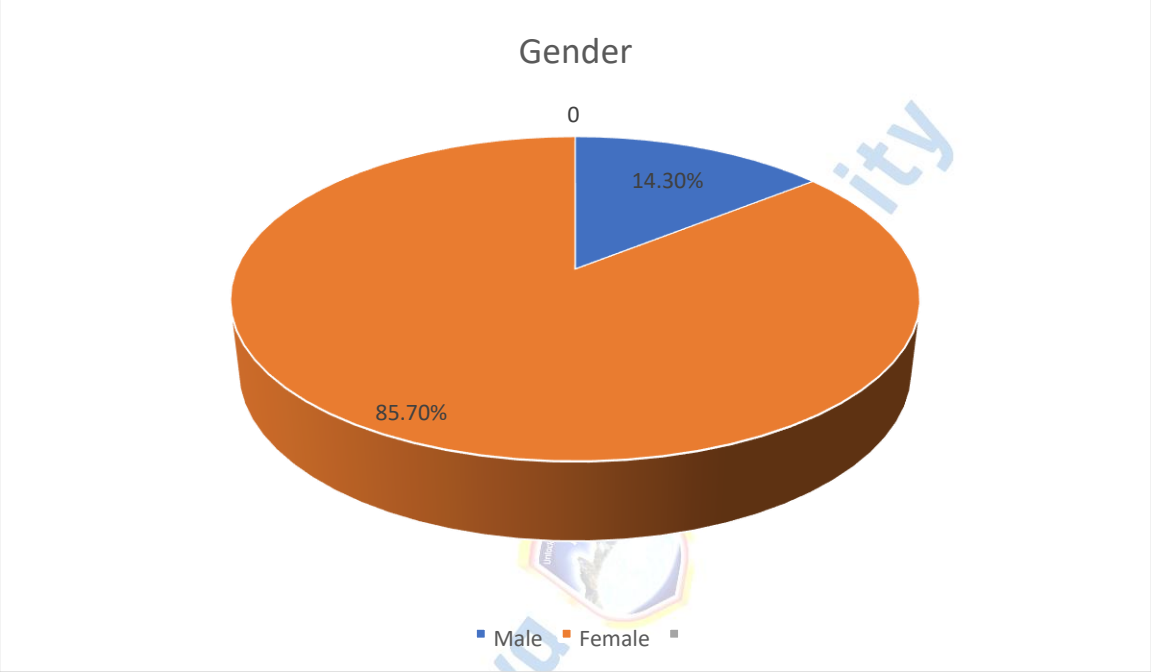


Figure 2: Gender of nurses

4.2.2 Age of the nurses

The nurses involved in the study had varied ages in complete years. The researcher then categorized the ages in class of tens. Two (2%) nurses were aged between 21-30 years age bracket, 35 (35.7%) nurses were having their ages ranging between 31-40 years, 24 (24.5%) nurses were found to have their ages range between 41-50 years and 37 (37.8%) had their ages being above 51 years. From these findings, it is evident that majority of the nurses were elderly. The cumulative percentage for nurses aged 40 years and above was 62.3%. Figure 3 gives a summary of these results.

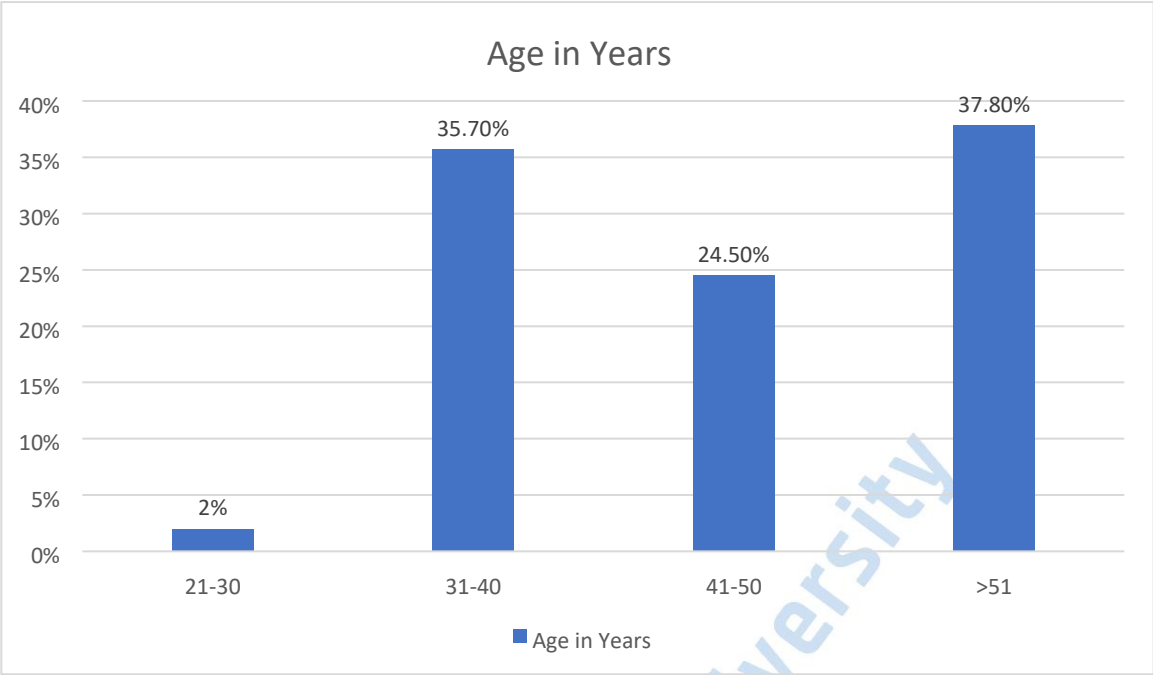


Figure 3: Age of nurses

Among the two nurses aged between 21-30 years old, one of them was adhering to the WHO guidelines on SSI prevention while the other was not. Also, among the 35 nurses aged between 31-40 years 27 nurses had low level of adherence to WHO guidelines, this implied that the older you become the less likely you will adhere to the guidelines. However, among the 37 nurses who were aged above 51 years, 24 had high level of adherence to the WHO guidelines on SSI prevention. These results were statistically significant at $\chi^2(3, N=98) = 12.87$, $p<0.001$.

4.2.3 Level of education of the nurses

In regard to level of education, the nurses training ranged from the lowest certificate level to the highest which was bachelor's degree. There were seventeen nurses (17.3%) with certificate level of training, majority of the nurses (72.4%) had a diploma level of training with two nurses (2%) having a higher diploma level of training and eight nurses (8.2%) holding a bachelor's degree level of training. These results are summarized in table 4.

Among the 17 nurses with certificate level of training, 10 had high level of adherence to the guidelines, for those who had a diploma level of training majority (44) out of 71 had low level of adherence to the guidelines. There were two nurses with higher diploma and they both had high level of adherence. Out of the eight nurses who had bachelor degree in nursing only three had low level of adherence. The results indicate that the higher level of training does not lead to high level of adherence. It is expected that those with diploma level of training could have adhered more to the guidelines than those with certificate level but the results did not match with the expectations. These results indicated that there is no significant association between level of training and adherence to the WHO guidelines on SSI prevention at (p=0.105)

Table 4: Association between level of training and adherence to SSI prevention guidelines

Variable	**Level of training**	**Adherence level**		**P value**
		High	Low	
Highest level of training	Certificate	10	7	Fisher exact test P value=0.105 χ^2=6.143
	Diploma	27	44	
	Higher diploma	2	0	
	Bachelor's degree	5	3	
Total		**44**	**54**	

$\chi^2(3, N=98) = 6.14, p=0.105$

Source: Field Data (2021)

4.2.4 Advanced training in nursing

Six nurses (6.1%) reported to have advanced their level of training into specific areas in nursing. There one nurse (1%)who had specialized in theatre nursing,two nurses (2%) had done reproductive health, two nurses (2%) had specialized in neonatal nursing, and one nurse (1%) had done psychiatric nursing. Five of these nurses who had a specialized training were all found to be adhering to the WHO guidelines on SSI prevention. These results were significant at (p=0.02).

Table 5: Association between having special training in nursing and adherence to SSI prevention guidelines

Variable	**Category**	**Adherence level**		**P value**
		High	Low	
Has a special training other than basic nursing	Yes	5	1	Fisher exact test P value=0.02 χ^2=7.844
	No	38	54	
Total		**44**	**54**	

$\chi^2(2, N=98) = 7.84, p=0.02$

Source: Field Data (2021)

4.2.5 Nurses working experience

The number of years an individual nurse had worked was recorded. Then the years of experience were categorized for easy analysis. There was one nurse who had a working experience of 1-5 years, 22 nurses (22.4%) had working experience of 6-10 years, 21 nurses (21.4%) had worked for 11-15 years and 54 nurses (55.1%) had worked for more than 15 years. This shows a positive correlation with the ages of the nurses. The older

the nurse the more years of experience. Figure 4 gives a summary of working experience of the nurses.

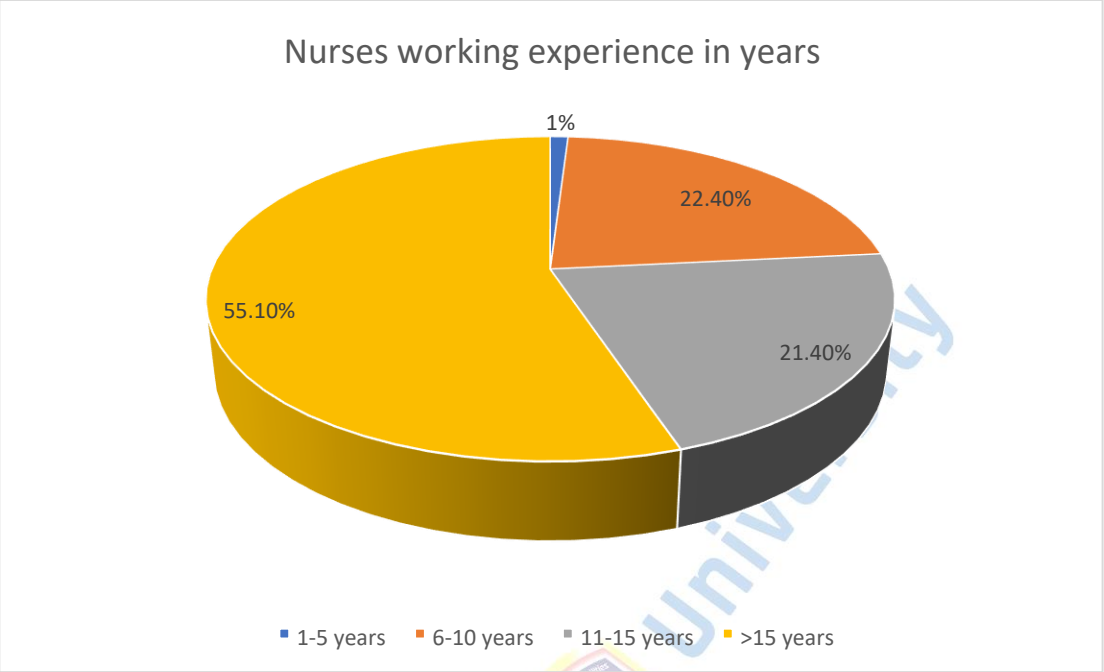


Figure 4: Nurses working experience

The one nurse who had an experience of 1-5 years was adhering to the SSI prevention guidelines. Out of the 22 nurses who an experience of 6-10 years, 18 had low level of adherence to the guidelines. It was also noted that out of 21 nurses who an experience of 11-15 years 13 had low levels of adherence. It was not clear why the increase in years of experience was associated with low levels of adherence to SSI prevention guidelines. However, among the 54 nurses with >15 years of experience 31 had high level of adherence. There was a moderate association between years of experience and level of adherence to the WHO SSI prevention guidelines at Phi value of .0341. These results were statistically significant at $\chi^2(3, N=98) = 11.83, p=010$.

Table 6: Association between work experience and adherence to SSI prevention guidelines

Variable	Years of working	Adherence level		P value
		High	Low	
Working experience	1-5 years	1	0	Fisher exact test P value=0.01
	6-10 years	4	18	χ^2=11.83
	11-15 years	8	13	
	>15 years	31	23	
Total		**44**	**54**	

$\chi^2(3, N=98) = 11.83, p=010$

Source: Field Data (2021)

4.2.6 Nurse's level of adherence to WHO blueprints on prevention of SSIs

A checklist with 20 items was used to evaluate the nurses' level of adherence to the WHO guidelines on prevention of surgical site infection. The highest a nurse could have scored is 20 and the lowest was zero. The researcher had set 10 as pass mark for adherence level in following the WHO guidelines on infection prevention. Those who scored above 10 were considered to be having high adherence level while those who scored less than 10 were considered to be having low level of adherence. Reverse coding was done for the statements that were negative before analysis was done. On analysis, it was observed that the majority of the nurse's level of adherence was low at 55.1%. The percentage shows the number of nurses who had low level of adherence. Those who had high level of adherence were 44.9%, and this was used as the general level of adherence. The figure below shows a summary of the analysis.

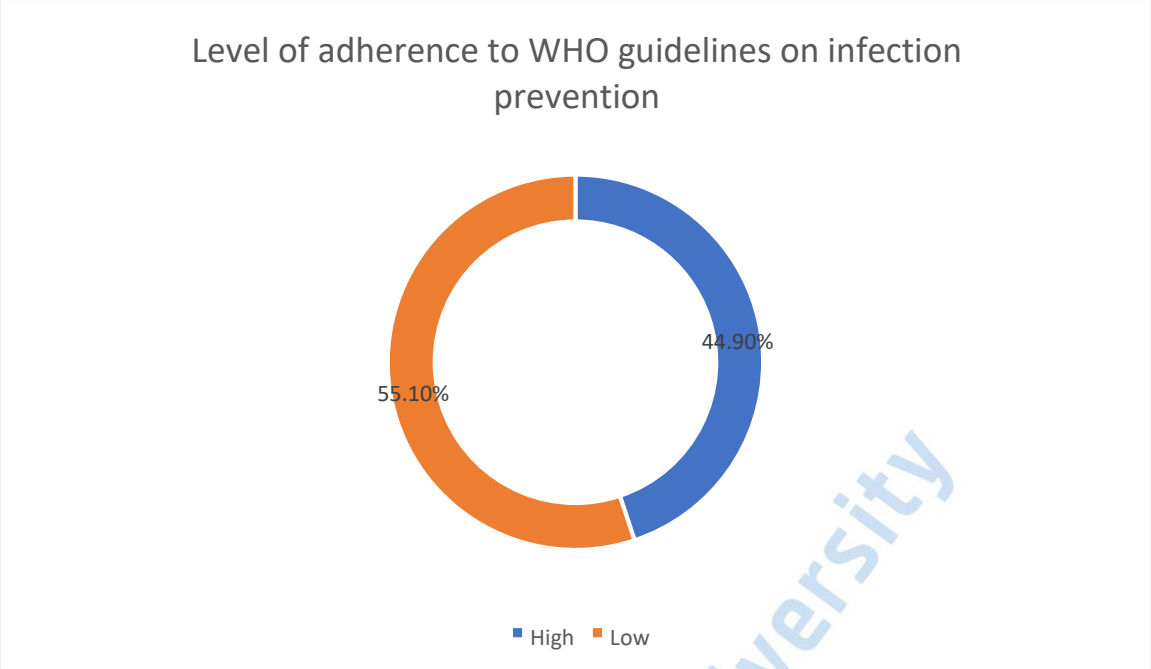


Figure 5: Level of adherence

These findings were congruent with those of (Nofal et al., 2017; Bekele et al., 2018) which placed the level of adherence was at 41.3.%, 45.8% in two studies respectively. However, this finding was different from Leaper et al., (2014) who found that the rate of adherence to the SSI guidelines in the country was at 10-20% following surgical procedures. There is limited data on nurses' level of adherence to prevention of surgical site infections, most of the studies are dwelling of incidence and prevalence of surgical site infections. Therefore, the current study will enrich the research world on the adherence level of the nurses to SSI prevention.

4.3 Nurse-related factors influencing the adherence to WHO blueprints on prevention of SSIs

The nurse related factors that were explored in the study included; nurses' knowledge on infection prevention, gender, specialty in training and working experience.

4.3.1 Nurses knowledge on infection prevention

Majority of the nurses (58.2%), 57 participants had not attended any special training on infection prevention. They relied on their college training knowledge. Also, a minority group of nine nurses (9.2%) had participated in trainings on surgical site infection prevention strategies. However, majority of the nurses (74.0%),73 participants were aware of the WHO guidelines on prevention of surgical site infections. Table 7 gives a summary of these results.

Table 7: Nurse Knowledge in SSI prevention

Variable	Category	Frequency	Percentage
Have you attended any training regarding infection control and prevention	Yes	41	41.8
	No	57	58.2
Have you participated in training on surgical site infections prevention strategies	Yes	9	9.2
	No	89	90.8
Are you familiar with WHO guidelines on prevention of surgical site infection	Yes	73	74.5
	No	25	25.5

Source: Field Data (2019)

The general level of knowledge was computed and the results showed that the nurses had below average level of knowledge. Out of the 98 nurses who participated in the study, 66 had poor level of knowledge. Out of the 66 nurses who had poor knowledge on infection prevention, only 16 had high level of adherence to WHO surgical site infection prevention guidelines. These results were significant at $\chi^2(1, N=98) = 9.87$, $p=012$.

These results indicate that the nurse's knowledge level is low on infection prevention, this is congruent with other studies (Bekele et al., 2018). However, the current study

showed that the general level of knowledge of the nurses after computation was below average level of knowledge. In Jordan, the nurse's knowledge level was estimated to be at 94% (Nofal et al., 2017), this is higher than that found in the current study. The difference might be brought about the ages of the nurses sampled. The current study sampled older nurses (majority was above 40 years) while in the study done in Jordan majority of the nurses were aged below 40 years. The younger nurses are most likely to recall the knowledge on infection prevention more than the older nurses.

Table 8: Association between nurse's level of knowledge and adherence to SSI prevention guidelines

Variable	Category	Adherence level		P value
		High	Low	
General level of knowledge on SSI prevention	Good	28	4	Fisher exact test P value=0.012 χ^2=9.87
	Poor	16	50	
Total		**44**	**54**	

$\chi^2(1, N=98) = 9.87, p=012$

Source: Field Data (2021)

4.3.2 The nurse's practices to prevent surgical site infections

The frequency of handling patients who require surgical site care was also assessed. Some (14.3%), 14 participants reported that they handle surgical patients weekly, 57.1% reported that the patients are handled biweekly and 28.6% reported that the patients are only handled when necessary. These results show that majority of the surgical patients are handled biweekly as shown in figure 6.

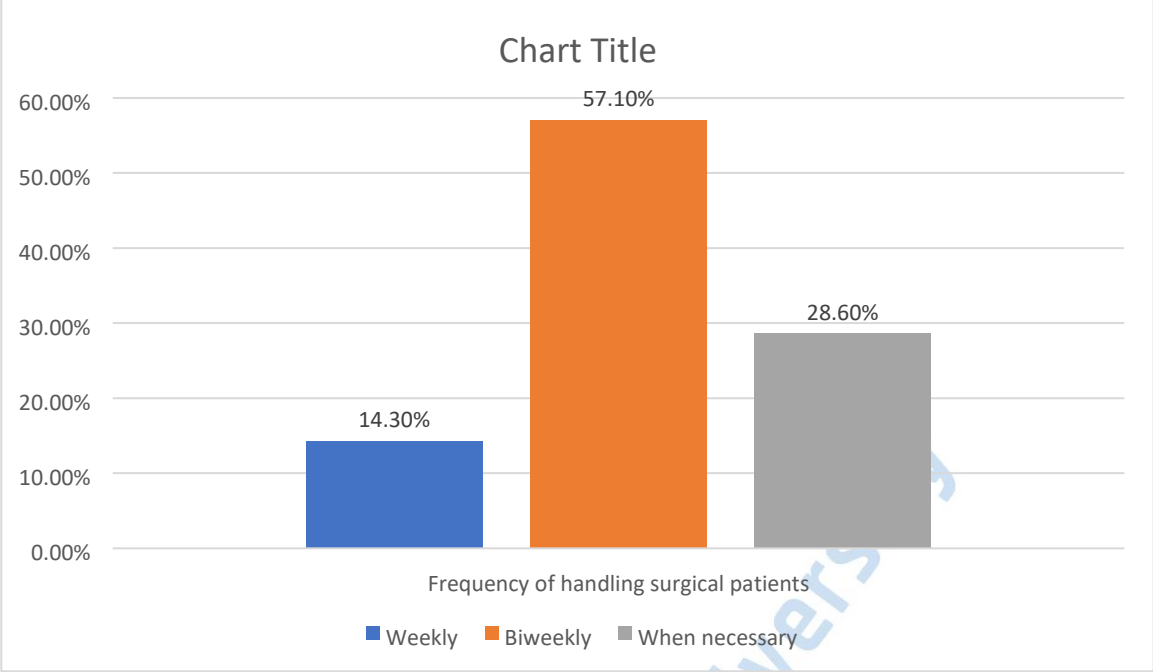


Figure 6: Frequency of handling surgical patients

Following this report, the nurses also reported how often they took care of the surgical sites. It was reported that 42 participants (42.9%) took care of the patient's surgical site daily, 13 participants (13.3%) took care of their patients' surgical sites weekly and 43 participants (43.9%) took care of their patients' surgical sites biweekly. This implies that the patient's surgical sites were mostly taken care of either daily or biweekly as shown in figure 7. This correlates positively with the report on how frequent the nurses handle surgical patients. The more frequent you handle the patients the more likely you are to take care of their surgical site to prevent infections.

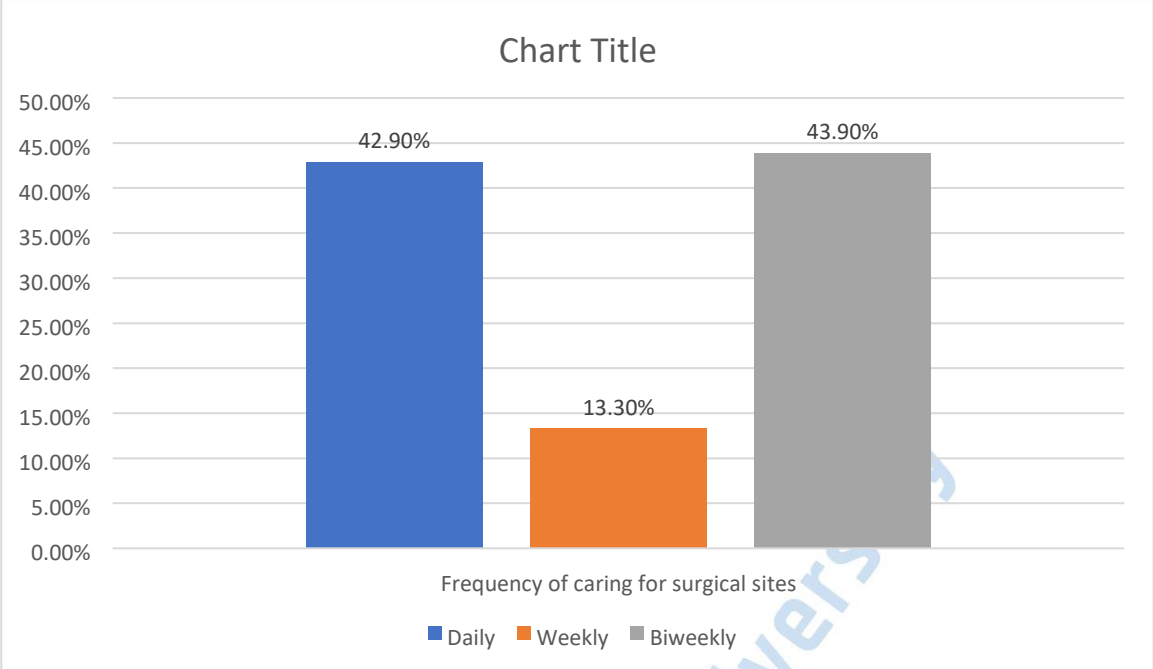


Figure 7: Frequency of taking care surgical sites

Administration of prophylactic antibiotics has been reported to help in preventing surgical site infections. The nurses in the current study also agreed that they administer antibiotics prophylactically to prevent surgical site infections. The patients receive the antibiotics before surgery. This was reported by 87.8% as shown in table 9 below. Administration of prophylactic antibiotics to patients scheduled for surgical procedures was significantly associated with low levels of surgical site infections at $\chi^2(1, N=98) =5.01, p=0.025$.

Table 9: Association between administration of prophylactic antibiotics and nurse's adherence level on SSI prevention guidelines

Variable	Category	Adherence level		P value
		High	Low	

The nurse administers prophylactic antibiotics	Yes	35	51	Fisher exact test P value=0.025 χ^2=5.01
	No	9	3	
Total		**44**	**54**	

Source: Field Data (2021)

Some participants (19.4%) reported that it is recommended to use mupirocin decolonization in known carrier of Staph aureus in cardiac or orthopaedic surgeries. Thirteen (13.3%) participants reported that it was not recommended while the majority (67.3%) was not sure if it is indicated or not. All the nurses advised their patients to take a shower before going for surgery as this helps to reduces chances of infecting the incision sites. Also, the use of 2% mupirocin decolonization in known carriers of Staph aureus bacteria was associated with low levels of SSI among the patients who underwent orthopedic or cardiac surgeries. These results were significant at $\chi^2(2, N=98) =6.92$, p=032. The summary of these results is shown in table 10.

Table 10: Nurses practices in preventing SSI

Variable	Category	Frequency	Percentage
It is recommended to administer prophylactic antibiotics before surgical procedures	Yes	86	87.8
	No	12	12.2

		17	17.3
It is recommended for removing hair on the surgical sites prior to surgical procedures using	Clippers Razor blade	15	15.3
	Scapel	66	67.3
It is recommended to use mupirocin decolonization in known carriers of S. aureus in cardiac or orthopaedic surgeries	Yes	19	19.4
	No	13	13.3
	Don't know	66	67.3
It is recommended for patients going for surgery to bathe with either soap	Yes	98	100

Source: Field Data (2021)

4.3.3 Association between nurses' gender and the nurse's level of adherence to WHO guidelines on SSIs prevention

All the 98 respondents reported their gender to be either male or female. From analysis of these results, 85.7% respondents were female while 14.3% were male. Out of the 14 male nurses only two had low level of adhering to WHO guidelines on infection prevention while among the 84 female nurses, 52 of them had low level of adhering to these guidelines. These results indicated that the male nurses followed the guidelines more than the female nurses. The male nurses were 9.75 times more likely to adhere to the guidelines than female nurses (OR=9.75, (95% CI: 2.048-46.416)). There was a moderate association between gender and adherence to WHO guidelines on SSI prevention at Phi value of 0.335. These results were statistically significant at $\chi^2(1, N=98) = 10.99$, $p<0.001$. The findings were different from those of Bekela *et al*., (2018) who

found that gender was not significantly associated with adherence to surgical site infections prevention.

Table 11: Association between nurses' gender and adherence levels to SSI prevention guidelines

Variable	Category	Adherence level		P value
		High	Low	
Gender of the nurse	Male	12	2	Fisher exact test P value<0.001
	Female	32	52	χ^2=10.999
Total		**44**	**54**	

$\chi^2(1, N=98) = 10.99, p<0.001$

Source: Field Data (2021)

4.3.4 Association between nurses' working experience and the nurse's level of adherence to WHO guidelines on SSIs prevention

The number of years an individual nurse had worked was recorded. Then the years of experience were categorized for easy analysis. There was one nurse who had a working experience of 1-5 years, 22 nurses (22.4%) had working experience of 6-10 years, 21 nurses (21.4%) had worked for 11-15 years and 54 nurses (55.1%) had worked for more than 15 years.

4.4 Facility-related factors that influence adherence to WHO blueprints on prevention of SSIs

The hospital related factors that were assessed included; availability of hospital policies on surgical site infections prevention, if the hospital offers nurses training on surgical site infections prevention, availability of clinical mentors in the hospital who support nurses on SSIs prevention and availability of routine surveillance activities in the hospital on SSIs.

4.4.1 Availability of hospital policies on SSIs prevention

Majority of the nurses (42.9%) reported that the hospital had policies regarding prevention of surgical site infections, 24 participants (24.5%) reported that the policies were not there and 32 nurses (32.7%) were not sure if the policies were there or not. Out of the 42 nurses who reported that the hospital had the policies, half of them were adhering to the WHO guidelines. It was found that among the 32 nurses who were not sure if the hospital had such policies 25 of them had low level of adherence. This implied that knowing the policies and making use of them contributes to reduction of SSI occurrence.

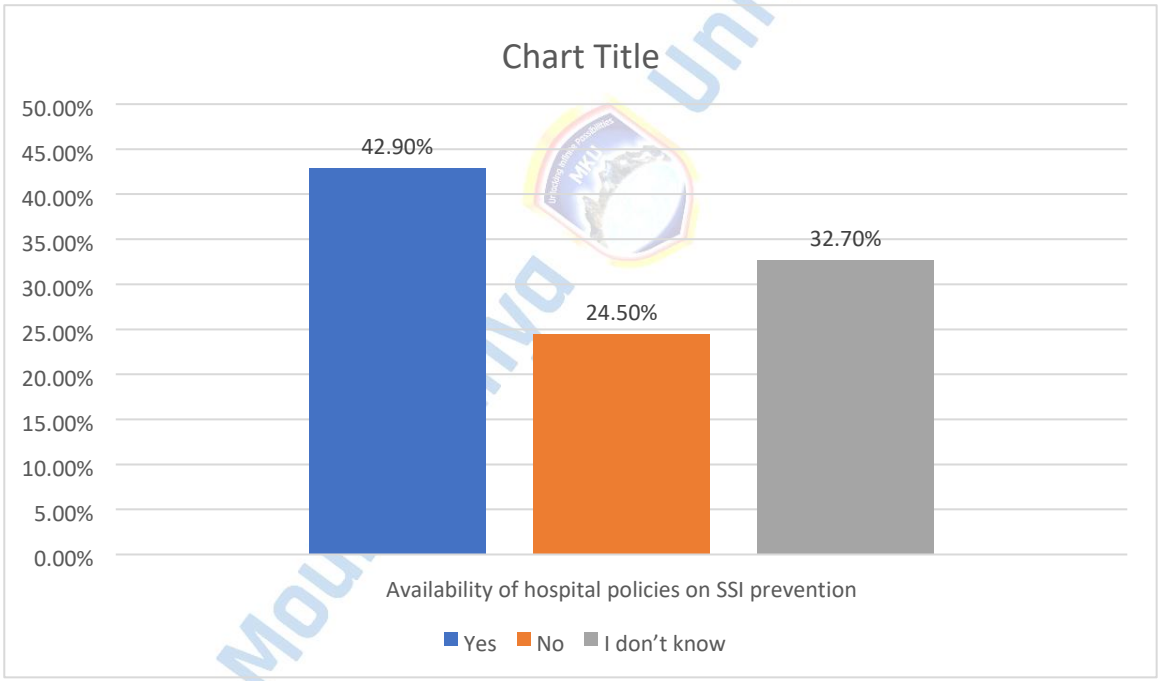


Figure 8: Availability of hospital policies on SSI prevention

4.4.2 The hospital offers nurses training on SSI prevention

The study found out that the nurses were differing on provision of the trainings on surgical site infection prevention. Some nurses (12.2%) reported that the hospital offers training to nurses on SSI prevention, 66 nurses (66.3%) reported that the hospital do not

offer such trainings and 21 nurses (21.4%) reported that there were not sure if the hospital provides such trainings or not. Provision of continuous medical education is aimed at improving nurses knowledge on prevention of SSI.

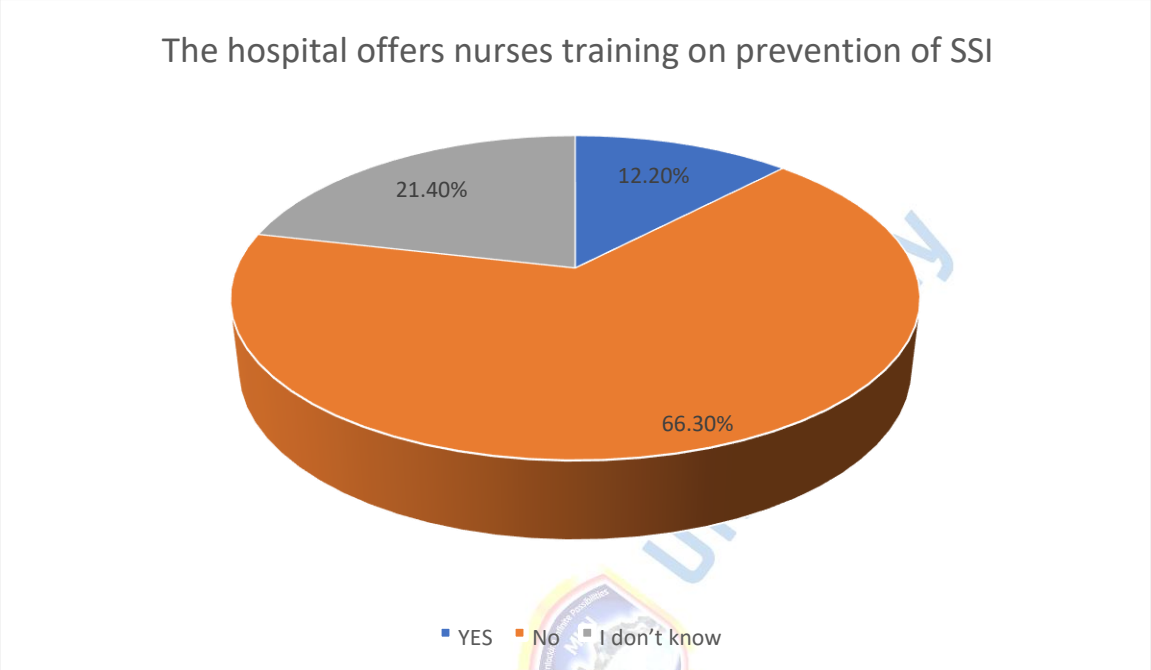


Figure 9: Hospital offers training to its staffs on SSI prevention

4.4.3 Availability of clinical mentors in the hospital who support nurses on SSI prevention

The nurses reported that clinical mentors were there. However, on the issue if the mentors supported them in SSI prevention; some (17.3%) reported that they are supported while the majority (82.7%) reported that they are not supported.

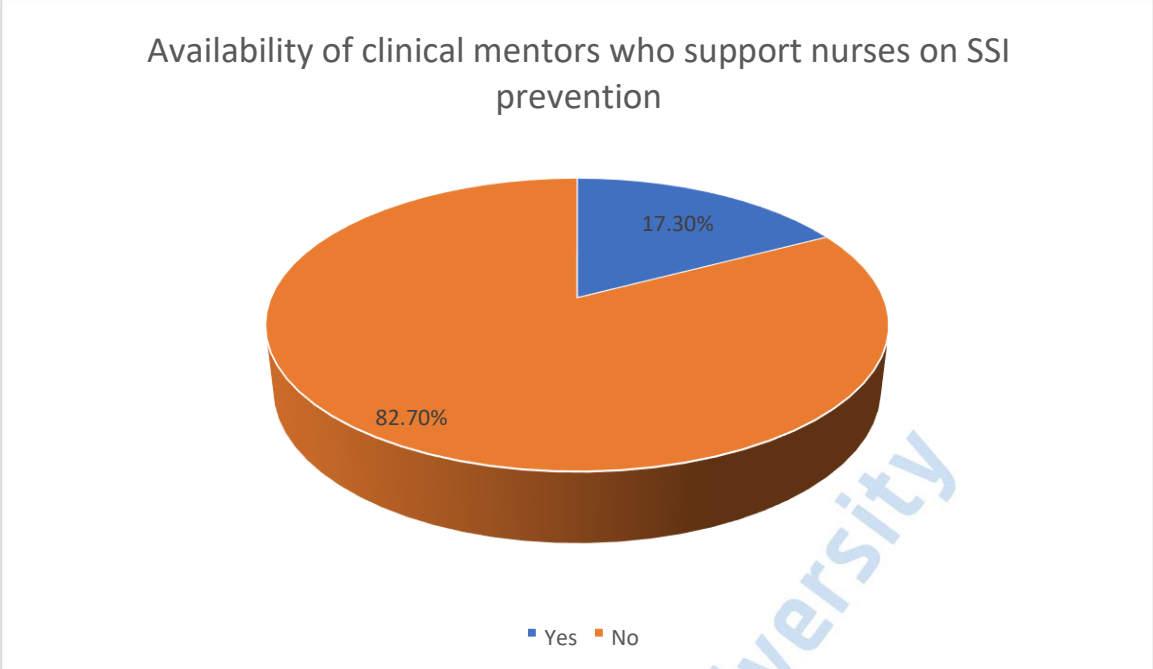


Figure 10: Availability of clinical mentors who support nurses on SSI prevention

The mentors did not significantly contribute to the prevention of SSI among surgical patients.

4.4.4 Availability of routine surveillance activities in the hospital on SSI

The nurses had varied responses on availability of surveillance activities in the hospital. Some nurses (25.5%) reported that these routine activities were there, 41 nurses (41.8%) reported that routine surveillance activities aimed at preventing occurrence of SSI were not there while another group of 32 nurses (32.7%) reported that they were not sure if the hospital carried out such activities.

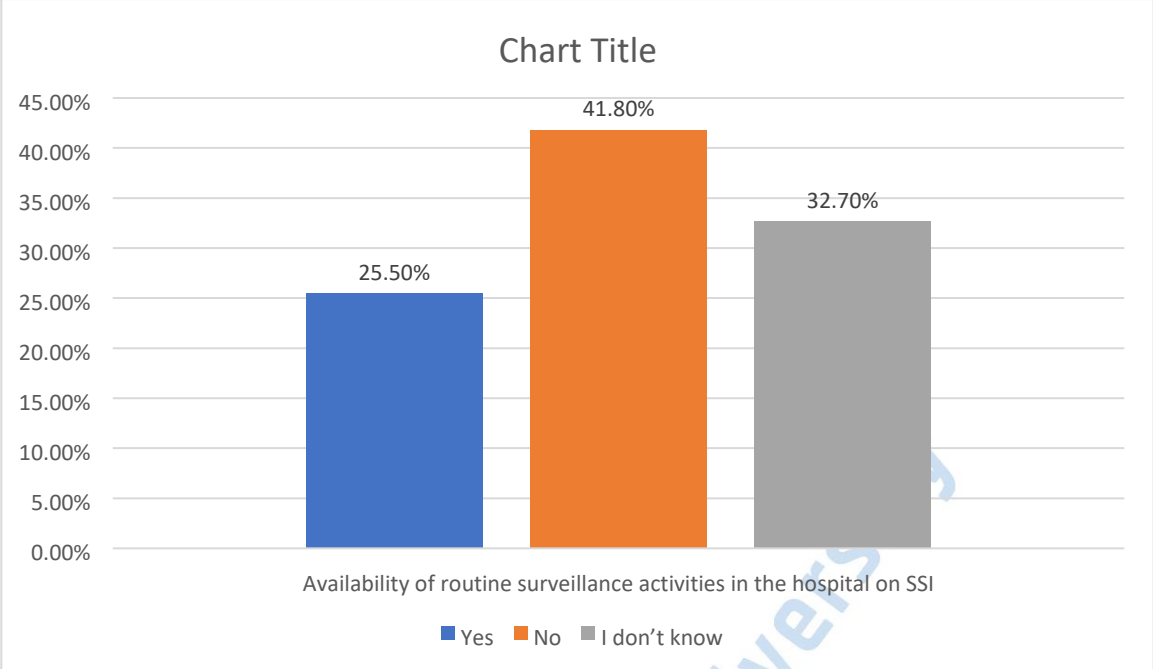


Figure 11: Availability of routine surveillance on SSI prevention

4.4.5 Ways in which the hospital can prevent occurrence of SSI

The nurses had varied responses on an open-ended question on how the hospital can prevent SSI. 65 nurses (66.3%) suggested frequent continuous medical education, 32 nurses (32.7%) suggested provision of resources for surgical site care, use of aseptic technique during wound dressing was suggested by 14 nurses (14.3%), administration of antibiotics for prophylaxis among surgical students was suggested by a group of 14 nurses (14.3%), 35 nurses (35.7%) suggested hand hygiene and 34 nurses (34.7%) proposed wound care. All these results are summarized in table 12 below.

Table 12: Suggestions on how to prevent SSI

Variable	Frequency	Percentage
Provision of Continuous medical education	65	66.3
Provision of resources for surgical site care	32	32.7
Use of aseptic technique in surgical site care	14	14.3
Prophylactic use of antibiotics	14	14.3
Practice of hand hygiene	35	35.7
Practice of wound care	34	34.7

Source: Field Data (2021)

4.4.6 Facility related hinderances to surgical site infection prevention

The nurses pointed out a number of challenges that hinder prevention of SSI among patients. Top in the list was inadequate resources for surgical site care, this was suggested by all the nurses. The dressing packs are less compared to the number of surgical patients who need the surgical site care. The nurses also noted lack of training on prevention of SSI as a contributing factor. This was suggested by 66 nurses (67.3%).

The nurses reported that they practiced hand hygiene but the technique was poor. Therefore, poor hand hygiene ends up contributing to surgical site infection instead of preventing by practicing good technique of hand hygiene. These factors are summarized in table 13 below.

Table 13: Challenges on preventing SSI

Variable	Frequency	Percentage
Inadequate resources	98	100
Lack of training on infection prevention	66	67.3
Poor hand hygiene	4	4.1

Source: Field Data (2021)

4.5 Summary of the results

The study found multiple factors to be contributing to prevention of surgical site infections. The significant factors included; age of the nurse, male gender, more years of working experience, administration of prophylactic antibiotics, use of 2% mupirocin decolonization in patients known to be carriers of Staph aureus bacteria before cardiac or orthopedic surgeries, and availability of hospital policies on surgical site infection prevention.

All these significant factors were subjected to multiple regression to adjust for confounding factors at an entry point of 0.05 and removal point of 0.1 in a backward forward regression model. The model was significant at P<0.001, Cox & Snell R square of 0.112 and Nagelkerke R square of 0.150. These findings indicate the fitness of the model. On analysis only three factors became significant at p value of <0.05. These included; gender of the nurse, age of the nurse after adjusting for working experience and availability of the hospital policies of SSI prevention.

Table 14: Multinomial Regression analysis of significant factors

Variable	B	S.E	Wald	df	Sig	Exp (B)	95%CI Lower	Upper
Gender of the nurse	2.514	0.790	8.17	1	0.011	12.358	.345	3.981
Age of the nurse	-.854	.264	10.47	1	0.01	.426	1.928	2.452
Availability of policies on SSI prevention	.810	.615	1.735	1	0.010	5.541	.676	6.78

Source: Field Data (2021)

4.6 Discussion of the results.

The results will be discussed as per the objective.

4.6.1 Level of Adherence among Nurses to SSI Guidelines

On analysis, it was observed that the majority of the nurse's level of adherence was low at 55.1% (n=54). Those who had high level of adherence were 44.9%, and this was used as the general level of adherence. In a study done in Jordan, the nurse's level of adherence was at 41.3%, 45.8% in two studies respectively (Nofal et al., 2017; Bekele et al., 2018). There is limited data on nurses' level of adherence to prevention of surgical site infections, most of the studies are dwelling of incidence and prevalence of surgical site infections. Therefore, the current study will enrich the research world on the adherence level of the nurses to SSI prevention.

4.6.2 Nurse related factors influencing the adherence to WHO blueprints on prevention of SSIs among nurses.

Increase in age was found to be significantly associated with low adherence level to the guidelines. Among the 35 nurses aged between 31-40 years 27 nurses had low level of adherence to WHO guidelines, this implied that the older you become the less likely you will adhere to the guidelines. Bekela et al., (2018) also found the ages of the nurses to be varied, but majority of the nurses were aged less than 40 years. Male staffs were associated with high level of adherence. In Jordan, the female nurses were more compared to male nurses, however, the gender was not significantly associated with adherence to surgical site infections prevention. The current study showed significant association between male nurses and high level of adherence (Bekela et al., 2018).

The results indicated that the higher level of training does not lead to high level of adherence. It is expected that those with diploma level of training could have adhered

more to the guidelines than those with certificate level but the results did not match with the expectations. However, advancing in nursing was significantly associated with high level of adherence to the guidelines. There was a moderate association between years of experience and level of adherence to the WHO SSI prevention guidelines, the more the experience the higher the level of adherence to the guidelines. These results indicate that the nurse's knowledge level is high on infection prevention, this is congruent with other studies (Bekele et al., 2018). However, the current study showed that the general level of knowledge of the nurses after computation was below average level of knowledge. In Jordan, the nurse's knowledge level was estimated to be at 94% (Nofal et al., 2017), this is higher than that found in the current study. The difference might be brought about the ages of the nurses sampled. The current study sampled more older nurses (majority were above 40 years) while in the study done in Jordan majority of the nurses were aged below 40 years. The younger nurses are most likely to recall the knowledge on infection prevention more than the older nurses.

All the nurses advised their patients to take a shower before going for surgery as this helps to reduces chances of infecting the incision sites. Also, the use of 2% mupirocin decolonization in known carriers of Staph aureus bacteria was associated with low levels of SSI among the patients who underwent orthopedic or cardiac surgeries. Use of prophylactic antibiotics before and after surgery has been associated with less incidences of SSI in previous studies (Nofal et al., 2017; Curcio et al., 2019).

4.6.3 Guidelines on prevention of SSIs among nurses.

The study found that knowing the policies and making use of them contributes to reduction of SSI occurrence. Provision of continuous medical education is aimed at improving nurses knowledge on prevention of SSI but the current study did not find a

significant association between the two. The nurses pointed out a number of challenges that hinder prevention of SSI among patients. Top in the list was inadequate resources for surgical site care, this was suggested by all the nurses. The dressing packs were reported to be less compared to the number of surgical patients who need the surgical site care. The nurses also noted lack of training on prevention of SSI as a contributing factor. The nurses reported that they practiced hand hygiene but the technique was poor. Therefore, poor hand hygiene ends up contributing to surgical site infection instead of preventing by practicing good technique of hand hygiene.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the results per objective, then the conclusive results are reported and finally the recommendations for the nurses and policy maker are given.

5.2 Summary of the results

The study aimed at exploring the determinants of adherence level to surgical site infections prevention. The researcher assessed the adherence level of the nurses towards SSI prevention, then the nurse related and facility related factors to SSI prevention were explored. The study involved 98 nurses with varied ages, different levels of training and different years of working experience. The response rate was at 100% since the questionnaires were researcher administered.

It was found out that there were more female nurses than male nurses. The ages of the nurses were mostly above 40 years. Majority of the nurses had a diploma level of training and a few had done specialized training like neonatal care, psychiatry, reproductive health and theatre nursing. On assessing the adherence level to following WHO surgical site infections prevention guidelines, the study used a checklist which was then computed to a single variable and the adherence level was established to be at

44.9%.

5.2.1 Level of Adherence among Nurses to SSI Guidelines

On analysis, it was observed that the majority of the nurse's level of adherence was low at 55.1%.Those who had high level of adherence were 44.9%, and this was used as the general level of adherence.

5.2.2 Nurse related factors influencing the adherence to WHO blueprints on SSI prevention

Increase in age was found to be significantly associated with low adherence level to the guidelines. Among the 35 nurses aged between 31-40 years 27 nurses had low level of adherence to WHO guidelines, this implied that the older you become the less likely you will adhere to the guidelines. The results indicated that the higher level of training does not lead to high level of adherence. It is expected that those with diploma level of training could have adhered more to the guidelines than those with certificate level but the results did not match with the expectations. However, advancing in nursing was significantly associated with high level of adherence to the guidelines. There was a moderate association between years of experience and level of adherence to the WHO SSI prevention guidelines, the more the experience the higher the level of adherence to the guidelines.

5.2.3 Facility-related factors that influence adherence to WHO blueprints on SSI prevention

The study found that knowing the policies and making use of them contributes to reduction of SSI occurrence. Provision of continuous medical education is aimed at improving nurse's knowledge on prevention of SSI . The nurses pointed out a number of challenges that hinder prevention of SSI among patients. Top in the list was inadequate resources for surgical site care; this was suggested by all the nurses. The dressing packs were reported to be less compared to the number of surgical patients who need the surgical site care. The nurses also noted lack of training on prevention of SSI as a contributing factor. The nurses reported that they practiced hand hygiene but the

technique was poor. Therefore, poor hand hygiene ends up contributing to surgical site infection instead of preventing by practicing good technique of hand hygiene.

5.3 Study conclusion

- The level of adherence to the WHO infection prevention guidelines was low among the nurses
- The nurses' age, gender, having advanced training, more years of experience and nurses knowledge on infection prevention influence adherence level to WHO guidelines on infection prevention.
- The facility related factors influencing adherence level include availability of resources for wound dressing, lack of training, poor hand hygiene technique practices in the hospital and availability of hospital policies and guidelines on surgical site infection prevention
- After multiple regression the significant factors included; age of the nurse, male gender of the nurse and availability of hospital policies and guidelines on surgical site infection prevention.

5.4 Study Recommendation

The study makes the following recommendations based on the results

1. The facility to put in place strategies to improve adherence level to WHO guidelines on SSI.
2. The human resource management to evaluate their staffing and employ younger nurses as their work force, and organize for capacity building especially in the area of infection prevention.
3. The facility should invest in infrastructure particularly availing wound dressing resources.

4. Policies and standard operating procedures should also be put in place and enforced.
5. There should be a qualitative study to explore why the male gender is more likely to adhere to the WHO guidelines on SSI prevention than the female nurses.

REFERENCES

Aiken, A., Wanyoro, A., Mwangi, J., Mulingwa, P., Wanjohi, J., Njoroge, J., Hall, A. (2013). Surveillance for surgical site infections at Thika Hospital, Kenya, has been evaluated. *Journal of Hospital Infection*, *83*(2), 140–145. doi: 10.1016/j.jhin.2012.11.003

Akhtar, I. (2016). Research Design. In Research in Social Science*: Interdisciplinary*

Perspectives (pp. 68–84). New Delhi.

Alfonso-Sanchez, J. L., Martinez, I. M., Martín-Moreno, J. M., González, R. S., & Botía, F. (2017). Analyzing the influence of environmental variables on surgical site infections: the risk factors. *Canadian Journal of Surgery*, *60*(3), 155–161. doi: 10.1503/cjs.017916

Al-Khateeb, M. R., Safadi, R. R., Najjar, Y. W., &Adwan, M. A. (2018). Perspectives of Nurses and Infection Control Personnel toward Prevention of and Caring for Orthopedic Surgical Site Infection. *Jurnalul De Chirurgie*, *14*(01). doi: 10.7438/1584-9341-14-1-2

Anderson, D. J., & Sexton, D. J. (2019). Overview of Control Measures for Prevention of Surgical Site Infection in Adults. Retrieved November 30, 2019, from https://www.uptodate.com/contents/overview-of-control-measures-forprevention-of-surgical-site-infection-in-adults/print.

Bekele I, Yimam I, Akele G (2018) Nurses at Jimma University Medical Center's Infection Prevention and Control Program. *Immunome Res* 14: 156. doi: 10.4172/17457580.1000156

Billoro, B. B., Nunemo, M. H., & Gelan, S. E. (2019). Surgical ward infection rates at Wachemo University Nigist Eleni Mohammed Memorial Hospital, Southern Ethiopia, were evaluated using a prospective cohort analysis. *BMC Infectious Diseases*, *19*(1). doi: 10.1186/s12879-019-3895-5

Cheadle, W. G. (2013). Surgical Site Infection: Still a Common Problem. *JAMA Surgery*, *148*(2), 189. doi: 10.1001/jamasurgery.2013.416

Curcio, D., Cane, A., Fernández, F., & Correa, J. (2019, March). In underdeveloped nations, surgical site infection is common in both clean and contaminated procedures. Retrieved December 3, 2019, from https://www.ncbi.nlm.nih.gov/pubmed/30639405.

Efstathiou, G., Papastavrou, E., Raftopoulos, V., & Merkouris, A. (2011). Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: A focus group study. *BMC Nursing*, *10*(1). doi: 10.1186/1472-6955-10-1

Harrop, J. S., Styliaras, J. C., Ooi, Y. C., Radcliff, K. E., Vaccaro, A. R., & Wu, C. undefined. (2012). Contributing Factors to Surgical Site Infections. *Journal of the American Academy of Orthopaedic Surgeons*, *20*(2), 94–101. doi: 10.5435/JAAOS-20-02-094

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative research. *Research Made Simple*, *18*(3), 66–67. doi: 10.1136/eb-2015-102129

Health Research & Educational Trust. (2018). *Surgical Site Infections Change Package*. *Surgical Site Infections Change Package* (pp. 2–30). Chicago: Health Research & Educational Trust.

Ismaili, S. A. (2017). Adherence to international and national recommendations for the prevention of surgical site infections in elective surgery at two tertiary hospitals in Oman (1-472). Cardiff University, Cardiff.

Laloto, T. L., Gemeda, D. H., & Abdella, S. H. (2017). Incidence and predictors of surgical site infection in Ethiopia: prospective cohort. *BMC Infectious Diseases*, *17*(1). doi: 10.1186/s12879-016-2167-x

Leaper, D. J., Tanner, J., Kiernan, M., Assadian, O., & Edmiston, C. E. (2014). Surgical site infection: poor compliance with guidelines and care bundles. *International Wound Journal*, *12*(3), 357–362. doi: 10.1111/iwj.12243

Lin, F., Gillespie, B. M., Chaboyer, W., Li, Y., Whitelock, K., Morley, N., Marshall, A. P. (2018). Preventing surgical site infections: Facilitators and barriers to nurses' adherence to clinical practice guidelines—A qualitative study.

Journal of Clinical Nursing, *28*(9-10), 1643–1652. doi: 10.1111/jocn.14766

Mahmoudi, L., Ghouchani, M., Birjand, M. M., Bananzadeh, A., & Akbari, A. (2019). Optimizing compliance with surgical antimicrobial prophylaxis guidelines in patients undergoing gastrointestinal surgery at a referral teaching hospital in southern Iran: clinical and economic impact

Infection and Drug Resistance, *Volume 12*, 2437–2444. doi: 10.2147/idr.s212728

Manian, F. A. (2014). The Role of Postoperative Factors in Surgical Site Infections: Time to Take Notice. *Clinical Infectious Diseases*, *59*(9), 1272–1276. doi: 10.1093/cid/ciu552

Meeks, D. W., Lally, K. P., Carrick, M. M., Lew, D. F., Thomas, E. J., Doyle, P. D., & Kao, L. S. (2011). Compliance with guidelines to prevent surgical site infections: As simple as 1-2-3? *The American Journal of Surgery*, *201*(1), 76–83. doi: 10.1016/j.amjsurg.2009.07.050

Molla, M., Temesgen, K., Seyoum, T., & Melkamu, M. (2019). Surgical site infection and associated factors among women underwent cesarean delivery in Debretabor General Hospital, Northwest Ethiopia: hospital based cross sectional study. *BMC Pregnancy and Childbirth*, *19*(1). doi: 10.1186/s12884-019-2442-0

Norfal M, Subih M, & Al-kalaldeh (2017). Factors influencing compliance to infection prevention precautions among nurses and physicians in Jordan: a crosssectional study. *Journal of infection prevention*. 18(4); 182-188.

Olowo-Okere, A., Ibrahim, Y., Sani, A., & Olayinka, B. (2018). Occurrence of Surgical

Site Infections at a Tertiary Healthcare Facility in Abuja, Nigeria: A Prospective Observational Study. *Medical Sciences*, *6*(3). doi: 10.3390/medsci6030060

Pyrek, K. M. (2017, April 3). The Adherence to Guidelines and the Team Approach to Prevention Have an Impact on Surgical Site Infections. Retrieved November 29, 2019, from https://www.infectioncontroltoday.com/ssi/guideline-adherence-teamapproach-prevention-impacts-surgical-site-infections.

Qvistgaard, M., Lovebo, J., & Almerud- Österberg, S. (2019). As observed by operating room nurses, intraoperative prevention of Surgical Site Infections is essential. *International Journal of Qualitative Studies on Health and Well-Being*, *14*(1), 1632109. doi: 10.1080/17482631.2019.1632109

Rono, L. (2018). A study of microcredit and its relationship to the growth of small and medium-sized enterprises (SMEs) in the Konoin Subcounty of Kenya. *International Journal of Advanced Research*, *6*(4), 961–968. doi: 10.21474/ijar01/6935

Sadaf, S., Inayat, S., Afzal, M., & Hussain, M. (2018). Nurse's Knowledge and Practice Regarding Prevention of Surgical Site Infection at Allied Hospital Faisalabad. *International Journal of Scientific & Engineering*, *9*(5), 351–368. Retrieved from https://www.researchgate.net/publication/327337584

Sadia, H., Azhar, M., Waqas, A., & Gilani, S. A. (2017). Assessment of Nurses' Knowledge and Practices Regarding Prevention of Surgical Site Infection. *Saudi Journal of Medical and Pharmaceutical Sciences*, *3*(6B), 585–595. doi: 10.21276/sjmps

Tarwadi, A. S. (2016). *Pattern of Superficial Surgical Site Infection after Elective Orthopedic Surgery at Kikuyu P.C.E.A Orthopaedic Rehabilitation Center*(dissertation).

Teshager, F. A., Engeda, E. H., & Worku, W. Z. (2015). Nurses working in Amhara Regional State Referral Hospitals in Northwest Ethiopia were asked about their knowledge, practice, and associated factors in relation to preventing surgical site infection (SSI). *Surgery Research and Practice, 2015*, 1–6. doi: 10.1155/2015/736175

U.S. Department of Health & Human Services, & Agency for Healthcare Research and Quality. (2019). Surgical Site Infections. Retrieved December 3, 2019, from http://psnet.ahrq.gov/primer/surgical-site-infections.

World Health Organization. (2018). Practice Approaches for Implementing Evidence-Based Recommendations in the Prevention of Surgical Site Infections.

World Health Organization. (2018, December 26). Guidelines for the prevention of surgical site infection from being published worldwide. Retrieved December 2, 2019, from https://www.who.int/infection-prevention/publications/ssi-guidelines/en/.

Zhang, K. (2018). The Origins, Development, and Future Direction of the Theory of Planned Behavior. *International Journal of Humanities and Social Science Invention*, *7*(5), 76–83. Retrieved from www.ijhssi.org

Zucco, R., Lavano, F., Nobile, C. G. A., Papadopoli, R., & Bianco, A. (2019). The results of an investigation into surgical ward nurses' adherence to evidence-based recommendations for surgical site infection prevention in Italy. *Plos One, 14*(9). doi: 10.1371/journal.pone.0222825

APPENDICES

Appendix I: Letter of Introduction

Roselyn M. Gakuanyi

P. O. Box 132

Runyenjes

6/8/2021

The Medical Superintendent

Karatina Sub-County Hospital

P. O. Box 133

Karatina

Dear Sir/Madam

RE: Request for Authorization to Conduct Research in Karatina Sub-County Hospital

My name is Roseline M. Gakuanyi, a master's student at Mount Kenya University. I am writing to seek your authority to carry out Research on Adherence to WHO Guidelines on avoidance of Surgical Site Infections among Nurses in Karatina SubCounty Hospital.

This is in line with partial fulfilment for the award of master's degree at the university

Thank you in advance.

Yours sincerely,

Roseline M. Gakuanyi

ID: 22705728

Appendix II: Letter and Consent Form

Introduction and Instructions

Title of the study: Adherence to WHO guidelines on the avoidance of SSIs among Nurses in Karatina Sub-County Hospital

Researcher: Roseline M. Gakuanyi

Institution Affiliation: Mount Kenya University

Hello, my name is ……, I am administering questionnaires and offering assistance in filling it in to the study participants on behalf of Roseline Muthoni Gakuanyi. I will also fill in an observation checklist following a short interview with the participants. Roseline is a master's of science in nursing student at Mount Kenya University in Thika. The study aims to assess the adherence to WHO guidelines on prevention of SSIs among nurses in Karatina sub-county hospital in Nyeri, Kenya.

The results of this study will enable health care providers and policy makers to address issues related to surgical site infections and probably minimize their occurrence. It will also assist policy makers to develop approaches which will help in infection control and prevention. Kindly note that there will be no benefits to you or any risks posed to you during this study. The information you give will be anonymous and will be kept confidential. Also, there will be no competition attached to participating in the study. Your engagement in this study is based on voluntary terms and you are free to withdraw at your discretion. Your participation is highly valued and appreciated.

Thank you in advance.

Study participant's signature:……. Date……..

Consent Declaration

I hereby consent to participate in this study. The investigator has explained to me what the study involves, including the potential risks and benefits pertaining my participation in the study. I also comprehend the fact that my engagement in the task is based on voluntary basis and that the participation will not influence my well-being at my area of work in any way whatsoever. I may also wish to withdraw my participation at any stage without any consequences. I have also been reassured that my personal details and information given will be kept confidential. I confirm that my concerns about my participation in the study have been adequately addressed by the investigator and that

he/she has asked me questions to ascertain my comprehension of the information provided.

I admit to take part in this research study: Yes/No
I acknowledge that I will complete the questionnaire Yes/ No
Participant's signature _____ Date_____

I admit that I have explained to the respondent the dynamics of the study and the elements of the acknowledgement form in detail and the respondent has agreed to take part on voluntary basis without any undue influence.

Investigator's signature_____ Date _____

For any clarification regarding your participation in this study, please contact
Researcher: Roseline Muthoni Gakuanyi. Mobile No: 0723039953
Supervisor 1: Prof. Catherine Mwenda: Mobile No: 0723846810
Supervisor 2: Dr. Josphat Njuguna: Mobile No: 0722612598

Thank you.

Appendix III: Questionnaire

Instructions

Before responding to the questions in this questionnaire, kindly read, comprehend, and append your signature attached form.

Do not write your name or personal details in the questionnaire

Indicate your response by using an (X) or a (✓) next to your response

Please respond to all the questions in each section if possible.

Section A: Nurse-Related Factors

Demographic factors:

Kindly fill the blank with a tick where appropriate.

1. What is your sex?

☐ Male

☐ Female

2. What is your age?

☐ 21-30 years

☐ 31-40 years

☐ 41-50 years

☐ Over 51 years

3. What is your highest level of education in nursing?

☐ Certificate

☐ Diploma

☐ Higher diploma

☐ Bachelor's degree

☐ Postgraduate degree

☐ Others specify

4. Have you undertaken any speciality in Nursing?

☐ Yes

☐ No

5. If yes, Specify……

6. How long have you served as a qualified nurse?

☐ 1-5 years

☐ 6-10 years

☐ 11-15 years

☐ Over 15 years

Section B: Knowledge

Kindly fill the blank with a tick where appropriate.

7. Have you attended any training regarding infection control or prevention?

☐ Yes

☐ No

8. Have you participated in training on surgical site infections (SSIs) prevention strategies?

☐ Yes

☐ No

9. Are you familiar with WHO guidelines on prevention of surgical site infections?

☐

☐ Yes

No

10. How often do you handle patients who require surgical site care?

☐ Weekly

☐ Biweekly

☐ When necessary

☐ Never

11. How often do you take care of surgical sites?

☐ Daily

☐ Weekly

☐ Biweekly

☐ Never

12. Should you administer prophylactic antibiotics prior to surgical procedures?

☐ Yes

☐ No

13. What is recommended for removing hair on the surgical sites prior to surgical procedures?

☐ Clippers

☐ razor blade

☐ Scalpel

☐ I do not know

☐

14. Is it recommended to use 2% mupirocin decolonization in known carriers of staphylococcus aureus in cardiac or orthopaedic surgeries?

☐ Yes
No

☐ I do not Know

15. Do you recommend to the patients going for surgery to bathe with either soap or antimicrobial soap?

☐ Yes

☐ No

☐ It is not necessary

Section C: Facility-Related Factors

Kindly fill the blank with a tick where appropriate.

18. Does the facility have policies of SSI prevention?

☐ Yes

☐ No

☐ I don't know

19. Does the hospital offer nurses trainings on SSIs?

☐ Yes

☐ No

☐ I don't know

20. Are there clinical Mentors in the hospital who support nurses on SSIs prevention?

☐

☐ Yes

☐ No

21. List at least two ways you think can help reduce SSIs in the hospital

---

---

22. List at least two factors in the facility that promote establishment of SSIs?

---

23. Are there routine surveillance activities available in the hospital on SSIs?

☐ Yes

☐ No

☐ I don't know

THANK YOU!!!!

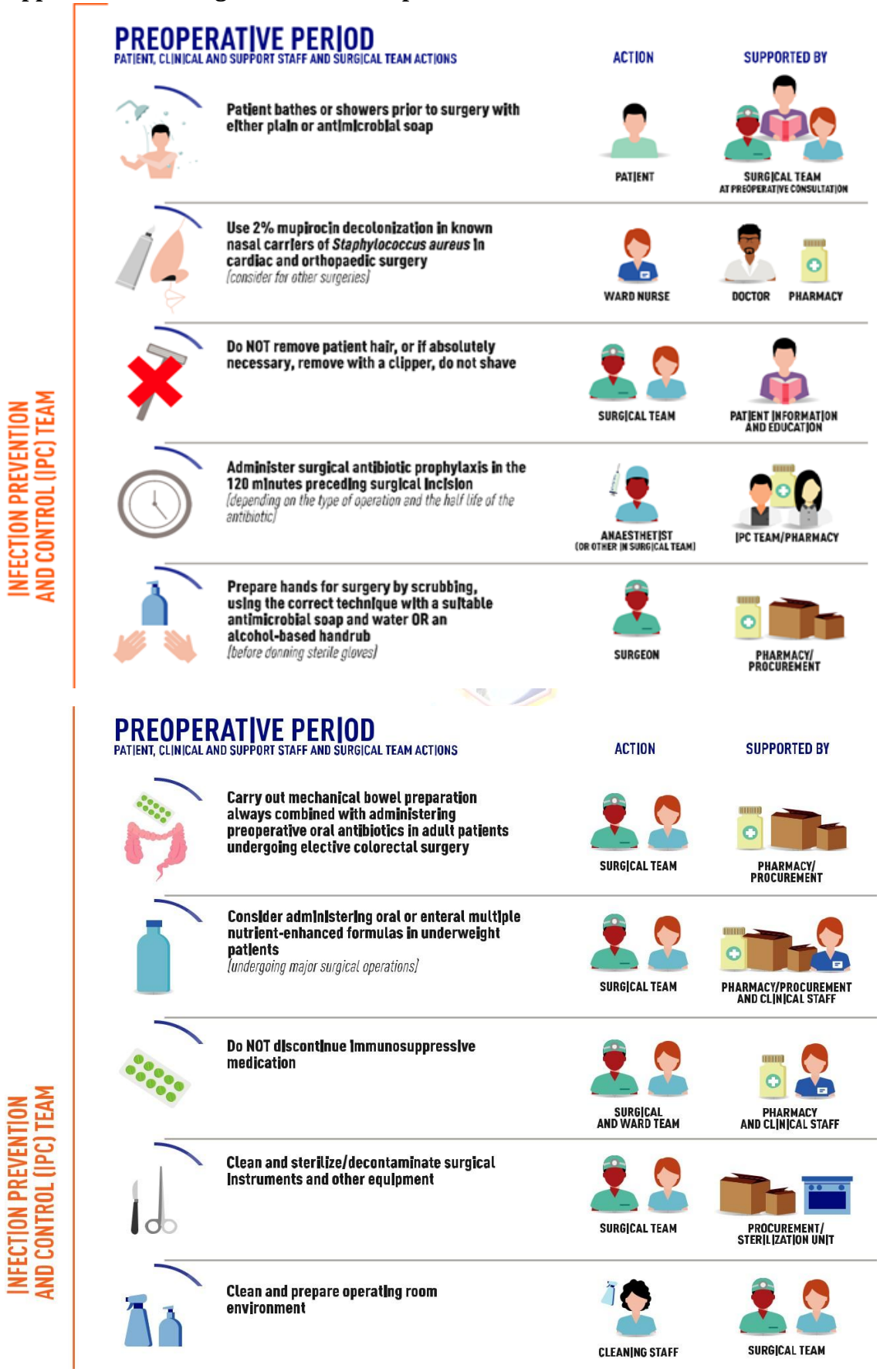
Appendix IV: Observational Checklist

	Actions/period	Done (√)	Not done (×)
	Pre-Operative Period		
1.	Patient bathes or showers prior to surgery with either plain or antimicrobial soap		
2.	Use of 2% mupirocin decolonization in known nasal carriers of staphylococcus aureus in cardiac and orthopaedic surgeries is done		
3.	Patient hair is removed with a clipper		
4.	Antibiotic prophylaxis is given 120 minutes preceding surgical incision		
5.	Hands are prepared by scrubbing using correct technique with an antimicrobial soap or alcohol-based hand rub		
6.	Mechanical bowel preparation is done combined with administration of preoperative oral antibiotics in elective colorectal surgery		
7.	Immunosuppressive medications are not stopped preoperatively		
8.	Surgical equipment are decontaminated and sterilized		
9.	Operating room is always cleaned and prepared before procedures		
	Intra-operative Period		

10.	Disposable non-woven sterile or re-usable sterile woven drapes and surgical gowns are used		
11.	Skin is prepared using chlorhexidine gluconate for skin preparation		
12.	Blood glucose control is ensured during the procedures		
13.	Asepsis is maintained at all levels in the operating room		
14.	Tricosan-coated sutures are used are used in the surgery		
15	Wound protector devices are used in clean-contaminated, contaminated, and dirty abdominal procedures		
16.	Oxygen is administered at 80% fraction of inspired oxygen		
Post-Operative Period			
17.	Wound cleansing, dressing, and care is done based on the nature of the wound		
18.	Advanced dressings of any sort are not used in wound dressing		
19.	Antibiotics prophylaxis is not carried on to the postoperative period		
20.	Oxygen is administered at 80% fraction of inspired oxygen		

THANK YOU!!!!!!!!

Appendix V: WHO guidelines on SSI prevention



INFECTION PREVENTION AND CONTROL (IPC) TEAM

INTRAOPERATIVE PERIOD

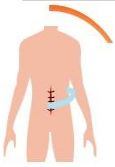
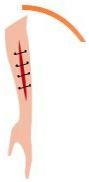
SURGICAL TEAM ACTIONS

	ACTION	SUPPORTED BY
Do NOT use laminar airflow ventilation systems *(not beneficial for patients undergoing total arthroplasty surgery)*	SURGICAL TEAM	PROCUREMENT/ESTATES AND MAINTENANCE STAFF
Use either disposable sterile non-woven or reusable sterile woven drapes and surgical gowns	SURGICAL TEAM	PROCUREMENT/ STERILIZATION UNIT
Do NOT use plastic adhesive incise drapes *(neither those with nor those without antimicrobial properties)*	SURGICAL TEAM	PROCUREMENT
Use alcohol-based solution containing chlorhexidine gluconate for skin preparation	SURGICAL TEAM	PHARMACY/ PROCUREMENT
Do NOT use antimicrobial sealants after surgical site skin preparation	SURGICAL TEAM	PROCUREMENT
Administer 80% fraction of inspired oxygen (FiO_2) *(in adults undergoing general anaesthesia with endotracheal intubation)*	SURGICAL TEAM	ESTATES AND MAINTENANCE STAFF
Consider using a warming device	SURGICAL TEAM	PROCUREMENT
Consider using a protocol for intensive blood glucose control *(for both diabetic and non-diabetic adult patients)*	SURGICAL TEAM	CLINICAL STAFF

INFECTION PREVENTION AND CONTROL (IPC) TEAM

INTRAOPERATIVE PERIOD

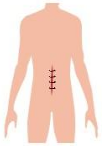
SURGICAL TEAM ACTIONS

	ACTION	SUPPORTED BY
 **Consider using goal-directed therapy**	SURGICAL TEAM	PROCUREMENT
 **Consider irrigating incisional wound with an aqueous povidone iodine solution before closure** *(in clean and clean-contaminated wounds)*	SURGICAL TEAM	PROCUREMENT
 **Do NOT perform antibiotic wound irrigation**	SURGICAL TEAM	PROCUREMENT
 **Consider using wound protector devices** *(in clean-contaminated, contaminated and dirty abdominal procedures)*	SURGICAL TEAM	PROCUREMENT
 Consider prophylactic negative pressure wound therapy *(primarily in closed surgical incisions in high-risk wounds)*	SURGICAL TEAM	PROCUREMENT
 **Consider using triclosan-coated sutures**	SURGICAL TEAM	PROCUREMENT
 **Maintain asepsis and discipline in the operating room**	SURGICAL TEAM	CLINICAL STAFF

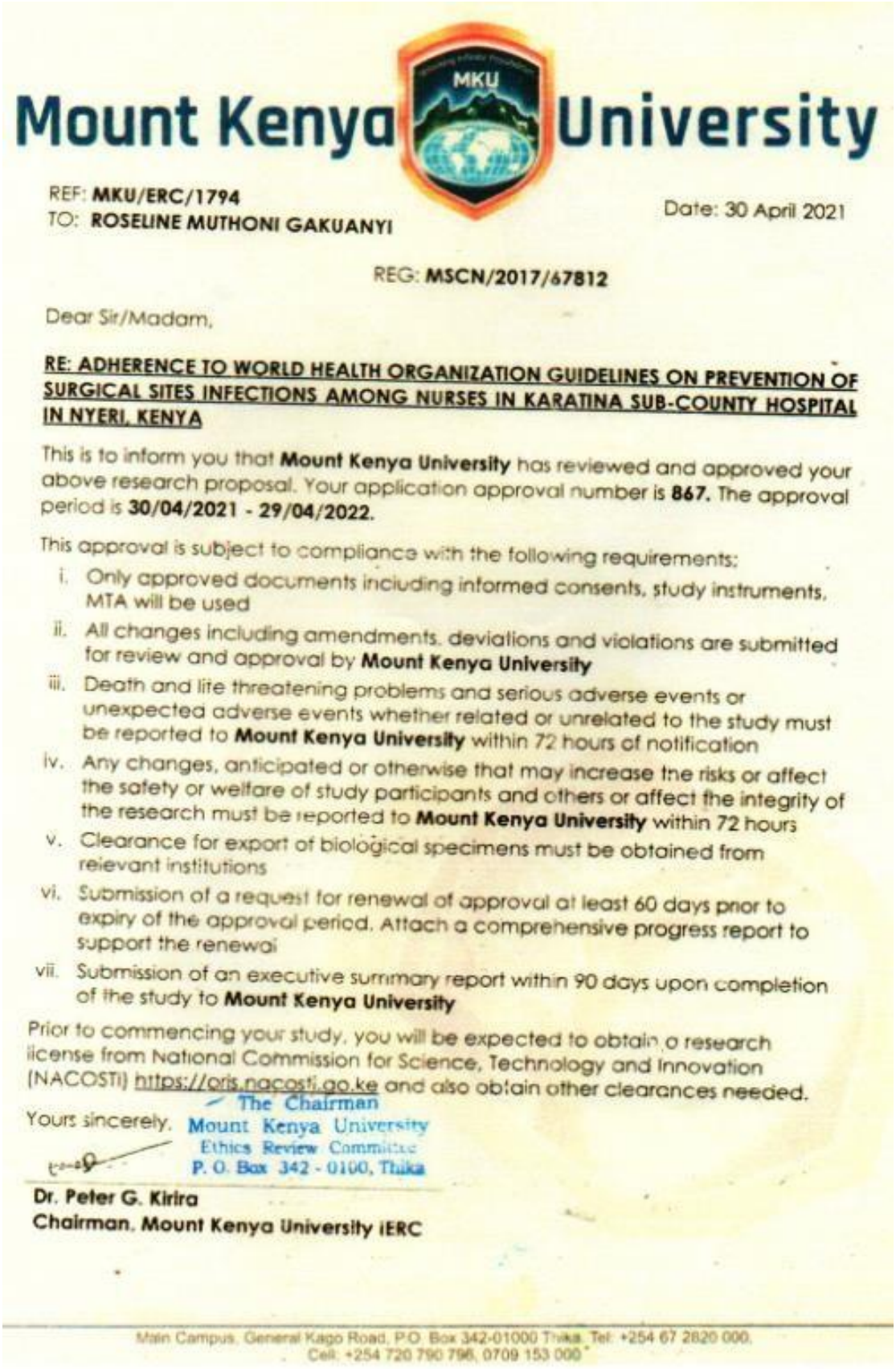
INFECTION PREVENTION AND CONTROL (IPC) TEAM

POSTOPERATIVE PERIOD

SURGICAL TEAM, CLINICAL STAFF ACTIONS

	ACTION	SUPPORTED BY
 Do NOT prolong surgical antibiotic prophylaxis in the postoperative period	 CLINICAL STAFF	 SURGEON PHARMACY AND POLICY (STOPPING DELIVERY)
 Do NOT continue surgical antibiotic prophylaxis due to the presence of a drain Remove wound drain when clinically indicated	 SURGICAL TEAM AND CLINICAL STAFF	 ANTIBIOTIC POLICY IN PLACE
 Administer 80% FiO_2 for 2–6 hours post-op	 WARD NURSE	 DOCTOR PRESCRIPTION (AND PROTOCOL IN PLACE), ESTATES/MAINTENANCE STAFF
 Evaluate and manage wound appropriately, including cleansing, dressing and care, according to the given wound situation	 CLINICAL STAFF	 DOCTOR REVIEW
 Do NOT use advanced dressings of any sort *(use standard dressings instead)*	 WARD NURSE	 PROCUREMENT AND SURGICAL TEAM

Appendix VI: ERC Letter



Mount Kenya University

REF: **MKU/ERC/1794**
TO: **ROSELINE MUTHONI GAKUANYI**

Date: 30 April 2021

REG: **MSCN/2017/67812**

Dear Sir/Madam,

RE: ADHERENCE TO WORLD HEALTH ORGANIZATION GUIDELINES ON PREVENTION OF SURGICAL SITES INFECTIONS AMONG NURSES IN KARATINA SUB-COUNTY HOSPITAL IN NYERI, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **867.** The approval period is **30/04/2021 - 29/04/2022.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Peter G. Kirira
Chairman, Mount Kenya University IERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika. Tel: +254 67 2820 000,
Cell: +254 720 790 796, 0709 153 000

Appendix VII: NACOSTI Authorization

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **769380**

Date of Issue: **27/May/2021**

RESEARCH LICENSE

This is to Certify that Ms.. Roseline Muthoni Gakuanyi of Mount Kenya University, has been licensed to conduct research in Nyeri on the topic: ADHERANCE TO WHO GUIDELINES ON PREVENTION OF SURGICAL SITES INFECTIONS AMONG NURSES IN KARATINA HOSPITAL NYERI COUNTY KENYA for the period ending : 27/May/2022.

License No: **NACOSTI/P/21/10705**

769380

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY &
INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document,
Scan the QR Code using QR scanner application.

Appendix VIII: Hospital Authorization

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NYERI
DEPARTMENT OF HEALTH SERVICES
OFFICE OF THE DIRECTOR

Email: nyericountyhealth@yahoo.com

COUNTY COMMISSIONER'S HQ
BLOCK 'A'
P.O. Box 110 - 10100

REF: CGN/HEALTH/HRM/5/VOL.II **Date: 10th June 2021**

The Hospital Director
Karatina Sub County Hospital
NYERI

RE: RESEARCH AUTHORIZATION

The bearer of this letter, **Roseline M. Gakuanyi** is a student at Mt. Kenya University.

She is hence introduced to undertake a research entitled "**Adherence to World Health Organisation guidelines on prevention of surgical site infections among nurses working in Karatina Sub County Hospital**".

Kindly accord her the necessary assistance.

The student **must** deposit a copy of the final report with the department following completion of the study.

Dr. Oscar Agono
For: Director of Health Services
NYERI COUNTY

Appendix IX: County Government

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NYERI

DEPARTMENT OF HEALTH SERVICES

karatinadhospital@yahoo.com

HOSPITAL DIRECTOR
KARATINA HOSPITAL
P.O. Box 133-10101
KARATINA

REF: P/NO. 2009093165 DATE: 11th June, 2021

Roselyne M. Gakuanyi
Nursing Officer I
P/NO. 2009093165

RE: RESEARCH AUTHORIZATION
Adherence to World Health organization guidelines on prevention of Surgical site infections among Nurses working in Karatina Sub County Hospital.

This is to inform you that you have been allowed to collect data in this facility.

You must deposit a copy of the final report with the department following completion of study.

KARATINA HOSPITAL-NYERI COUNTY
HOSPITAL DIRECTOR
P. O. Box 133-10101,
KARATINA

K. M. KIBAARA
HOSPITAL DIRECTOR
KARATINA SUB COUNTY HOSPITAL

Appendix X: Ministry of Education

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING & BASIC EDUCATION

Telegrams,:Schooling", Nyeri
Telephone: (061) 2030518, 2030540
Fax: 0612030535
When replying please quote

Sub-County Education Office,
Mathira East ,
P. O. Box 1613,
KARATINA
Email:Mathiraeastdiste@yahoo.com

REF: MED/ED/15/GENERAL/VOL 111/65

14th June, 2021

TO WHOM IT MAY CONCERN

RE: PERMIT TO COLLECT DATA : ROSELINE GAKUNYI -MT KENYA UNIVERSITY

The above named person is under taking a course at Mt Kenya University and had been authorized to collect data for her research on "Adherence to (WHO) Guidance on prevention of surgical sites infection among Nurses working in Karatina Sub-county Hospital, Nyeri County.

For: SUB-COUNTY DIRECTOR OF EDUCATION
MATHIRA EAST

Lucy K. Mbae
Sub-County Director of Education
Mathira East

Appendix XI: Work Plan

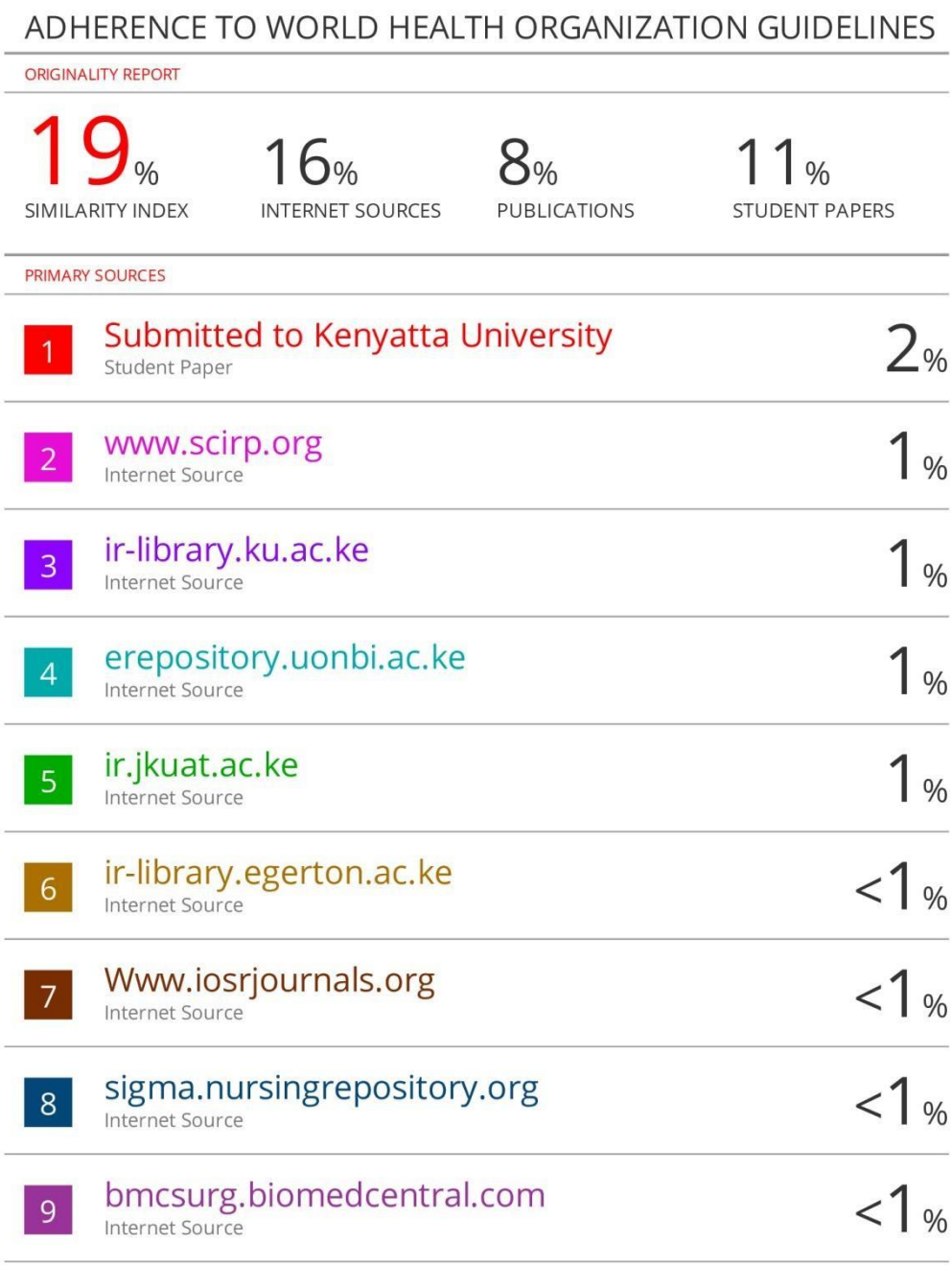
2020-2021	JAN 2020	FEB	NOV	DEC	JAN 2021	JUNE 2021	JULY 2021	NOV 2021
Research topic development								
Review of Literature								
Proposal presentation								
Pretesting of research instrument								
Data collection								
Data analysis								
Thesis presentation								

Appendix XII: Budget

Item/activity	Expenditure
Stationery	4,000
Typing and editing Services	17,000
Data Bundles/Internet	9,000
Printing services	15,000
Photocopying and Binding	20,000
Data analysis	35,000
Manuscript preparation and publication	30, 000
Miscellaneous	10,000
Total	140,000

Appendix XIII: Study area map

Appendix XIV: Similarity Index



ADHERENCE TO WORLD HEALTH ORGANIZATION GUIDELINES

ORIGINALITY REPORT

19%	16%	8%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Kenyatta University Student Paper	2%
2	www.scirp.org Internet Source	1%
3	ir-library.ku.ac.ke Internet Source	1%
4	erepository.uonbi.ac.ke Internet Source	1%
5	ir.jkuat.ac.ke Internet Source	1%
6	ir-library.egerton.ac.ke Internet Source	<1%
7	Www.iosrjournals.org Internet Source	<1%
8	sigma.nursingrepository.org Internet Source	<1%
9	bmcsurg.biomedcentral.com Internet Source	<1%