



UNIVERSITY *of*
RWANDA

**NURSING PRACTICE REGARDING PREVENTION OF HOSPITAL ACQUIRED
INFECTIONS IN INTENSIVE CARE UNITS AT UNIVERSITY TEACHING
HOSPITALS, RWANDA.**

By

Odette MUKANTWARI

College of Medicine and Health Sciences

School of Nursing and Midwifery

Master of Critical Care and Trauma Nursing

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the degree of
MASTER OF CRITICAL CARE AND TRAUMA NURSING

In the College of Medicine and Health Sciences

Supervisor: Prof Busisiwe BHENGU

Co-Supervisor: Mrs. Emeline UMUTONI CISHAHAYO

September, 2019

DECLARATION

I do hereby declare that this dissertation submitted in partial fulfillment of the requirements for the degree of Master of Science in Nursing: Critical care and Trauma at UR-College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere.

In addition, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Odette MUKANTWARI

Signed.....

Date.....

DEDICATION

I dedicate this research to the almighty God, my beloved parent and family, my friends and fellow classmates for their kind collaboration to handle and accomplish this work.

ACKNOWLEDGEMENTS

I offer our great thanks to the Almighty God who granted me courage, blessings and strength for this study.

I would like also to thank the Government of Rwanda through the Ministry of Health for offering the program of post-graduate nursing.

I deeply address my sincere thanks to my supervisor Prof Busisiwe BHENGU and co-supervisor Emeline UMUTONI CISHAHAYO for their guidance, commitment, time and constructive advice throughout this work,

My great thanks go to my School for their moral support and advices.

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ABSTRACT

Background: Hospital acquired infections (HAIs) is a major safety concern for both health care providers and the patients. It is a major cause of mortality and morbidity and provides challenge to clinicians. However; the measures of infection control including identifying patients at risk of nosocomial infections, observing hand hygiene, following standard precautions have been identified.

Objectives: The aim of this study was to assess the nursing practices in prevention of hospital acquired infections while also evaluating various factors affecting those practices to minimize hospital acquired infections in intensive care unit at University Teaching Hospitals in Rwanda

Methodology: Quantitative non-experimental approach was used in this study. The study population was made of 93 nurses working in adult or pediatric Intensive Care Units (ICUs) at three hospitals namely Kigali University Teaching Hospital, King Faisal Hospital and Butare University Teaching Hospital.

A census sampling strategy was used for data collection. To achieve the study's objectives, the Infection Control Assessment Tool, a Standardized Approach for Improving Hospital Infection Control Practices was used as data collection tool. The tools were simplified and adapted to this study. The SPSS 21 was used to capture and analyze the data. Both descriptive and inferential statistics were applied to assess the associations among various variables.

Results: Participants in this study were mainly young (mean age of 33 ± 3.8 years) and 61 (65,6%) of them were females. Most of them were married [63 (67.7%)], 2 (2.2%) cohabitant and 28 (30.1%) were single. Most of the participants [65.6%] had advanced diploma in nursing while holders of bachelor and master's degree were 31 (33.3%) and 1 (1.1%) respectively.

In regression analysis, participants who had training on infection control had 4.1 times high score in the observed nursing practices compared to those who did not attend the training (OR=4.1, 95%CI=1.55-11.2 and $p=0.004$). Participants with experience of working in ICU of at least 6 years had 2.8 times high scores in nursing practice compared to those with less experience. The level of education was not associated with the observed nursing practice (OR=1.3, 95%CI=0.-53-3.3, $p=0.537$). Male participants had 3.4 times of scoring high in observed nursing practice than female participants (OR=3.4, 95% CI= 1.2-9.5 and $p=0.018$).

Nurses with age greater than 35 years had 3.6 times odds of scoring high in nursing practice compared to those with 35 years and less (OR=3.6, 95% CI=0.9-13.5, $p=0.054$).

Conclusion: Training on infection control, work experience, age and male gender were associated with convenient nursing practice for infection control. The level of education is unlikely to influence this practices.

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LIST OF SYMBOLS AND ACRONYMS/ABBREVIATIONS

BUTH: Butare University Teaching Hospital

CHUK: Centre Hospitalier Universtaire de Kigali

CMHS: College of Medicine and Health Sciences

CI: Confidence Interval

CVP: Central Venous Pressure

ECDC: European Center for Diseases Prevention and Control

HAI: Hospital Acquired Infection

HIV: Human Immunodeficiency Virus

IABP: Intra-Aortic Balloon Pump

IBM: SPSS Current versions (2015) of SPSS

IBM: International Business Machines Corporation

IV: Intravenous

IRB: Institutional Review Board

ICU: Intensive Care Unit

KUTH: Kigali University Teaching Hospital

KFH: King Faisal Hospital

OR: Odds Ratio

LMIC: Low and Middle Income Countries

PICU: Pediatric Intensive Care Unit

SFD: Saudi Fund for Development

SD: Standard Deviation

SFD: Saudi Fund for Development

SMS: Short Message Service

SPSS: Statistical Package for Social Sciences

UR: University of Rwanda

UTI: Urinary Tract Infection

VAP: Ventilator associated pneumonia

WHO: World Health Organization

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CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

1.2. BACKGROUND TO THE STUDY

Hospital acquired infections (HAIs) are the infections that occur at least 48 hours after patients' admission, the infections that were neither present during patient's admission nor in incubation period. Hospital acquired infections are critical issues for the safety of patients, healthcare providers and healthcare systems in general (Lukas et al., 2016,p.7).

The hospital acquired infections or healthcare associated infections occur in patients under medical care. These infections occur worldwide both in developed and developing countries. The research has reported that nosocomial infections account for 7% in developed and 10% in developing countries. These infections occur during hospital stay in ICU.They increase mortality, hospital stay, disability, and economic burden (Afroz H. et al., 2017, p. 359).

The common risk factors for hospital acquired infections include central line insertion, catheter associated urinary tract infections, surgical site infections and ventilator-associated pneumonia (Afroz H. et al., 2017,p.361).The study done in Europe has estimated that 4.1 million people are affected by HAIs every year. This results in at least 37,000 deaths and an annual economic impact of 7 billion according to the European Centre for Disease Prevention and Control (ECDC).

The ECDC estimates that implementing hygiene and infection control programmes could prevent 20-30% (WHO, 2016,p.66) .Another study done in Bangladeshreported that the hospital acquired infections Eastern Mediterranean and South East Asia Regions are 11.8% and 10.0% respectively(Shahida et al., 2016,p.30-31).In another study from Uganda, The most commonly isolated organisms were Acinetobacter species (37.5%), Klebsiella pneumonia (35.3%), Pseudomonas aeruginosa (14.7%), Staphylococcus aureus (5.9%) and Enterobacter species (5.9%) (Namutebi and Kwizera, 2015, p. 1)

For Rwanda, in Rwanda Military Hospital, 18 patients were admitted in ICU from 1st May-1st June 2016. Records in the ICU show that 14 of these patients were mechanically ventilated and 1 case (5%) of Klebsiella was diagnosed. Another 1 (5%) case showed a sign of VAP through a new infiltrate on chest X-ray (Rwanda Military Hospital ICU report book, 2016). Such hospital acquired infections were observed to be even higher at the University Teaching Hospital in Kigali where a surveillance to monitor hospital-acquired infections reported 50.0% hospital acquired infections in ICU and 23.1% in Neonatology (Lukas et al., 2016,p.6).

The common causes are the bacteria, viruses, fungi and parasites. According to WHO, the hospital acquired infections are estimated to approximately 15% of all hospitalized patients. During hospitalization, a patient is exposed to pathogens through different sources in the environment, healthcare staff, and other infected patients. Transmission of these infections should be restricted for prevention. Hospital waste serves as potential source of pathogens and about 20%–25% of hospital waste is termed as hazardous (Afroz H. et al., 2017,p.360).

Nosocomial infections can be controlled by practicing infection control programs, keep check on antimicrobial use and its resistance and adopting antibiotics control policy. Efficient surveillance system can play its part at national and international level. Efforts are required by all stakeholders to prevent and control nosocomial infections (Hassan et al 2017, p.120).

Nosocomial infections affect a huge number of patients globally, elevating mortality rate and financial losses significantly (Fatima et al 2017, p.34).

These infections are responsible for 4%–56% of all death causes in neonates, with incidence rate of 75% in South-East Asia and Sub-Saharan Africa. The incidence in high income countries is between 3.5% and 12% whereas it varies between 5.7% and 19.1% in middle and low income countries. The frequency of overall infections in low income countries is three times higher than in high income countries whereas this incidence is 3–20 times higher in neonates (Fatima et al 2017,p.48).

1.3. PROBLEM STATEMENT

Hospital-acquired infection affects hundreds of millions of people worldwide; it is a major global issue for patient safety (Abera et al., 2017.p.111).

Hospitals are the potential source of the risk of acquiring an infection during the healthcare delivery. Hospital-acquired infections (HAIs) are associated with increased attributable mortality, length of stay in the hospital, and healthcare costs incurred by patients and healthcare facilities (Afroz H et al., 2017.p65).

The common hospital acquired infections are the urinary tract infections, VAP, pneumonia, sepsis, meningitis, and gastro-intestinal infections. The factors that are reported to be likely to trigger the hospital acquired infections are poor hand washing, non-respect of sterility while caring for the ICU patients (urinary catheterizations, central line insertion, airways devices, unsterile airways manipulations... (Shahida et al., 2016.p,30).

Furthermore, the hospital acquired infection in ICU are the causes of prolonged hospital stays, the increased out of pocket disbursements, poverty, loss of wages and disability. When the patient is admitted in ICU, family members are overstressed, this increase later if the patient develop the hospital acquired infection because this increases the likelihood of dying (Shahida et al., 2016.p,32).

Even though much has been done to improve the health care delivery in Rwanda, still there is high prevalence of hospital acquired infections. A study done in Rwanda found that the prevalence of hospital acquired infection is highest in intensive care unit at a rate of 50.0% of admitted patients, with overall 15.1% of hospitalized patients (Lukas et al., 2016.p,7). So as nurses are the pillar of health care professions, the present study, identified the nursing role in preventive measures of hospital acquired infections. However there is limited data regarding nursing practice about prevention of hospital acquired infections in intensive care units. Therefore the present study will identify the nursing practice of preventive measures of hospital acquired infections at university teaching hospitals, Rwanda. This study is anticipated to inform the administrative authorities to set programs to improve the application of prevention of hospital acquired infections, particularly in ICU.

1.4. AIM OF THE RESEARCH

To assess the nursing practice regarding prevention of hospital acquired infections in intensive care units at University Teaching Hospitals, Rwanda.

1.5. RESEARCH OBJECTIVES

1. To assess the nursing practice regarding prevention of hospital acquired infections in intensive care units at University Teaching Hospitals, Rwanda.
2. To identify the factors affecting the nursing practice of preventive measures of hospital acquired infections in intensive care units at University Teaching Hospitals, Rwanda.

1.6. RESEARCH QUESTIONS

1. What is nursing practice regarding prevention of hospital acquired infections in intensive care units at University Teaching Hospitals, Rwanda?
2. What are the factors affecting the nursing practice of preventive measures of hospital acquired infections in intensive care units at University Teaching Hospitals, Rwanda?

1.7. SIGNIFICANCE OF THE STUDY

This study has three major areas of significance:

Nursing research: This study will identify the nursing practice of preventive measures of hospital acquired infections in ICU at university teaching hospitals, Rwanda. This will contribute to the nursing knowledge as well as triggering of further research, such as testing some of the identified preventive measures..

Nursing practice: The results of this study will inform national healthcare policy makers and, University Teaching Hospitals' administration in particular, to recognize gaps in nursing practice of preventive measures of hospital acquired infections in intensive care units, hence providing reasons to develop appropriate measures to enhance the nursing practice of preventive measures of hospital acquired infections. This study also will increase the awareness and practice of all other ICU team about prevention of hospital acquired infections.

Nursing education: The results of the study will be an additional source of information to the available literature on this subject as well as contribution to nursing education. It will inform curriculum updates and perhaps assist in motivation for a programme in specialization in infection prevention and control.

1.8. DEFINITION OF KEY TERMS

Hospital acquired infections: The hospital acquired infections (HAIs) are the infections that occur at least 48 hours after patients admission, the infections that were neither present during patient's admission nor in incubation period (Who, 2016) in this study HAIs refers to infections that were not present in the patient at the admission time, and get acquired in the hospital after admission.

Intensive care unit: Also called **critical care unit**, is a hospital facility for care of critically ill patients at a more intensive level than is needed by other patients. Staffed by specialized personnel, the intensive care unit contains a complex assortment of monitors and life-support equipment that can sustain life in once-fatal situations (WHO, 2016). In this study it should be understood as a special unit in a hospital, where critically ill patients or highly dependent patients who require close monitoring can be cared for by well qualified and specially trained staff working under the best possible conditions.

Nursing practice: According to WHO (2016) is underpinned by values that guide the way in which nursing care is provided. The Nursing and Midwifery Board of Ireland considers that the following values should underpin nursing practice and provide the basis for the formulation of a philosophy of nursing: According to this study nursing practice are those nursing activities aimed to prevent HAIs

Preventive measures (health): consist of measures taken for diseaseprevention. ... Health, disease, and disability are dynamic processes which begin before individuals realize they are affected (WHO, 2016). In this study, preventive measures are all plans, activities and decisions taken to prevent hospital acquired infections in the ICU.

Teaching hospital: A hospital that is affiliated to a medical school, in which medical students receive practical training (WHO, 2016). In this study, teaching hospitals are all hospitals that are

considered to be affiliated to medical school but also that can receive a referred patient from a secondary level, those ones in a Rwandan health care system are at tertiary level.

1.9. STRUCTURE/ORGANIZATION OF THE STUDY

This study is organized into two main parts, namely preliminary pages of title page, declaration, dedication, acknowledgements, abstract, table of contents, list of symbols and acronyms/ abbreviations, list of tables, list of figures and graphs and list of annexes. The second part is the main body made of six chapters(including introduction, literature review, research methodology, results, discussion, conclusions and recommendations).Chapter one includes the introduction, background, problem statement, aims of the study, research questions, significance of the study, definition of concepts, structure/organization of the study and conclusion to chapter one.

Chapter two is the literature review that is made of theoretical literature, empirical literature, critical review, research gap identification and conceptual framework. Chapter three is the methodology that includes, research design, research approach, research setting, population, sampling, data collection data analysis methods, ethical considerations, data management, data dissemination, limitations and challenges to study and conclusion to chapter three. Chapter four presents the results of the study in the form of tables and narratives. Chapter five comprises of the discussion and conclusions of the study including recommendations and limitations of the study. In addition to the two main parts, this study document includes references and appendices at the end.

1.10. CONCLUSION OF CHAPTER ONE

Chapter one has presented the background, problem statement, purpose of the study, research objectives and questions, definitions and significance of the study. The next chapter will present the literature.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

Chapter two presents the existing literature about hospital acquired infections and their preventive measures that are applied to decrease hospital acquired infections. It is made of theoretical and empirical literature review. In addition to that, this chapter contains the critical review and research gap identification, theories on hospital acquired infections, conceptual framework and conclusion to chapter two.

2.2 THEORITICAL LITERATURE

2.2.1. HOSPITAL ACQUIRED INFECTIONS

Hospital acquired infections (HAIs) are the infections that occur at least 48 hours after patients' admission, the infections that were neither present during patient's admission nor in incubation period. Hospital acquired infections are critical issues for the safety of patients, healthcare providers and healthcare systems in general (Lukas et al., 2016.p,3).

The consequences of HAIs are well documented and include increased patient morbidity and/or mortality; risk of disease among healthcare workers; and significant financial burden to patients, their families and health care facilities and the sources are these infections(Lukas et al., 2016.p,5).

Infectious diseases are caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another. Zoonotic diseases are infectious diseases of animals that can cause disease when transmitted to humans. So those pathogens to be called Hospital acquired is when a patient was admitted without that germ and 48 hours after, there are some symptoms,. They may be transmitted from one patient to another by poor nursing care (Who, 2019.p, 59).

Nosocomial infection is contracted because of an infection or toxin that exists in a certain location, such as a hospital. People now use nosocomial infections interchangeably with the

terms health-care associated infections (HAIs) and hospital-acquired infections. For a HAI, the infection must not be present before someone has been under medical care(WHO, 2002,p,34)

2.2.2. Epidemiology of hospital acquired infections

A study done by Swartz (1994) has reported that about 5% of patients admitted to acute-care hospitals acquire an infection.

Research done by Spelman, has found that between 5% and 10% of patients admitted in intensive care unit acquire infections (Spelman, 2002,p.77). About 6% of patients acquire an infection in hospital, and the incidence of hospital-acquired infections may be increasing. In addition, as home administration of intravenous medications becomes increasingly common, cannula associated infections once confined to hospital patients, may present in the community. (Spelman, 2002, ``p.77-78).

A study done in USA has reported that the hospital acquired infection is the eighth leading cause of death in intensive care unit. The most common hospital acquired infection is the blood stream infection such as severe sepsis and septic shock occupying 10% of all hospital acquired infections. The next common hospital acquired infection is ventilator associated pneumonia(VAP), representing 5% of hospital acquired infections(Spelman, 2002,p.98).

The prevalence of health care associated infection has been estimated to be two to twenty times higher in developing countries than that of resource rich countries with the percentage of infected patients exceeding 25% (Shahida et al., 2016,p 22). The highest frequencies of HAIs reported from hospitals in the Eastern Mediterranean and South East Asia Regions are 11.8% and 10.0% respectively.

Accurate data on HAIs are not available due to limited record keeping and follow-up of patients in large urban hospitals in LMICs. Hospital acquired infection rates in Bangladesh may exceed 30% in some hospitals (Shahida et al., 2016,p 65).

2.2.3. Common hospital acquired infections

The most frequent hospital acquired infections are urinary tract infections (UTIs), surgical site infections, gastroenteritis, meningitis and ventilator associated pneumonia. These infections can spread through blood stream causing sepsis, severe sepsis. The progression of hospital acquired infections in intensive care unit may be severe systemic infections as well as severe sepsis and septic shock. If aggressive management fails, multiple organ failure ensues(KATHRYN L et al., 2014,p,78).

Other hospital acquired infections are from fungal and viral germs that spread mainly through person-to-person contact by uncleaned hands, and medical instruments such as catheters, respiratory machines, and other hospital tools.

Those infections are also associated with excessive and improper use of antibiotics leading to killing of normal flora by broad spectrum antibiotics resulting in fungal and viral infections (KATHRYN L et al., 2014.p,66).

2.2.4. Common causes of hospital acquired infections

A study done by Spelman (2002) has found that the common causes of hospital-acquired infections are microorganisms, including: bacteria, fungi, viruses.

Those microorganisms are introduced in the body by passing through different hospital procedures, namely, urinary bladder catheterization, respiratory procedures, and surgery and wound care. Airway procedures like tracheal intubations, mechanical ventilations, airway suctioning, intravenous procedures, such as, central and peripheral lines placement and care are also implicated(Lukas et al., 2016.p,51).

Most common pathogens that are commonly found after cultures are *Acinetobacter baumannii*, *Bacteroides fragilis*, *Burkholderia cepacia*, *Clostridium difficile*, *Clostridium sordellii*, Carbapenem-resistant Enterobacteriaceae, *Enterococcus faecalis*, *Escherichia Coli*, Methicillin-Resistant *Staphylococcus Aureus*, antibiotic-resistant gram- negative bacilli and, more recently, vancomycin resistant enterococci (Spelman, 2002,p 40).

2.2.5. Risk factors of hospital acquired infections

Patient related factors

Many patient related factors have been reported to contribute to HAI; these are extreme ages of patients and immunosuppressive diseases (HIV, Diabetes). A study done by Swartz, (1994) found that a patient's age contributes to the occurrence of infections. The latter are reported to be common in pediatric and elderly cases. The nutritional status of a patient also contributes and the more the germ is more resistant also contribute.

2.2.6. Signs and symptoms of hospital acquired infections

Hospital acquired infections occur up to 48 hours after hospital admission, up to 3 days after discharge, up to 30 days after an operation in a healthcare facility when someone was admitted for reasons other than the infection (Afroz H.et al .,2017,p. 23).

In addition to the presence of systemic signs and symptoms of infection (e.g. fever, tachycardia, tachypnea, skin rash, general malaise), the source of healthcare-associated infections may be suggested by the instrumentation used in various procedures (Afroz H.et al .,2017,p.23-25). For example, an endotracheal tube may be associated with sinusitis, tracheitis, and pneumonia; an intravascular catheter may be the source of phlebitis or line infection; and a Foley's catheter may be associated with a urinary tract infection (Behnke et al., 2017,p.89)

A study done by many researchers reported that acquired pneumonia patients may present with fever, cough, purulent sputum and abnormal chest auscultation findings such as decreased breath sounds, crackles or wheezes (Yallew, Kumie and Yehuala, 2017,p.70).

Patients with urinary tract infection may present with or without fever, for patients with cystitis, can have suprapubic tenderness while those with pyelonephritis can have costovertebral tenderness. Upon inspection, their urine can be cloudy and foul-smelling (Yallew, Kumie and Yehuala, 2017,p.6-7).

Neonates on the other hand usually do not present with any of the above findings and may have very subtle and nonspecific signs of infection. Fever may or may not be present. Signs of infection can include temperature and/or blood pressure instability, apnea, bradycardia, lethargy, fussiness, and feeding intolerance and refusal (Yallew, Kumie and Yehuala, 2017,p.10).

2.2.6. Consequences of hospital acquired infections

The hospital acquired infection is a challenge to public health worldwide. A study done by Wenzel et al.,(2001,p.17) has found that hospital acquired infections are common, particularly in ICU. Lukas et al., (2016) in his study reported that the hospital acquired infections are found in 50% of ICU patients, and this has contributed to long hospital stay, increased mortality, morbidity and increased out of pocket dispenses of patient's families.

Hospital acquired infections are reported to be associated with the increased mortality and morbidity in the intensive care unit. A study done by Spelman, (2002) has found that the hospital acquired infections has led to 15% of ICU death. This puts the hospital acquired infections at the eighth leading cause of death worldwide.

Research done in Europe from the European Center for Disease Prevention and Control (ECDC.2017), on hospital acquired infections, said that every year, 3.5 million Europeans got an infection while in hospital and 2.5 million die or are seriously debilitated (Behnke et al., 2017.p.25). Hospital acquired infections account for a significant proportion of deaths in Europe each year, and it represents the largest effect on the European population's health," says co-author Alessandro Cassini from the ECDC (Behnke et al., 2017,p.856).

The scientists searched specifically on hospital-acquired pneumonia, urinary tract infections, infections acquired during post-operative procedure, neonatal sepsis (an infection that affects newborn infants) and septicemia. Due to this developed a method to assess the effect of hospital acquired infections beyond the usual measures (Behnke et al., 2017,p.857).

2.3. EMPIRICAL LITERATURE

This section of the empirical literature is emphasizing on evidence based findings related to the variables of this study. Research studies on nursing practice regarding hospital acquired infections in ICU.

2.3.1. Factors related to health care providers

The use of invasive medical devices was found to be associated with hospital acquired infections; the risk is highly increased when sterility/aseptic principles are not strictly respected. A study done by Lukas et al., (2016,p.30) has reported that the hospital acquired infections increased up to 50% in ICU because of frequent use of invasive procedures.

Hand washing was reported to be very crucial in infection control. Lukas et al., (2016) reported that compliance with hand washing modality was associated with decreased hospital acquired infections in intensive care unit. A study was conducted in Brazil by Santos and Celina (2015, p. c) on “adherence to the five moments for hand hygiene among intensive care providers”. In this study, it was observed that healthcare providers’ adherence rate to hand hygiene was 43.7%, which is considered as low. Nurses had the most worrisome and lowest adherence to hand hygiene (29%) and yet nurses have more frequent and direct contact with patients.

The lowest percentages of adherence to hand washing were observed during the moments before touching the patient and before aseptic procedures. These findings show that hand washing practices in the unit is the most fragile point. To verify adherence to hand hygiene techniques, hand hygiene inspection is essential (Santos and Celina, 2015,p.70).

Other main factors that contributed to hospital acquired infections is the frequent use of antimicrobial drugs capable of selecting a resistant microbial flora (Swartz, 1994,p.65).

2.3.2. Hospital related factors

The hospital related factors that increase the risks to hospital acquired infections is the ICU layout .The rooms should be well ventilated with appropriate windows, but also the location should promote the healing environment (Thompson et al., 2012). The critical care unit consists of four major zones, each housing a primary function or set of interrelated functions.

- 1) The Patient Care Zone consists of patient rooms and adjacent areas; its primary function is direct patient care.
- 2) The Clinical Support Zone consists of functions closely related to direct patient care; not only inpatient rooms but also in other areas of the unit.
- 3) The Unit Support Zone refers to areas of the unit where administrative, materials management, and staff support functions occur.
- 4) The Family Support Zone refers to areas designed to support families. The Patient Care Zone refers to areas where direct patient care is provided – patient rooms and the immediately adjacent areas. Designers must consider the needs of patients and visitors, and direct care performed by staff. As critical care has evolved to integrate families into daily patient care, family needs and care functions must be incorporated into ICU design(Thompson et al., 2012,p.1588).

2.3.3.. Preventive measures of hospital acquired infections

Many measures have been identified to prevent and control hospital acquired infections. Those measures include surveillance as the first and effective measure in control and prevention of hospital-acquired infections (Spelman, 2002,p.128).

As most of the time, HAIs are transmitted via hands of healthcare workers, hand washing remains the most important means to prevent infection (Shahida et al., 2016,p.30-31). In 2006, World Health Organization (WHO) publications have emphasized on hand hygiene as a key measure to reduce hospital acquired infection (WHO, 2016). The lowest percentages of adherence to hand washing were observed during the moments before touching the patient and before aseptic procedures. These findings show that hand washing practices in the unit is the most fragile point. To verify adherence to hand hygiene techniques, hand hygiene inspection is essential, according to the study conducted in Brazil by Santos and Celina (2015,p.30).

Strategies to prevent both development of antibiotic resistance and spread of resistant organisms are necessary. This should include the selective use of antimicrobials after culture and antibiogram and timely hand washing, including aseptic techniques while caring for patients, minimizing the hospital stays, minimal use and early removal/ change of invasive devices, adequate staffing and an active infection control programs (Spelman, 2002,p.134-135).

A study done by Mehta et al. (2014) has found that preventive measures of infection control include identifying patients at risk of hospital acquired infections, observing hand hygiene, following standard precautions to reduce transmission and strategies to reduce ventilator associated pneumonia (Mehta et al., 2014,p.146-147).

The use of invasive procedures like central lines, tracheal intubations, urinary catheterizations, injections, invasive monitoring and devices (CVP, IABP...) should be limited or used with extreme caution (Lukas et al., 2016,p.7).

Environmental factors and architectural lay out by planning the Patient Care Zone refers to areas where direct patient care is provided, patient rooms and the immediately adjacent areas. Designers must consider the needs of patients and visitors, and direct care performed by staff. As critical care has evolved to integrate families into daily patient care, family needs and care functions must be incorporated into ICU design. Design also needs to be emphasized when planning for prevention of hospital acquired infections in ICU (Mehta et al., 2014,p.140). For example, one way traffic of waste and linen, ventilation and avoiding overcrowding..

Antibiotic prophylaxis must be used selectively after cultures and antibiograms. Early removal of necrotic tissue, prevention of tetanus, early nutrition and surveillance are also recommended (Mehta et al., 2014).

2.3.4. Nursing practice of preventive measures of hospital acquired infections

The nursing practice to control the hospital acquired infections in ICU are found to play a crucial role to improve the ICU patient's outcome. A study done by Spelman, (2002) has found limited use of antibiotics for selected cases after culture and antibiogram, regular hand washing, aseptic techniques while caring for patients, minimizing the hospital stays, minimal use and early removal/ change of invasive devices, adequate staffing and active infection control programs

have contributed much to the reduction of the incidence of hospital acquired infection (Spelman, 2002).

A study done by Mehta et al., (2014) has found that observation of hand hygiene, following standard precautions to reduce transmission and strategies to reduce hospital acquired infections are critical in ICU infection control (Mehta et al., 2014,p.145).

The respect of sterility while caring for invasive procedures like central lines, tracheal intubations, airway suctioning, urinary catheterizations was associated with reduction of hospital acquired infections in ICU (Lukas et al., 2016,p.8).

Prevention of hospital acquired infections in special subsets of patients, such as burned patients and other patients at high risk include identifying sources of organism, identification of organisms, and sometime isolation of infected patients is an option (Lukas et al., 2016,p.8).

HAND WASHING

A study was conducted in Brazil by Santos and Celina (2015, p. 27) on “adherence to the five moments for hand hygiene among intensive care providers”. In this study, it was observed that healthcare providers’ adherence rate to hand hygiene was 43.7%, which is considered as low. Nurses had the most worrisome and lowest adherence to hand hygiene (29%) and yet nurses have more frequent and direct contact with patients. The lowest percentages of adherence to hand washing were observed during the moments before touching the patient and before aseptic procedures. These findings show that hand washing practices in the unit is the most fragile point. To verify adherence to hand hygiene techniques, hand hygiene inspection is essential.

ENDOTRACHEAL SUCTIONING PRACTICES

Endotracheal suctioning (ETS) is a process that may constitute a risk factor for Hospital acquired infection (VAP) by increasing microbial colonization of the lower airway. Unsafe endotracheal suctioning practices have been experienced globally during recent years due to adverse reactions. Nurse practitioners want to take all essential measures to ensure that patients are safe and there is high quality of nursing care (Jansson et al., 2013, p.99).

Patients who are managed on mechanical ventilation need an artificial airway, either an endotracheal tube or a tracheotomy tube. The patients frequently retain tracheobronchial secretions due to impaired cough reflex, decreased mucociliary clearance, and possibly increased

mucus production. Endotracheal suctioning is essential to remove retained tracheobronchial secretions and ICU nurses assume the responsibility for removal of these secretions. Even though endotracheal suctioning is essential, it should be done only as needed because the procedure can result in hypoxemia, dysrhythmias, damage of the tracheal mucosa as well as VAP (Ashworth, Melody .2015, p.15) and is not a comfortable procedure to patients.

Following standard precautions to reduce transmission and strategies to reduce ventilator associated pneumonia (Mehta et al., 2014) includes:

The use of invasive procedures like central lines, tracheal intubations, urinary catheterizations injections, invasive monitoring and devices (CVP, IABP...) should be limited or used with extreme caution (Lukas et al., 2016).

Environmental factors and architectural lay out by planning the Patient Care Zone refers to areas where direct patient care is provided, patient rooms and the immediately adjacent areas. Designers must consider the needs of patients and visitors, and direct care performed by staff. As critical care has evolved to integrate families into daily patient care, family needs and care.

2.3.4. Factors affecting nursing practice of preventive measures of HAI

2.3.4.1 Possible barriers for HAIs prevention

In this section, it was found in some research the barriers like lack of time or heavy workload, lack of knowledge, forgetfulness, lack of supplies and facilities are thought to be cross-cutting barriers to all practices for HAIs prevention. Preventive practices such as hand washing, oral hygiene, sterility while urinary catheterization, positioning of the patient and tracheal suctioning are inadequately or improperly done in the presence of such barriers.

Lack of material resources

In a qualitative study conducted in Egypt by Lohiniva et al., (2015, p. 669) through focus group discussion, the majority of nurses in both Hospitals identified lack of hand hygiene to be due to a shortage of products (soap or alcohol) and sinks as the main constraint to complying with hand hygiene guidelines. The possible problem varied from one department to another and some health care department workers were expected to walk to the next department for hand washing.

Another quantitative cross-sectional survey was done in Finland by Jansson et al., (2013,p. 216) on: “Critical care nurses’ knowledge of adherence to and barriers towards evidence-based guidelines for the prevention of hospital acquired infections”. With the sample size of 101 participants revealed that an overall self-reported adherence to measures for preventing HAIs was 84.0%. The main self-reported barriers towards evidence-based guidelines were inadequate resources.

As reported by many studies hand washing is critical in infection control; however some health-care facilities have deficiencies of equipment and materials for hand washing and bedside hand rub. This has led to poor compliance with hygiene principles (Shahida et al., 2016,p.19).

Workload

The same study conducted in Egypt found that many respondents mentioned that a heavy workload prevented them from following hand hygiene policies especially in the evening and night shifts. Others stated that the workload was always high and therefore it always impacted hand hygiene practices (Lohiniva et al., 2015, p. 669).

Other factors

The disposition of patient to isolation facilities, management of hospital waste is another neglected area. Health care providers’ lack of sufficient knowledge about the use of antibiotics also contributes (Shahida et al., 2016).Other factors such as the lack of awareness of infection control protocols, and individual behavior are all barriers in prevention of hospital-acquired infections. All these factors put together have been reported to contribute to poor nursing practice of hospital acquired infections in intensive care units(Shahida et al., 2016).

It has been reported that the low level of ICU nurses education contributed to poor nursing practice of preventive measures of hospital acquired infections and increased the incidence of hospital acquired infections (Shahida et al., 2016).

2.4. CRITICAL REVIEW AND RESEARCH GAP IDENTIFICATION

Many studies have reported that hospital-acquired infection affects hundreds of millions of people worldwide; it is a major global issue for patient's safety (Abera et al 2017). Hospital-acquired infections (HAIs) are associated with increased attributable mortality, increased length of hospital stay and healthcare costs for patients' families and healthcare facilities (Afroz H at al., 2017). However, these studies did not report about contribution of nursing practice on infection control in intensive care unit. The studies reported that the common hospital acquired infections are the urinary tract infections, pneumonia, sepsis, meningitis and gastro- intestinal infections. Factors that are reported to be likely to trigger the hospital acquired infections are poor hand washing, none respect of sterility while caring for the ICU patients (urinary catheterizations, central line insertion, airways devices, unsterile airways manipulations(Shahida et al., 2016).

On the other hand, these studies are limited to the factors affecting the nursing practice of preventive measures of hospital acquired infections in intensive care units. In the current study we identified different factors that contribute to acquire infections in ICU. Even though much has been done to improve health care delivery in Rwanda, still there is high prevalence of hospital acquired infections. A study done by Lukas et al., (2016) found that the prevalence of hospital acquired infection is highest in intensive care unit at a rate of 50.0% of admitted patients, with overall of 15.1% of hospitalized patients. In Rwanda Military Hospital, 18 patients were admitted in ICU from 1st May-1st June 2016. Records in the ICU show that 14 of these patients were mechanically ventilated and 1 case (5%) of Klebsiella was diagnosed. Another 1 (5%) case showed a sign of VAP through a new infiltrate on chest X-ray (Rwanda Military Hospital ICU report book, 2016). Such hospital acquired infections were observed to be even higher at the University Teaching Hospital in Kigali where a surveillance to monitor hospital-acquired infections reported 50.0% hospital acquired infections in ICU and 23.1% in Neonatology (Lukas et al., 2016).

Given that, the data regarding nursing practice about prevention of hospital acquired infections in intensive care unit are limited, the present study is anticipated to cover that existing gap about infection control in ICU.

The present study will assess the nursing practice and identify the factors affecting that practice of preventive measures of hospital acquired infections at university teaching hospitals, Rwanda ,and King Faisal hospital this is anticipated to inform the administrative authorities to set the programs to improve the application of prevention of HAI, particularly in ICU.

2.5. CONCEPTUAL FRAMEWORK

The conceptual framework in the present study is composed by several concepts, namely, the factors affecting nursing practice regarding prevention of hospital acquired infections, and those factors are socio-demographic, work conditions and factors related to the institution (ICU setting).Other concepts are the nursing practices of preventive measures of hospital acquired infections, that nursing practice can be good or poor.

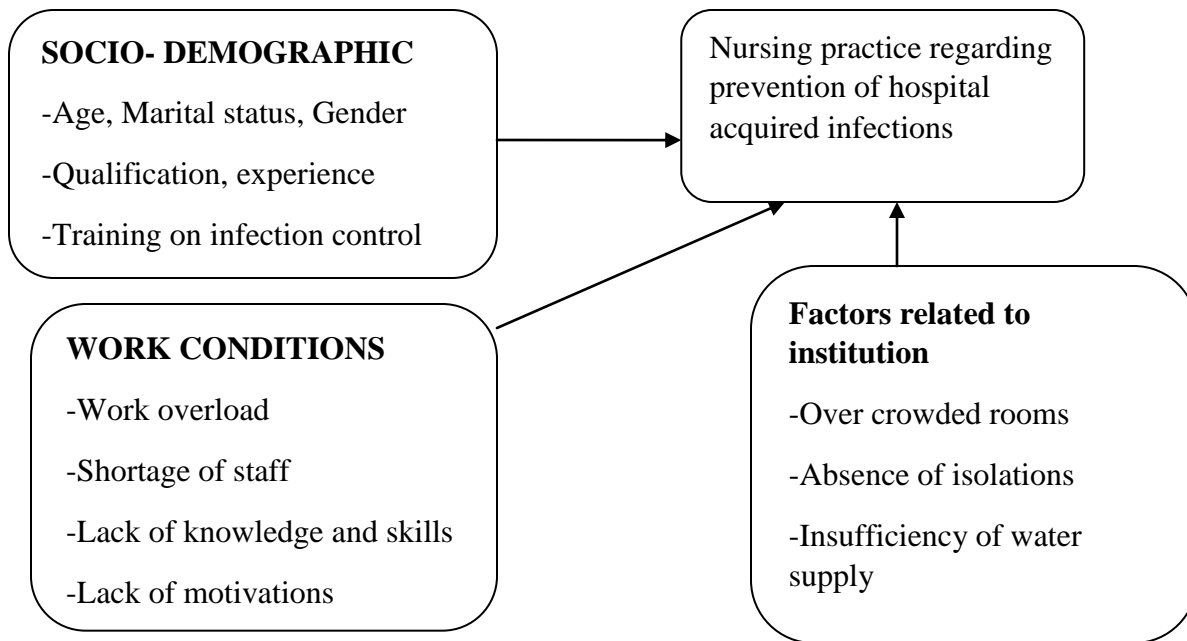


Figure 2.1: Conceptual framework of the study.

CONCLUSION OF CHAPTER TWO

This chapter described the theoretical literature in detail based on the study variables. The empirical literature also was described in detail related to the variables of this study and emphasized on evidence based findings. The Critical review and research gap identification in relation to nursing practice are identified. In addition, the conceptual framework was designed.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. INTRODUCTION

The third chapter presents the research methodology. It outlines the process and procedure that will be used to conduct this study. The research methodology is made of the study design, research approach, study population, sample size and sampling methods, data collection instruments, methods and procedures, data analysis, study limitation and problems, and ethical consideration.

3.2. STUDY DESIGN

Rebar et al.(2011, p. 175) defined a study design as an overall plan to get knowledge through an approach that answers research questions and design determines how participants are recruited and involved in the study, the process for the study, including the timing of any activity and when the study will be completed. A descriptive cross-sectional design was applied to achieve these study objectives. The cross sectional study is a kind of descriptive epidemiological method in which the health related event of the study population, in this study, nursing practice regarding preventive measures to hospital acquired infection, is determined at a given point of time. And the observation of cauterization practice was done in this study.

3. 3. RESEARCH APPROACH

Quantitative research is a formal, objective, systematic process by which numerical data are processed to get new information about the world. Quantitative methods focus on a comprehension and split down phenomenon into parts to evaluate the outcome, it can be descriptive, exploratory, correlational, quasi-experimental or experimental (Grove, Burns and Gray, 2013, p.26). The quantitative non-experimental approach was used in this study. The study involved the statistical measurement (numbers) or numerical analysis of data.

3.4. STUDY SETTING

The present study was conducted at three University Teaching Hospitals in Rwanda, namely the University Teaching Hospital of Kigali (UTHK), King Faisal Hospital (KFH) and the University Teaching Hospital of Butare (UTHB).

The University Teaching Hospital of Kigali (UTHK)

The University Teaching Hospital of Kigali is one of Rwanda university teaching hospitals located in Kigali city within Nyarugenge District. It is nearby SERENA Hotel, National Laboratory and National Blood Transfusion Centre.

CHUK was built in 1918 by a group of Missionaries referred to as Pennies through the initiative of the official Authorities of Belgium. The hospital began with four rooms for hospitalization and a dispensary. CHUK was awarded the status of a referral and teaching hospital on 7/12/2000 by the law N°41/2000 and then expanded.

Currently CHUK has a capacity of admitting 509 patients and employs 406 nurses. Its mission is to provide education and clinical training for a medical profession, to deliver high-quality medical care for all categories of people and to develop research. The intensive care unit at CHUK is made of seven beds in ICU and 4 beds in HDU, the nurses allocated in ICU are thirty-five.

The University Teaching Hospital of Butare (CHUB)

The University Teaching Hospital of Butare is situated in HUYE district, Southern province. It is a university teaching hospital with 511 staff and 206 beds. The intensive care unit at BUTH is made of five beds; the nurses working in ICU are 30.

CHUB started its health services from 1928, by that time, it was called Butare Hospital. It was built by Belgian colonies. Butare Hospital became a University Teaching Hospital in 1966.

King Faisal Hospital

The hospital was constructed between 1987 and 1991 with the help of the Saudi Fund for Development (SFD). Thus the name “King Faisal Hospital, Kigali”

The hospital currently offers more than 34 services and has a capacity of 160 beds, has 350 staff, with the mission of providing specialized health care in Rwanda and beyond .The intensive care unit at KFH is made of seven beds; the nurses allocated in ICU are thirty-five.

3.5. STUDY POPULATION

A population is an entire group of individuals, substances or objects that meet inclusion criteria set by the researcher (Grove, Burns and Gray, 2013, p.44). In this study population was made of the nurses working in intensive care units (ICUs) at three University Teaching Hospitals namely Kigali University Teaching Hospital, King Faisal Hospital and Butare University Teaching Hospital.

The ICU nurses include 31 nurses from ICU at CHUK and 10 from PICU at CHUK, 24 from BUTH, and 35 from KFH; the total population will be 100 ICU nurses.

3.5.1. Inclusion criteria

The inclusion criteria were all nurses working in intensive care units at University Teaching Hospitals (UTHK, UTHB and KFH) Rwanda, who consented to participate in the study.

3.5.1 Exclusion criteria

The exclusion criteria were all nurses working in other units than intensive care unit, the ICU nurses who did not consent to participate in the study and those who were on leave at the time of the data collection.

3.6. SAMPLING

The sampling approaches in quantitative research refer to the procedure of choosing a part of the population of interest for representation in order to draw inferences and conclusions (Grove, Burns and Gray, 2013, p. 37) The sample was selected from 3 university teaching hospital who fulfilled the inclusion criteria. A convenience sampling technique was used.

3.6.1. Sample size

To calculate the sample size, a researcher used a formula of small sample technique by Krejcie and Morgan (1970, p.1).

$$N = \frac{X^2 NP (1-P)}{d^2(N-1) + X^2 P (1-P)}$$

Where:

n = required sample size.

X² = the critical value for the corresponding 95% confidence interval = 3.8416

N = the population size.

P = the estimated proportion of the outcome (assumed to be 0.50 since we don't have any previous conducted study in Rwanda to estimate the proportion of nurses in relation to nursing practice of preventive measure and associated factors to nursing practice of preventive measure of HAIs.

d = is the level of significance for the study results which is set at 5%

The target population size is 100 nurses comprised of 31 ICU nurses from CHUK and 10 from PICU at CHUK, 24 from CHUB and 35 from KFH, totaling 100 ICU nurses.

The specific sample size will be calculated as follows:

$$N = 3.8416 \times 100 \times 0.50 (1-0.5) / (0.05)^2 (100-1) + (3.8416)^2 0.5 (1-0.5) = 81$$

To achieve a medium effect size, with 80% power at a 0.05 significance level, a minimum of 81 participants was needed. However, the following reasons pushed the researcher to consider taking the totality of 100 participants

. Since the researcher already knew the total number of the participants, the researcher opted to take all nurses from 3 university teaching hospitals.

. In order to increase the generalizability of the results and the power of this study, 100 nurses from 3 university teaching hospitals were recruited via convenience sampling.

. In the small sample technique, a provided table to indicate the sample size needed, since the sample size was less than a hundred the study considered the whole 100 participants.

3.6.2 Sampling Strategy

This is the process of describing the concept of probability sampling method as a technique with an equal chance of individuals to be selected from the population (Grove, Burns, and Gray 2013, p. 357). This study used the convenience sampling method, which is a nonrandom technique that does not necessitate an underlying theories or a set number of participants. The researcher decided what needed to be known and aims to find people who are willing to provide the information based on their experience or knowledge (Etikan et al, 2016,p.2-3).

3.7. DATA COLLECTION

Data collection assisted the researcher in gathering information from respondents. A structured data collection approach was used and a self-administered questionnaire containing closed questions was administered to respondents. All participants were given the same questionnaire with predetermined and standardized word, and the researcher used the checklist to observe some nursing practices. The data collection instrument, pilot study, and data collection procedure are described below.

3.7. 1. Data collection instrument

The Infection Control Assessment Tool: A WHO Standardized Approach for Improving Hospital Infection Control Practices was adapted by making revisions of its contents and used to collect data .The tool was simplified and adapted to this study, because the original version of the tool was in English because all nurses were able to understand English.

The final data collection tool was made of three sections: the first is made of socio-demographic data, the second is made of nursing practices regarding prevention of HAI (Infection Control Assessment Tool), and the third section is made of various factors affecting the nursing practice of preventive measures of hospital acquired infections. The score level of observed practice was calculated out of 10 based on the sum of the scores of 10 variables where for each practice done well a score 1 was awarded and the practice which is not done or incorrectly done was scored 0.

These variables are hand washing before entering ICU, hand washing before nursing care, hand washing after patient care, hand washing before leaving ICU, humidifier in the ventilator circuit, in-line bacterial filter, change of filters at least once daily, swabbing on the top of the vial before injection, correct use of safety box and respect of sterility during urinary catheterization.

Participants who scored 6 and above were classified in high score group and participants who scored 5 and less were classified as low score.

3.7.2. VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENT

A valid quantitative study must have an accuracy and consistency in measurement. The instrument, questionnaire, or procedure must measure what they are supposed to measure and be consistent to what they are measuring (Rebar et al., 2011, pp. 150–170).

3.7.2.1 Validity of the research instrument

The validity refers to the degree to which an instrument measures what it is supposed to measure (Polit and Beck, 2008, p. 422). In this study, the content and construct validity were ensured when organizing items of the questionnaire against the research objectives, the literature review and the conceptual framework. The data collection tool used was developed from an existing approved WHO(World Health Organization) infection control guideline available online, the developed tool was adapted to fit the Rwandan context. The questionnaire was given to 2 nurse experts in critical care nursing, to test its consistency and accuracy. The questionnaire was fairly easy to read.

The internal validity: was controlled by avoiding the use of complicated and confusing words in data collection tools. The questionnaire was in English.

The external validity: was controlled by selecting a representative sample size from the sampling frame with a convenience sampling of participants. The researcher selected participants at random, making sure that all participants fulfilled the inclusion criteria to avoid selection bias.

3.7.2.2 Reliability

The reliability of a tool means the consistency with which it measures the target attribute that means, there must be the same results in different tests if the feature being measured has not changed (Rebar et al., 2011, p. 162). The researcher calculated the internal consistency reliability coefficient. The Cronbach's alpha test was 0.78, which shows that items were completely connected or related to each other at 78% (Rebar et al., 2011, p. 163).

3.7.2.3 Pilot study

The pilot study is useful to develop or enhance a research instrument and examine its reliability and validity, detect problems with a study design, and to determine if the sampling technique and

data analysis techniques are effective (Grove, Burns and Gray, 2013, p. 46). The revised tool was pretested among 10 nurses working in ICU.

This was to determine whether the present study was practical in terms of availability of study subjects, studying the cost, timeframe of the study and the consistency of the tool. Therefore, a thorough scrutiny of the constructed tool with regard to its clarity, readability, appropriateness to the Rwandan context and validity of the questions was done for the usefulness of the questionnaire. The results from the pilot study were used for testing the validity and reliability of the questionnaire only, they were then kept and the used participant in the pilot study were not included in the main study, they were from another hospital apart from the research setting

3.7.2.4. DATA COLLECTION PROCEDURE

After getting approval from IRB/CMHS, the researcher applied for permission to conduct research from KUTH, KFH and CHUB ethics committees. Once permission was guaranteed, the researcher met the unit managers of ICUs to introduce herself and explain the study purpose and ask appointments to meet the ICU nurses.

After explanation of the study purpose, process, participants' rights, risks and their mitigation, and requested the ICU nurses to participate in the study, the ICU nurses were asked to sign the informed consent forms. Thereafter the researcher left the questionnaires for the participants to be filled later to avoid disruption of the ward or unit activities. The sealed box was left with the Unit Manager where the participants would deposit the completed questionnaires and the researcher checked the box regularly for completed questionnaires until the end of the data collection period. In the meantime, a reminder in the form of SMS was sent to the participants and a week before the end of the study period to improve on the return rate.

When the researcher came back, she observed some nursing practice to complete the other part of a questionnaire which was a checklist.

3.9. DATA ANALYSIS

Data were checked daily for completeness and were cleaned, edited, counter-checked for accuracy. The SPSS version 21 was used in order to process, compile and analyze the data from questionnaires conducted during data collection by using both descriptive and inferential statistical analysis.

Descriptive analysis using frequency and percentages was computed. Pearson chi-square test and odds ratio with corresponding 95% confidence interval were computed to find the association between independent and dependent variables. A $p \leq 0.05$ was considered as statistically significant.

3.10. ETHICAL CONSIDERATIONS

The researcher applied for ethical clearance from IRB/CMHS and permission to conduct research from KUTH, BUTH and KFH ethics committees. To ensure anonymity and confidentiality of participants, the codes were used on questionnaires and kept in locked box; the softcopies were kept in computer locked by a password only known to the researcher.

The participants were guaranteed the right to refuse the participation and to withdraw from the study at any stage without any negative consequences, therefore participation was totally voluntary. The researcher approached and informed the participants about research purpose and objectives, procedures involved, their rights regarding study participation or withdrawal including potential risks and how they would be mitigated.

For example, this study involved minimal risk of interruption of ward routine; however, the researcher allowed the participants to complete the part of questionnaires during their own time to avoid disruption of unit activities. The researcher completed herself the observation part of the questionnaire.

Of course the comfort of their leisure time would be disrupted but the benefit of the information produced by this study may balance or even outweigh the sacrifice. Then the participants were requested to sign an informed consent in the language of choice as the documents were translated into Kinyarwanda.

The data collection tool was adapted from WHO standardized tool for infection control, freely available on https://www.who.int/infection-prevention/campaigns/IPCAF_training-video.EN.pdf?ua=1

3.11. DATA MANAGEMENT

The soft copies were stored on external disk, kept confidential and were used for the purpose of the research. Hard copies were stored in a locked cupboard with the key kept by the researcher only. These research documents will be kept confidential for five years as per university policy and will be destroyed by shredding and incineration while the soft copies will be permanently deleted.

3.12. DATA DISSEMINATION

The results of this study will be published in order to be accessible to the user as needed and the researcher will provide feedback to the study settings in order to facilitate them to set context driven and evidence based strategies to prevent hospital acquired infections in ICUs.

3. 13. LIMITATIONS AND CHALLENGES

In this study some problems were anticipated, for instance, delay to get permission to collect data from study settings. This was anticipated on finishing the research proposal as early as possible and get enough time to wait for permission.

Some participants were also expected not to be willing participate in this research and some self-administered questionnaires not well completed because the study was little bit time consuming to the ICU nurses who are most of time busy with heavy workload. So the data collection was made very specific and simplified to minimize the time for completion (about fifteen minutes) and a regular reminder was done to increase the return rate. Because of the small sample size the findings of the study may not be generalizable.

CONCLUSION OF CHAPTER THREE

Chapter three has described the method that was used to answer the research questions including the ethical principles that were considered and limitations.

CHAPTER FOUR: RESULTS

4.0 INTRODUCTION

This chapter summarizes the important findings from the study. Results are presented in tables to concisely capture different studied variables. This study used the adapted questionnaire from that of WHO guidelines for infection control to collect data from the ICU nurses about the nursing practice regarding prevention of hospital acquired infections in intensive care units at university teaching hospitals, Rwanda. The study was done in ICU at University Teaching Hospitals (CHUK and CHUB) and King Faisal Hospital from the 1st to 31st May 2019.

A hundred (100) questionnaires were distributed; Ninety three (93) were returned making a return rate of 93% of Nurses working in Intensive Care Unit (ICU). The presentation of results is structured according to the four sections of the data collection tool, which are, respectively: socio-demographic data, working conditions affecting the nursing practice of preventing hospital acquired infections, Behaviors of ICU nurses regarding prevention of hospital acquired infection. Airways suctioning practices and observed catheterization practices of ICU nurses. After data collection and analysis, the results were presented using tables from outputs of IBM SPSS statistics version 25. Each table is preceded by a short summary of explanations.

Tables 4.1 and 4.2 display the descriptive analysis (frequencies), and outline the information about socio demographic characteristics of the participants and the working conditions affecting the nursing practices of preventing hospital acquired infections as reported by participants.

4.1. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

In this study, as shown in Table 4.1 below, the participants were mainly young (mean age of 33 ± 3.8 years) with 32(34.4%) being males and 61(65, 6%) females. Many of the participants were married [63 (67.7%)], 2 (2.2%) cohabitant and 28 (30.1%) were single. Most of the participants [65.6%] had advanced diploma in nursing as education level, while the bachelor and masters holders were 31 (33.3%) and 1 (1.1%) respectively.

Table 4.1: Socio-demographic characteristics of study participants (N=93)

Demographics	N	%
Age (Mean \pm SD) in years		33.1 \pm 3.8
Age category		
\leq 35 Years	74	79.6
>35 Years	19	20.4
Gender		
Male	32	34.4
Female	61	65.6
Marital status		
Married	63	67.7
Cohabitant	2	2.2
Single	28	30.1
Level of education		
A1	61	65.6
A0	31	33.3
Master's degree	1	1.1
Clinical experience		
<5 years	47	50.5
6-10 years	40	43.0
\geq 11 years	6	6.5
Training on infection control		
Yes	70	75.3
No	23	24.7
Number of training sessions [Median (min-max)] sessions		1(1-5)

4.2. Working conditions affecting the nursing practices of preventing hospital acquired infections.

As presented in table 4.2 below, the working conditions affecting nursing practice were reported by the majority (64.5%) to be workload, shortage of ICU staff (66.7%), absence of isolation facilities (67.7%). Almost an equal number of participants admitted to or not on many patients or overcrowding (50.5% and 49.5% respectively), and insufficient equipment or materials for hygiene (51.6 and 48.4% respectively). Small majorities (57.0%) dispute the fact that limited job training on infection control and insufficiency of water supply (63.4%) are factors in preventing hospital acquired infections.

Table 4.2: Working conditions affecting the nursing practices of preventing hospital acquired infections

Working condition	N	%
Work overload		
Yes	60	64.5
No	33	35.5
Shortage of ICU staff		
Yes	62	66.7
No	31	33.3
Limited job training on infection control		
Yes	40	43.0
No	53	57.0
Many patients/overcrowded rooms		
Yes	47	50.5
No	46	49.5
Absence of isolation facilities		
Yes	63	67.7
No	30	32.3

Insufficiency of water supply

Yes	34	36.6
No	59	63.4

Insufficient equipment or materials for hygiene

Yes	45	48.4
No	48	51.6

4.3. Behaviors of ICU nurses regarding prevention of hospital acquired infection

Table 4.3 outlines the behaviors of ICU nurses regarding prevention of HAI. On entering the ICU, 63.4% of nurses reported to wash their hands and 28.0% of them wash their hands before nursing care. After patient care 43.0% reported to wash their hands and 57.0% did not.

Before leaving the ICU the results are the same as the ones for the after patient care. About the presence of the humidifier in the ventilator circuit, 59 (63.4%) were humidified. The in-line bacterial filters were present at 39.8% and Change of bacterial filters, at least once daily were at 28.0%.

.Table 4.3: Behaviors of ICU nurses regarding prevention of hospital acquired infection

Behavior	N	%
Hand washing at entering ICU		
Yes	59	63.4
No	34	36.6
Hand washing before nursing care		
Yes	26	28.0
No	67	72.0
Hand wash after patient care		
Yes	40	43.0
No	53	57.0
Hand washing before leaving ICU		
Yes	40	43.0
No	53	57.0
Humidifier in the ventilator circuit		
Yes	59	63.4
No	34	36.6
In-line bacterial filters used in ventilator circuit		
Yes	37	39.8
No	56	60.2

Change of bacterial filters, at least once daily

Yes	26	28.0
No	67	72.0

4.4. Airways suctioning practices

For airway suction practice, the results show that, for fluid instillation while suctioning, most participants [86(92.5%)] used normal saline; a single vial to one patient [63(67.7%)], and changed suction catheters daily [45(48.4%)]. About the frequency of suction tube change, the results showed that most of the participants (34.4%) changed them daily and more than one day by 31.2%.

For storage of suction catheter between uses, 39(41.9%) participants reported that suction catheters are stored covered in a sterile cover while 25.8% stated that they used them once and discarded them. Most participants [69(74.2%)] stated that during airway suction they do not use sterile gloves. See Table 4.4.

Table 4.4: Distribution of participants response according airways suction

Variable	N	%
Type of fluid for installation while airways suctioning		
Sterile water	7	7.5
Normal saline	86	92.5
Fluid container		
Single vial only	63	67.7
Multiple use	21	22.6
One container for > 9 one patient	9	9.7
Frequency of airway suction catheters change		
Every séance	23	24.7
Every shift	25	26.9
Every day	45	48.4

Frequency of suction tube change

Every séance	1	1.1
Every shift	31	33.3
Every day	32	34.4
More than one day	29	31.2

Store of suction catheter between uses

In a bottle containing sterile water	18	19.4
Covered in sterile cover	39	41.9
Kept uncovered	12	12.9
Used once	24	25.8

Type of gloves during airways suction

No gloves	2	2.2
Surgical gloves	22	23.7
No surgical gloves	69	74.2

4.5: Observed catheterization practices of ICU nurses

For the observed catheterization practice, it was found that, before injection practice, 31.2% ICU nurses swab on the top of the vial while 89.2% correctly use safety boxes. For the type of antiseptic used while inserting the IV line, alcohol was mainly used at 92.5% while betadine was used by 7.5%. For the time of change of the peripheral IV line, we have seen that the IV lines are mainly changed when the limb is swollen or the line is leaking at 61.3%. With respect to sterility during urinary catheterization, 76(81.7%) participants respect sterility and 17(18.3%) did not respect sterility. For the frequency of indwelling urinary catheterization, 92.5% participants changed them mainly within 72 hours up to two weeks.

Table 4.5: catheterization practices of ICU nurses

Variable	N	%
Swabbing on the top of vial bottle before medication		
Yes	29	31.2
No	63	67.7
Correct use of safety boxes after		
Yes	83	89.2
No	10	10.8
Type of antiseptic for IV line		
Betadine	7	7.5
Alcohol	86	92.5
Time of peripheral IV line change		
Every 3 days	11	11.8
In more than 3 days	25	26.9
When swollen or leaking	57	61.3
Respect of sterility while urinary catheterization		
Yes	76	81.7
No	17	18.3
Frequency of indwelling urinary catheter change		
Within 72 hours	7	7.5
>72 hours to 2 weeks	86	92.5

To determine infection control practice score, 10 observed practice namely hand washing before entering ICU, hand washing before nursing care, hand washing after patient care, hand washing before leaving ICU, humidifier in the ventilator circuit, in-line bacterial filter, change of filters at least once daily, swabbing on the top of the vial before injection, correct use of safety box and respect of sterility during urinary catheterization were considered.

Yes response was considered as correct and given 1 mark while a no response was considered incorrect and received 0. Total score was 10 out of 10 (100%). Table 4.6 below describes the distribution of participants according to level of infection control practice. The cut of >60% out of the total practice score were considered as good practice while <60% were deemed to have poor practice regarding the infection control in ICU.

After computation, more than half of participants [64.5% (n=60)] were revealed to have good

practice while the rest 35.5% had poor practice. Table 4.6 below shows the distribution of participants according to level of practice regarding infection control in frequency and percentage.

Table 4. 6:Distribution of participant according to level of infection control practice (N=93)

Infection control practice	Frequency	Percentage
Low practice score	33	35.5
Good practice score	60	64.5
Total	93	100

4.6. BIVARIATE ANALYSIS

Bivariate analysis was done as in table 4.7 to determine the association between demographic characteristics and level of infection control practice in ICU. Fisher’s exact test and Pearson chi-square revealed that there is a statistical significance between level of infection control and gender, clinical experience and training on infection control ($P < 0.05$).

Table 4.7: Association between demographic characteristic and level of infection control practice

N=93

Demographic variable	Level of practice			Test done	P-Value
	Low score	High score	Total		
Male	6	26	32(100)	Pearson chi-square	0.014
Female	27	34	61(100)		
Total	33	60	93(100)		
Age					
<35 Years	30 (40.5)	44 (59.5)	74 (100)	Fisher exact test	0.059
>35 Years	3 (15.8)	16 (84.2)	19 (100)		
Total	33 (34.5)	60 (64.5)	93 (100)		
Experience					
<5 Years	22 (46.8)	25 (53.2)	47 (100)	Pearson chi-square	0.021
>5 Years	11 (24)	35 (76)	46 (100)		
Total	33 (34.5)	60 (64.5)	93 (100)		
Training on infection control					
Yes	19 (27.1)	51 (72.9)	70 (100)	Pearson chi-square	0.003
No	14 (60.9)	9 (39.1)	23 (100)		
Total	33 (34.5)	60 (64.5)	93 (100)		

P- Value significant at $p < 0.05$

4.8. LOGISTIC REGRESSION ANALYSIS OF INFECTION PRACTICE

During logistic regression as presented in table (4.8.) the researcher have found that Participants who had training on infection control had 4.1 times high score in the observed nursing practices compared to those who did not attend any training on infection control (OR=4.1, 95%CI=1.55-11.2 and p=0.004). Participants with experience of working in ICU of at least 6 years had 2.8 times high scores in nursing practices compared to those with work experience of 5 years and less. The level of education was not associated with the observed nursing practice (OR=1.3, 95%CI=0.-53-3.3, p=0.537). Male participants had 3.4 times of scoring high in observed nursing practice than female participants (OR=3.4, 95% CI= 1.2-9.5 and p=0.018). Nurses with age greater than 35 years had 3.6 times odds of scoring high in nursing practice compared to those with 35 years and less (OR=3.6, 95% CI=0.9-13.5, p=0.054).

Table 4. 8: Simple logistic regression of infection control practice among participants

N=93

	Observed nursing practice		OR (95% CI)	P value
	Low score	High score		
Gender				
Male	6 (18.8%)	26 (81.3%)	3.4 (1.2-9.5)	0.018
Female	27 (44.3%)	34 (55.7%)		
Age				
≤35 Years	30 (40.5%)	44 (59.5%)	3.6 (0.9-13.5)	0.054
>35 Years	3 (15.8%)	16 (84.2%)		
Level of education				
A1	3 (37.7%)	38 (62.3%)	1.3 (0.53-3.3)	0.537
A0/Master's degree	10 (31.3%)	22 (68.7%)		
Clinical experience				
≤5 years	22 (46.8%)	25 (53.2%)	2.8 (1.15-6.79)	0.023
>5 years	11 (24.0%)	35 (76.0%)		
Training on infection control				
Yes	19 (27.1%)	51 (72.9%)	4.1 (1.55-11.2)	0.004
No	14 (60.9%)	9 (39.1%)		

CONCLUSION OF CHAPTER FOUR

Hand washing before and after patient care practice as the main easy way to prevent infection was found to be adhered to by few participants 26(28.0%, and 40(43.0%) respectively. Only 64.5% (n=60) were revealed to have good practice and participants who had training on infection control had 4.1 times high score in the observed nursing practices compared to those who did not attend any training on infection control (OR=4.1, 95%CI=1.55-11.2 and p=0.004). below is the discussion of the results in detail.

CHAPTER FIVE: DISCUSSION

5.1. INTRODUCTION

5.2 DEMOGRAPHIC CHARACTERISTICS

Of the 93 nurses who participated in the study, the mean age were 33 years ($SD=\pm 3.8$). These findings were approximately similar to the findings of a study done by Babanataj et al (2019) which was (35.3 ± 6) and this may be attributed to the working conditions in ICU which mainly require young workers.

For the gender, my population were mainly female at 61(65, 6%) and also this is similar to the study done by Babanataj et al (2019) in India where they found that among participants, 58.1% were female. Many of the participants were married at a rate of 67.7% and this is similar to the study done in New England by Perl et al. where 69% of participants were married. In the study done by Dasgupta et al. (2015) most participants (62%) were nurses who had clinical experience not greater than 5 years, which is similar to the current study where 50.5% ($n=47$) of participants had clinical experience not greater than 5 years. When considering the age, we shall see that ICU nurses in this study are mainly young with less clinical experience.

5.3: NURSING PRACTICE REGARDING INFECTION CONTROL

5.3.1. Hand washing

In the current study, we found that at entering the ICU, hand washing was by 63.4% ($n=59$) which is approximately similar to the study done in India which found 67% of participants (Vinodhini and Devi, 2017). Before nursing care, nurses poorly washed their hands at the extent of 28% ($n=26$) and this is contrary to the study done by Vinodhini and Devi (2017). After patient care the study found that hand washing was still poor for ICU nurses which was by 43% ($n=40$) and before leaving the only 43% ($n=40$) ICU nurses wash their hands which was similar to the study done in Ethiopia by Desta et al. (2018). In general, hand washing in ICUs is poor among ICU nurses. As literature says that hand washing is very crucial in infection and prevention control, this picture of hand washing found in the current study, shows that hand washing is the risk factor of hospital acquired infections in the attended ICUs.

5.3.2 Airway suctioning

In the study done by Haghghat and Yazdannik (2015) in Iran, it is documented that Airway suctioning is one of the most important procedures performed by critical care nurses for airway management and clearance. Clearing the mechanically ventilated patients' airways by suctioning is an inevitable procedure, which is one of the concerns in nursing practice. In the current study, the researcher observed that the practice of airway suctioning is an open airway suctioning, where Open system suctioning is the conventional suctioning technique, which requires disconnecting the patient from the ventilator during endotracheal suctioning. It involves suctioning the airway using a single-use catheter, and then reconnection of the patient to the ventilator and discarding the suctioning catheter (Haghghat and Yazdannik, 2015).

In the current study, the fluid for instillation used in suction was mostly normal saline reported by 92.5 % (n=87). For the suction catheter change after suction procedure, I found that it is mostly changed every day by 48.4 % (n=45) of participants. That means it is used more than one time and conserved to be reused again for another suction. Only 26.9 % (n=25) of participants suction changed every shift, and only 24.7% (n=23) changed the suction catheter every time suction is being done and get discarded after use.

For the storage of the suction catheter after suction, the researcher found that the suction catheter is stored covered in a sterile container by 41.9 % (n=39) and 25,8% (n=24) used and discarded them. The researcher found that the gloves used by 74.2% (n=69) for suctioning were non-sterile gloves. These findings are similar to the study done in Iran by Haghghat and Yazdannik (2015) where the used system was closed suction, and according to WHO, the closed suction is the preferred one. The study done by Haghghat and Yazdannik (2015) shows the advantage of the closed suctioning, that it can remain in line for 24 hours, thus, can be used for multiple suctioning procedures.

This multiple-use catheter is enclosed in a plastic sheath; therefore, the nurse is not exposed to patient's airway secretions, ventilation continues during the suctioning procedure and consequently decreases the loss of lung volume and avoids gas exchange impairment while airway suctioning is being performed.

Maintaining a positive end-expiratory pressure (PEEP), decreasing contamination of the environment, saving time in equipment set-up and clean-up, and reducing the anxiety in patients are among the advantages of this system. According to the current study, compared to what literature says about endotracheal suctioning, the researcher found that the airway suctioning technique was below 60 which is poor.

5.3.3. Observed catheterization practices of ICU nurses

In the current study the researcher has found that, different practice performed by ICU nurses includes swabbing on the top of vial before injection practice was done by 31.2%(n=29),however, the correct use of safety boxes were by 89,2% which is similar to the study done by Ella et al., (2016) in Nigeria where 126(65.9%) of the respondents (nurses) had good practice of injection safety.

While in the other study done in Nigeria by Omorogbe, Omuemu and Isara (2012) has found that the injection practice among nurses was encouraging by 55.7% of participants. For the type of antiseptic for intravenous line insertion ,it has been revealed in the current study that they mainly used antiseptic is alcohol 86(92.5%) while Betadine was found to be used at 7(7.5%),which is similar to the study done by Collection and Baraki (2017)saying that for the antiseptic we may either use a 70% alcohol wipe or an antiseptic swab containing chlorhexidine. For the days the ICU nurses change the peripheral iv line ,we found that they are changed mostly when swollen or leaking at 61.3%(n=57),and 11.8%(n=11) changed within 3 days. This shows that most of these ICU nurses do change the peripheral IV lines routinely, and this is similar to a study conducted by Brown, Rowland and Ewigman (2010).

For the respect of sterility with urinary catheterization, 81.6%(n=76) participants did which is very good and approximately similar to a study conducted in Rwanda by Mukakamanzi, (2017) where she found that nurses' practice toward prevention of urinary tract infection including respect of sterility was by79.9% of participants.

5.4. FACTORS INFLUENCING INFECTION CONTROL PRACTICE

There are factors influencing infection control practice positively and others negatively. For example, 64.5% of participants were found to have good practice regarding infection control. Findings from this study reveal also that training on infection control and having clinical experience influence infection control positively because participants who had training on infection control had 4.1 times high score in the observed nursing practices compared to those who did not attend any training on infection control (OR=4.1, 95%CI=1.55-11.2 and p=0.004) and participants who had experience in ICU of at least 6 years had 2.8 times high scores in nursing practice compared to those with work experience of 5 years and less (OR=2.5, 95% CI=1.15-6.79, P= 0.023). A descriptive cross sectional study done in Ethiopia which involved 158 participants on knowledge, practice and associated factors of infection prevention among healthcare workers reveals congruent findings with the current study where nurses with beyond 10 years of clinical experience had highest odds of good infection prevention practice than their colleagues with fewer clinical experience (AOR = 3.17,95%, CI = [1.98–5.674])(Desta et al., 2018, p.2).

Desta et al also found that participants who had infection control training were 4 times more likely to adhere to the practice of infection control than others without training on prevention of infection in ICU, the fact which is congruent with the current study (AOR = 3.97, 95%, CI = [2.576–5.457])(Desta et al., 2018).The present study has showed that a majority of the ICU nurses (64.5%)reported work overload as one of the factors that affect the nursing practice of prevention of hospital acquired infection while 35.5% reported that work overload is not an issue. This is similar to the study done in India by Dasgupta et al. (2015) which found that shortage of ICU staff was a factor that enhances hospital acquired infection. A small majority (66.7%) of nurses reported in the current study that shortage of ICU staff, many patients and the absence of isolation facilities were found to be the issue in prevention of hospital acquired infections. This is approximately similar to the results from the study done in India by Dasgupta et al. (2015). So working condition as shown in the current study is a challenge to ICU nurses in Hospital acquired infection prevention.

CHAPTER SIX. CONCLUSIONS AND RECOMANDATIONS

6. 1. INTRODUCTION

The chapter six is made of conclusions that are drawn from the findings of this study, in addition to that the recommendations to the health policy makers, the administrations of the university teaching hospitals, health care providers and to the health researchers.

6.2. CONCLUSION

This study focused on determining nursing practice regarding prevention of hospital acquired infections and factors influencing infection preventive measures. The researcher found that 59(63.4%) of the observed participants wash their hand before entering in the ICU.

Hand washing before and after patient care practice as the main easy way to prevent infection was found to be adhered to by few participants 26(28.0%, and 40(43.0%) which is unacceptable. After computation of 10 observed practice, more than a half of participants 64.5% (n=60) were revealed to have good practice while the rest 35.5% had poor practice. Investigating factor associated with infection prevention practice, the researcher found that working experience and training on infection prevention and control were significantly associated with infection control practice score.

Logistic regression analysis exposed that participants who had training on infection control had 4.1 times high score in the observed nursing practices compared to those who did not attend any training on infection control (OR=4.1, 95%CI=1.55-11.2 and p=0.004).Participants with experience in working in ICU of at least 6 years had 2.8 times high scores in nursing practices compared to those with work experience of 5 years and less. The level of education was not associated with the observed nursing practice (OR=1.3, 95%CI=0.-53-3.3, p=0.537). Work related conditions perceived to compromise the practice of infection control were also revealed including insufficient equipment or materials for hygiene mentioned by 48.4% participants. Absence of isolation facilities was mentioned by 67.7% and work overload mentioned by 64.5 % of participants.

6.3. RECOMMENDATION

The following recommendation are made to:

Referral hospital

1. Equip intensive care nurses with essential knowledge and practice required for infection prevent and control through continuous training and audit.
2. Consider experienced nurses in hiring nurses to work in intensive care unit as experience was proven to influence infection control practice positively.
3. Avail enough equipment for hygiene including water supply to facilitate the practice of infection control.
4. Assign ICU nurses per patient at a ratio of 1:1 to tackle heavy workload as a barrier hindering adherence to infection control practice.

Schools of Nursing

1. Strengthen the curriculum especially on how to suction a critical ill patient because its poor practice may lead to the development of hospital acquired infection in a serious way.

Future Research

1. Conduct research on infection control among all health care providers working in ICU not nurses only.
2. Perhaps a qualitative study can explore in depth the reasons for non-adherence with hand hygiene as many studies have come up with similar results with no improvement.
2. Investigate financial and health related outcome of poor infection control practice.

6.4. CONCLUSION OF CHAPTER SIX

In chapter six conclusion of the study and recommendation to the schools of nursing, referral hospitals and futures research was made. However the study is limited by the small sample.

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ANNEXES

ATHAURIZATION LETTERS





**CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL**

Ethics Committee / Comité d'éthique

April 05th, 2019

Ref.: EC/CHUK/061/2019

Review Approval Notice

Dear Mukantwari Odette,

Your research project: "Nursing practice regarding prevention of hospital acquired infections in Intensive Care Unit at CHUK"

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 5th April, 2019 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

Dr. RUSINGIZA KAMANZI Emmanuel
The chairperson, Ethics Committee,
University Teaching Hospital of Kigali



CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

CENTRE HOSPITALIER UNIVERSITAIRE
DE BUTARE (CHUB)
OFFICE OF DIRECTOR GENERAL

Huye, ... 09/04/19

N° Ref: CHUB/DG/SA/04/...../2019
0596

Odette Mukantwari
UR-CMHS
Phone: +250788249472
Email: ntwariodette@gmail.com

Dear Mukantwari,

Re: Your request for data collection

Reference made to your letter requesting for permission to collect the data within University Teaching Hospital of Butare for your research proposal entitled "*Nursing practice regarding prevention of hospital acquired infection in Intensive Care Units at University Teaching Hospital, Rwanda*", and based to the different approvals Ref: CMHS/IRB/087/2019 from Institution Review Board of University of Rwanda and No: RC/UTHB/028/2019 from our Research-Ethics committee, we are pleased to inform you that your request was accepted. Please note that your final document will be submitted in our Research Office.

Sincerely,

Dr. Augustin SENDEGEYA
Director General of CHUB



Cc:

- Head of Clinical Education and Research Division
- Director of Research



KING FAISAL HOSPITAL, KIGALI

Patient Centered Care

16th April, 2019

MUKANTWARI, Odette

Masters Post-graduate student

Masters of Science, Nursing_Critical Care and Trauma

School of Nursing and Midwifery

College of Medicine and Health Sciences (CMHS)

We acknowledge receipt of your study protocol: **"Nursing practice regarding prevention of hospital acquired infections in intensive care units at University teaching hospitals, Rwanda"**

After a thorough review; the reviewers consider the topic for research important to KFH as ICU infections are a challenge and any measure to prevent them is very welcome.

Therefore; It is recommended that the postgraduate student be permitted to conduct the study at KFH immediately but be required to respond to the issues raised by the reviewer and deposit the response at the Office of Continuing Quality Improvement of KFH, K in due course

N.B. It is a requirement that you deposit a final copy of your research in the office of Continuous Quality Improvement in King Faisal Hospital, Kigali for our records.

Best Regards

Prof. Samuel Lutalo

Clinical Professor of Medicine;

Chief Consultant Physician and

Chairperson KFH, K Ethics Research Committee

CC:

- Chief Executive Officer, Oshen- KFH
- All KFH, K Ethics-Research Committee Members.

The data collection tool was adapted from WHO standardized tool for infection control, free available on https://www.who.int/infection-prevention/campaigns/IPCAF_training-video.EN.pdf?ua=1



Infection prevention and control facility-level assessments using WHO standardized tools in a spirit of improvement

**Infection Prevention and Control Global Unit,
WHO HQ**

2. RESEARCH INSTRUMENTS

INFORMATION DOCUMENT

Title: Nursing practice regarding prevention of hospital acquired infections in intensive care units at university teaching hospitals, Rwanda

Principle investigator Miss. MUKANTWARI Odette, Master student at University of Rwanda, College of Medicine and Health Science, School of Nursing and Midwifery, (Email: Odettentwari@gmail.com, Mobile: +250788249472

Supervisor: Professor Busisiwe Rosemary BHENGU, Master trainer at University of Rwanda, College of Medicine and Health Science, School of Nursing and Midwifery (Mobile: 0782333732, email: Bengub2@ukzn.za).

Dear participant,

This research project assesses nursing practice regarding prevention of hospital acquired infections in intensive care units at university teaching hospitals, Rwanda .These hospitals are King Faisal Hospital (KFH), University Teaching Hospital of Kigali (UTHK) and University Teaching Hospital of Butare (CHUB).This information document invites you to participate in this study and the information you provide will be confidential. The questionnaire consists of a series of questions including those asking you to provide your personal profile information, questions on your working condition, availability of hygiene materials and barriers to adherence to infection control practice.

Here are the most important things to consider:

You are selected because you are a nurse working in intensive care unit of a selected referral hospital with required information and have signed the informed consent. You will be given a research questionnaire to fill any time you want and you will be observed sometime during your practice.

We anticipate that your participation in this study presents no risk to you and be reminded that you will not have any monetary benefit from participating in the study however your input will help us to respond to the research questions.

Your participation is absolutely voluntary and you are allowed to withdraw from the study anytime you feel uninterested to provide information.

In case you want further clarification or have any concern please feel free to contact me on odettentwari@gmail.com, or on 0788249472. You can also contact my co-supervisor Emeline CISHAHAYO UMUTONI on her phone number 0788865066 or her email emelicis@yahoo.fr, or my supervisor Prof Busisiwe Rosemary BHENGU (Mobile: 0782333732, email: Bengub2@ukzn.za).

In case of questions regarding research ethics, you may contact, Director for Research, Innovation and Postgraduate studies at College of Medicine and Health Sciences in the University of Rwanda on +250783340040 or on his email: j.b.gahutu@ur.ac.rw

1. STUDY QUESTIONNAIRE

I. SOCIO-DEMOGRAPHIC DATA

1. Age (in years):
2. Marital Status: Married Cohabitant Single
3. Education level: A1 A0 Master's
4. Clinical experience (in years): ≤ 5 6-10 11 <
5. Qualification: A2 A1 A0 Masters Other, specify
6. Training on infection control: None Yes if yes, how many times

II. FACTORS AFFECTING NURSING PRACTICES

Instructions: Answer the questions below by encircling the number that corresponds to factors that hinder your practice of prevention of HAI (Hospital acquired infections)

I. Work conditions

.What are your barrier to application of preventive measures of HAI?

1. Overloaded workload: No Yes
2. Shortage of ICU staff: No Yes
3. Limited of on job training (CPD) on infection control: No Yes
4. Many patients/ overcrowded rooms: No Yes
5. Absence of isolation facilities: No Yes
6. Insufficiency of water supply: No Yes
7. Insufficiency of equipment or materials for hygiene : No Yes

III. PRACTICE OF PREVENTION OF HAI

Instructions: A check list to be used by the research while observing the nursing practice

A. Proper hand washing

1. At entering ICU
2. Before nursing care
3. After patient care:
4. Before leaving the ICU:

➤ **.Is the humidifier in the ventilator circuit?**

- 1.No
2. Yes

➤ **Are in-line bacterial filters used in ventilator circuits?**

1. No
2. Yes

➤ **.The change of bacterial filters, at least once daily?**

1. No
2. Yes

B. Airways suctioning

➤ **.Type of fluid for instillation while airways suctioning.**

- 1.Distilled or filtered water
- 2.Sterile water
3. Normal Saline

➤ **.Fluid container:**

1. Single-use vial
2. Multiple use
3. One container for more than one patient

➤ **.Frequency of airway suction catheters change**

1. Every séance
2. Every shift
3. Every day

➤ **.Frequency of suction tube change**

1. Every séance
2. Every shift
3. Every day
4. More than 1 day.

➤ **.Store of suction catheter between uses**

1. In a bottle containing sterile water
2. Covered in a sterile cover
3. Kept uncovered

➤ **.Frequency of suction bottle change**

1. Every séance of suction
2. Every day
4. More than one day

➤ **. Type of gloves during airways suction**

1. No gloves
2. Sterile
3. Not sterile

C. Injections practices

➤ **. Swabbing on top of vial bottle before medication withdraw**

1. No
2. Yes

➤ **. Correct use of safety boxes after injection:**

1. No
2. Yes

D. Iv catheterizations

➤ .Type of antiseptic for IV line insertion

- 1.Chlorhexidine
- 2.Betadine (povidone-iodine)
- 3.Alcohol

➤ . Time of peripheral IV line change

1. Every 3 days
2. In more than 3 days
3. When swollen or leaking

➤ . Intravenous fluids and medications

- 1.The source of premixed IV fluids available in this unit
 1. Prepared in ICU
 2. Prepared centrally in hospital

➤ Urinary catheters

Respect of sterility while urinary catheterization

1. No
2. Yes

➤ . Frequency of indwelling urinary catheters change

- 1.Within 72 hours
2. More than72 hours up to 2 weeks.

INFORMED CONSENT

I..... ..consent /accept to participate in this research project entitled:
NURSING PRACTICE REGARDING PREVENTION OF HOSPITAL ACQUIRED
INFECTIONS IN INTENSIVE CARE UNITS AT UNIVERSITY TEACHING
HOSPITALS, RWANDA Conducted by MUKANTWARI Odette, UR/CMHS/ Remera-
Campus.

The information about this study has been availed and explained to me and all my questions have been answered. I have read this form and I feel that I have had enough information and time to consider my decision to join the study. I fully understand that by signing this form, I do not waive any of my legal rights, nor does it relieve the study investigators their duty (liability), but merely indicates that I have been informed about the research study in which I am voluntarily agreeing to take part in this research, however if you do have any other concern about your rights you may contact the chairperson of CMHS IRB :0788490522 or Deputy chairperson 0783340040. Having understood all the information pertaining to this study I therefore agree to participate in this study by appending my signature and name below.

Research Participant

Initials

Signature