Adherence to Infection Prevention and Control Practices Among Critical Care Staff at the Kenyatta National Hospital in Kenya

Glory Wanja Mutia

Master of Business Administration in Healthcare Management

Adherence to Infection Prevention and Control Practices and the Associated Factors Among Critical Care Staff, at the Kenyatta National Hospital, Kenya.

GLORY WANJA MUTIA

MBA-HCM/135761/2020

Submitted in partial fulfillment of the requirements for the award of Master of Business Administration in Healthcare Management (MBA-HCM) degree at Strathmore University.

STRATHMORE UNIVERSITY BUSINESS SCHOOL

INSTITUTE OF HEALTHCARE MANAGEMENT

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

Dr. Glory Wanja Mutia

15th May 2024

Approval

The dissertation of Glory Wanja Mutia has been reviewed and approved for examination by:

Prof. Francis P.N. Wafula (Supervisor)

15th May 2024

Associate Professor, Health Systems & Policy

Strathmore Business School

ABSTRACT

Compliance with infection prevention and control (IPC) practices is important for the provision of safe, quality, and efficient healthcare services. This study assessed healthcare worker (HCW) compliance with IPC practices and associated factors at the Kenyatta National Hospital intensive care units. The hospital-based cross-sectional study involved HCWs who were directly involved with patient care across the Hospital's ICUs. These included doctors (consultants, registrars, and medical officers), nurses, clinical officers, and allied professionals. A total of 189 providers were recruited using consecutive sampling, with care taken to include all key cadres. Data were collected using a structured self-administered questionnaire uploaded on Google Forms. Information was collected on compliance levels and the organizational and contextual influences, and analysis was done using SPSS version 28. Of the total respondents, 62% were aged between 31- 40 years, 63% were female, 62% were bedside nurses, and 98% had received some form of training on IPC, out of whom 91% said the training was conducted as part of in-service training by the Hospital. The findings established that 47.1% had optimal overall compliance with standard IPC practices. As for compliance with individual IPC components, 54.5% were optimally compliant with the use of PPEs, 40.2% were optimally compliant with the safe disposal of sharps, and 88.9% were optimally compliant with the appropriate disposal of waste. Adequate management support and work safety climate, absence of job hindrances, and education and training of HCWs on standard IPC practices, were the organizational and environmental factors that were found to have a significant correlation with adherence to standard IPC practices. Adequate knowledge and a good attitude toward IPC practices were the individual factors that were associated with adherence to standard IPC practices. In conclusion, a multifaceted approach encompassing both organizational-level and individual-level strategies should be employed in improving IPC compliance among HCWs.

TABLE OF CONTENTS

DECLARATION i
ABSTRACT ii
TABLE OF CONTENTS iii
LIST OF TABLES v
LIST OF FIGURES vi
LIST OF ABBREVIATIONS vii
ACKNOWLEDGMENT viii
DEDICATION ix
1 CHAPTER ONE: INTRODUCTION 1
1.1 Background 1
1.2 Problem Statement 3
1.3 Objectives 5
1.3.1 Broad Objective 5
1.3.2 Specific objectives 5
1.4 Research questions 5
1.5 Scope of the study 5
1.6 Significance of the study 6
2 CHAPTER TWO: LITERATURE REVIEW 7
2.1 Introduction to the chapter 7
2.2 Theoretical review 7
2.2.1 Introduction to the theoretical review 7
2.2.2 Dejoy's Behavioural Diagnostic Model 7
2.2.3 The Donabedian Framework 9
2.3 Conceptual literature review 10
2.3.1 Introduction to the Conceptual Literature Review Section 10
2.3.2 Infection prevention and control strategies 10
2.4 Empirical Literature Review 11
2.4.1 Introduction to the empirical review section 11
2.4.2 Adherence to Standard IPC Practices 11
2.4.3 Organizational and environmental factors that Influence Adherence to IPC practices 12
2.4.4 Individual factors that influence adherence to IPC 16
2.5 Conceptual Framework 18
2.6 Operationalization of the variables 18
2.6.1 Independent Variables 19
2.6.2 Dependent Variables 19
2.7 Research Gap 19
3 CHAPTER THREE: RESEARCH METHODOLOGY 20
3.1 Introduction 20
3.2 Research Philosophy 20
3.3 Research Design 20
3.4 Study Site and Setting 20
3.5 Population of the study 21
3.5.1 The inclusion criteria: 21
3.5.2 The exclusion criteria: 21
3.6 Sample size determination and sampling technique 21
3.6.1 Sample size determination 21
3.6.2 Sampling technique 23

3.7 Data collection methods and procedure 23
3.7.1 Data collection tools 23
3.7.2 Recruitment of the Research Assistants 25
3.7.3 Recruitment and consenting 26
3.7.4 Data collection procedures 26
3.8 Study variables 26
3.9 Data Quality 28
3.9.1 Pilot Test 28
3.9.2 Validity 28
3.9.3 Reliability 28
3.9.4 Practicality 29
3.10 Data Analysis 29
3.11 Ethical Considerations 30
4 CHAPTER FOUR: RESULTS 31
4.1 Overview of the Chapter 31
4.2 Response rate 31
4.3 Social demographic profile of the study participants 31
4.4 Compliance with standard IPC precautions among HCWs in the KNH ICUs 33
4.4.1 Rate of Compliance with standard IPC precautions among HCWs in the KNH ICUs. 33
4.5 The organizational and environmental factors that influence compliance with standard IPC practices among HCWs in KNH ICUs. 35
4.5.1 Association between Organizational and environmental factors and compliance with standard IPC practices 36
4.6 Individual factors that influence adherence to standard IPC practices among healthcare workers in the Intensive Care Units at KNH 37
4.6.1 Individual knowledge of IPC guidelines among health workers 37
4.6.2 Attitude towards IPC among Healthcare personnel at the Kenyatta National Hospital ICUs 39
4.7 The multivariable analysis of determinants of compliance with IPC guidelines 40
5 CHAPTER FIVE: DISCUSSION 41
5.1 Overview of the Chapter 41
5.2 Rate of Compliance with Standard IPC Practices 41
5.3 Individual factors that influence adherence to standard IPC practices 44
5.4 Study limitations 46
5.5 Conclusion 46
5.6 Recommendations 46
5.7 Areas for Further Research 47
REFERENCES 48
Appendix 1: Letter of Introduction and Consent Form 52
Appendix 3:Study Budget 69
Appendix 4:Gantt Chart 70
APPENDIX 5: KNH/UoN ERC Approval 71
Appendix 6: SU-ISERC Approval 72
Appendix 6: NACOSTI Permit 73

LIST OF TABLES

Table 1: Disaggregated sample size for each cadre 22
Table 2: Dimensions of the CSPS 24
Table 3: Table showing the data collection method for each objective 25
Table 4: Table showing study variables 26
Table 5: Characteristics of healthcare workers in the Intensive Care Units of the Kenyatta National Hospital 32
Table 6: The rate of compliance with standard IPC precautions among HCWs in the KNH IC 34
Table 7: Overall rating of organizational and environmental factors that influence compliance with standard IPC practices 35
Table 8: Bivariate analysis of the organizational and organizational factors that influence compliance with standard IPC practices 36
Table 9: Overall knowledge of standard IPC practices 37
Table 10: The bivariate analysis of the influence of an individual's knowledge on adherence to standard IPC practices 38
Table 11: Attitude towards IPC practices 39
Table 12: The bivariate analysis of the influence of an individual's attitude on compliance with standard IPC guidelines 39
Table 13: The multivariate analysis of the determinants of compliance with standard IPC guidelines 40

LIST OF FIGURES

Figure 1: Dejoy behavioural-diagnostic model 9

Figure 2: Donabedian framework 10

Figure 3: The conceptual framework 18

LIST OF ABBREVIATIONS

aOR	Adjusted Odds ratio
CDC	Centre for Disease Control and Prevention
EPIC	European prevalence of infections in intensive care
HAI	Hospital-acquired infections
HBM	Health belief model
HCW	Healthcare workers
INICC	International Nosocomial Infection Control Consortium
IPC	Infection prevention and control
IPSG	International Patient Safety Goals
LMIC	Low- and Middle-Income Countries
MDROs	Multidrug-resistant Organisms
MoH	Ministry of Health
OR	Odds Ratio
SARS	Severe Acute respiratory syndrome
SDG	Sustainable Development Goals
SP	Standard precautions
SSA	Sub-Saharan Africa
UHC	Universal Health Coverage
UN	United Nations
USA	United States of America

ACKNOWLEDGMENT

I am immensely grateful to God for His provision, guidance, and unmerited favor during this journey.

I would like to express my sincere gratitude to my supervisor, Professor Francis Wafula, for his guidance and invaluable feedback throughout the research process. His support has been instrumental in shaping this dissertation.

I am eternally grateful to my family for their unwavering love, encouragement, support, and prayers during this academic journey. Their unwavering belief in me has been a constant source of motivation, and I owe them a debt of gratitude for their endless sacrifices.

I would like to acknowledge the Kenyatta National Hospital for granting me approval to conduct the research at the institution. The support and cooperation of the hospital staff were essential to the success of this study.

I am also grateful for all the critical care healthcare workers of the Kenyatta National Hospital who took time out of their busy schedules to participate in this study. Their willingness to share their insights and experiences has been invaluable, and I am deeply appreciative of their contributions.

Lastly, I would like to extend my gratitude to all those who have supported me in any way during this journey, whether through encouragement, advice, or assistance. Your support has been truly appreciated, and I am thankful to each one of you.

DEDICATION

I dedicate this dissertation to my spouse and children for their unwavering support, love, understanding, and prayers during the entire journey. Their presence has been my anchor, providing comfort and strength through every challenge and triumph. This work stands as a tribute to their unwavering belief in me and the sacrifices they have made to see me succeed.

I also dedicate this work to my parents and siblings for their encouragement and support. Their belief in my abilities and unwavering support have been a constant source of motivation.

1 CHAPTER ONE: INTRODUCTION

1.1 Background

Patient safety is a fundamental element of quality health services which is key to realizing universal health coverage (UHC). Infection prevention and control is paramount to attain high-quality care for all individuals (*SIXTY-NINTH WORLD HEALTH ASSEMBLY*, 2016). It represents a practical and evidence-based approach that significantly enhances the quality of care and patient safety across all tiers of the healthcare system (WHO, 2022).Complying with infection prevention and control (IPC) practices is crucial for the provision of safe, quality, and efficient services (Dewi et al., 2019). Additionally, efficient IPC practices are essential prerequisites for all healthcare institutions to mitigate the occurrence of the morbidity and mortality related to nosocomial infections, hence achieving excellent patient outcomes (Alhassan et al., 2021). In many instances, HAIs are a consequence of poor quality care delivery stemming from inexistent or defective IPC programs (WHO, 2022).

Globally, approximately 1.4 million people are afflicted by nosocomial infections with a higher risk in developing countries due to limited resources (Donaghy, 2022). In a hospital infection prevalence study conducted by the World Health Organization (WHO), covering 47 hospitals across 14 countries spanning four continents, the findings indicated an average prevalence rate of 8.4% for HAIs. The highest incidence was observed in intensive care, acute surgical, and orthopedic units (Tikhomirov, 1987). In the USA, an estimated two million patients get hospital-acquired infections per year with roughly 90,000 dying. It is estimated that hospitals in the United States of America incur between US$28 billion and 45 billion in direct costs associated with hospital-acquired infections (Stone, 2009).

Moreover, a WHO-led systematic review, found that low- and middle-income countries (LMICs) have a greater prevalence of HAIs at 15.5% in contrast to 7.6% reported in high-income countries (Organización Mundial de la Salud, 2011). In Sub-Saharan Africa (SSA) the prevalence of HAIs is higher, ranging from 2.0% to 49% (Alhassan et al., 2021). Locally, a Ministry of Health (MoH) of Kenya initiated surveillance for hospital-acquired infections at three public hospitals of different cadres namely national, provincial, and district hospitals, revealed an overall prevalence of 4.4 per 100 patients' admissions (Ndegwa, 2015).

Furthermore, evidence from past literature suggests that intensive care units have the highest proportions of HAIs. For instance, a systematic review done by (Allegranzi et al., 2011) revealed that adult intensive care units in LMICs experience HAI infection densities of 47.9% per 1000 patient days, which is three times higher than rates reported in developed nations (Allegranzi et al., 2011). Moreover, according to the WHO, the incidence of HAIs among intensive care patients is 2 to 20 times higher in LMICs than the HICs (Allegranzi et al., 2011).

According to the WHO, effective utilization of evidence-based IPC practices has been shown to reduce the incidence of HAIs by 35 to 70% (Organization, 2016). Nonetheless, implementation of IPC measures remains suboptimal the world over, especially in LMICs. A WHO-led global survey on IPC implementation in 106 countries across the world revealed that only 54.7% of these had an active IPC program (World Health Organization, 2022). However, only four (3.8%) countries had all the minimum IPC requirements in place (World Health Organization, 2022). Furthermore, another WHO-led global survey on IPC in healthcare facilities found that only 15.2% of the healthcare facilities met the minimum WHO IPC requirements, ranging from 0% in low-income countries to 27.4% of primary and 10.7% of secondary and tertiary healthcare facilities in the high-income countries (Tomczyk et al., 2022).

These reports underscore the need to conduct a survey on compliance with IPC practices and determine the associated factors in LMICs. Furthermore, there exists limited data on compliance with these guidelines in our healthcare setup, despite their proven significance in abating the burden of HAIs. Moreover, the existing studies often have a narrow focus, assessing only a few aspects of IPC practices. Additionally, there is a dearth of data on compliance with IPC guidelines in the intensive care setting, even though these units bear the highest burden of HAIs. This study aimed to address this gap by evaluating the adherence rate to standard infection prevention and control (IPC) guidelines and identifying correlated factors within the intensive care units of KNH. The study focused on compliance with standard practices, including hand hygiene, safe injection practices, utilization of PPEs, waste segregation, and decontamination of surfaces. The study also looked at the organizational, environmental, and individual factors that influence compliance with standard IPC practices at the Kenyatta National Hospital. In terms of organizational and environmental factors, we evaluated the work safety climate, management support, training, and education on IPC, availability of PPE and IPC infrastructure, and staffing levels as some of the factors that

influence adherence to IPC. Whereas for the individual factors, we looked into how individual knowledge and attitude influence adherence to IPC practices.

1.2 Problem Statement

HAIs pose a major patient safety concern in the ICUs especially in LMICs (Alp & Damani, 2015) . In past studies, ICUs have been shown to bear a high burden of HAIs compared to other hospital units. For instance, the European Prevalence of Infection in Intensive Care (EPIC) study found that over 30% of all ICU admissions experience healthcare-associated infections (HAIs) (J. L. Vincent et al., 1995).Similarly, the '*Extended Prevalence of Infection in Intensive Care'* study conducted in 2007 in 1,265 ICUs from 75 countries found that 51% of the patients had some form of HAI, which contributed to a higher mortality and prolonged hospital stay among these patients (J.-L. Vincent et al., 2009).

The rate of ICU-acquired infections is three to five times higher in developing countries, in comparison to the United States, as reported by the International Nosocomial Infection Control Consortium (INICC), a research network focused on controlling HAIs in resource-limited hospitals (Rosenthal et al., 2008). This is in keeping with findings of a systematic review, that found more than 50% of ICU patients in developing countries were affected by HAIs (Nejad et al., 2011). Moreover, a study done locally reported a prevalence of 55.6% of HAIs with MDROs among ICU patients (Maina et al., 2023). Furthermore, an antimicrobial surveillance done at the Kenyatta National Hospital in 2015 found that 88% of the pathogens isolated were multi-drug resistant, while 26% were extensively drug-resistant (Wangai et al., 2019).

The magnitude of HAIs is higher in LMICs owing to a couple of factors including a lack of government regulations and guidance to implement IPC policies, a lack of IPC-trained personnel, and a lack of IPC infrastructure. Furthermore, most LMICs adopt IPC guidelines developed for higher-income countries which may not apply to the LMICs (Alp & Damani, 2015). Additionally, the demanding workload and understaffing in low-resourced healthcare facilities, especially ICUs hinder healthcare workers' ability to consistently adhere to basic IPC measures, such as hand hygiene, resulting in the transmission of harmful microorganisms between patients (Alp & Damani, 2015). Furthermore, a study done by (Hugonnet et al., 2007) demonstrated an association between a low nurse-to-patient ratio and an increased risk of HAIs. Further, the same study estimated that >30% of HAIs could be averted if healthcare facilities had a ratio of > 2.2 nurses to every patient (Hugonnet et al., 2007).

The World Health Organization (WHO) recommends a comprehensive and evidence-based multimodal strategy to enhance adherence to IPC measures. This approach comprises five essential elements, each playing a crucial role in fostering a safer healthcare environment (WHO, 2009). These include; i). System change which entails establishing an enabling environment for IPC compliance by provision of IPC infrastructure and necessary equipment for effective IPC practices, ii). Training and education to ensure healthcare workers (HCWs) possess adequate knowledge and skills related to IPC, iii). Regularly monitoring IPC practices to identify areas for improvement in adherence to guidelines and providing timely feedback to healthcare professionals, iv). Reminders and communication by placing cues to action at the point of care to serve as reminders for IPC practices, and ensuring effective communication of IPC guidelines to HCWs through various channels, and v). Cultivating a supportive culture of safety within the healthcare institution. This can be done by senior managers demonstrating commitment by providing adequate funding for IPC resources and encouraging a collective responsibility for IPC adherence among all staff members (WHO, 2009).

By integrating these five key elements into healthcare systems, organizations can create a robust framework for IPC compliance. This approach addresses not only the technical aspects of IPC but also emphasizes the importance of organizational culture, ongoing education, and managerial support in maintaining a safe healthcare environment (WHO, 2009). From evidence, implementation of IPC best practices using the multimodal approach has been shown to lead to more than a 30% reduction in HAIs (Organization, 2016). Moreover, a systematic review conducted to assess the efficacy of infection prevention and control (IPC) programs in long-term care facilities, revealed that utilization of the WHO multimodal strategy in IPC implementation was associated with a decrease in respiratory infections, infections with MDROs, and improved compliance with hand hygiene practices in these facilities (Lee et al., 2019)

On the contrary, non-adherence to IPC practices in hospitals has serious consequences. It compromises patient outcomes, leading to prolonged hospital stays, increased bed occupancy, the strain on already limited hospital resources, development of multidrug-resistant organisms, long-term disability, higher healthcare costs for the hospital, and significant financial burdens for patients and their families, ultimately resulting in untimely deaths (Abalkhail et al., 2021; Sahiledengle et al., 2018). This highlights the significance of examining the execution of IPC standards within the hospital to pinpoint the precise factors

influencing compliance levels. This, in turn, will facilitate the implementation of corrective actions aimed at enhancing the safety and quality of healthcare services offered at the facility.

1.3 Objectives

1.3.1 Broad Objective

To assess adherence to standard IPC practices and associated factors among HCWs at the Kenyatta National Hospital intensive care units.

1.3.2 Specific objectives

i. To examine the rate of compliance with standard IPC precautions among HCWs in the KNH ICUs.
ii. To determine the organizational and environmental factors that influence compliance with standard IPC practices among HCWs in KNH ICUs.
iii. To examine the individual factors that influence compliance with standard IPC practices among HCWs in KNH ICUs.

1.4 Research questions

i. What is the rate of compliance with standard IPC practices among HCWs in the KNH ICUs?
ii. What are the organizational and environmental factors that influence compliance with standard IPC guidelines among KNH ICU HCWs?
iii. What are the individual factors that influence compliance with standard IPC guidelines among HCWs in KNH ICUs?

1.5 Scope of the study

The study focused on the level of compliance with standard IPC practices and the determinants among HCWs at the KNH ICUs. The HCWs in question included doctors (specialists, registrars/senior house officers, and medical officers), clinical officers, different cadres of nurses, and allied health workers (physiotherapists). The study focused on the following aspects of standard IPC practices namely, hand hygiene practices, utilization of

PPEs, safe injection practices, surface decontamination, and waste segregation and disposal.

The main theme of the research centered around examining the extent to which adherence to standard IPC practices is followed at the ICUs of the Kenyatta National Hospital. The study also explored the organizational, environmental, and individual factors that influence adherence to these IPC protocols. The study was conducted at the Kenyatta National Hospital, which is located in Nairobi County, Kenya.

1.6 Significance of the study

The study aimed to assess compliance with standard Infection Prevention and Control (IPC) practices and identify influencing factors at Kenyatta National Hospital (KNH) Intensive Care Units (ICUs). This assessment is crucial for management to identify potential gaps in infection control and devise targeted strategies for improvement in adherence, which could subsequently lead to improved patient safety and quality of care in the healthcare facility.

Additionally, the findings will inform the development and implementation of IPC policies within healthcare facilities, thereby enhancing patient outcomes. The insights garnered from this study can be extrapolated to the rest of the hospital and other medical institutions, thereby improving overall healthcare quality. From a research standpoint, the findings will contribute to our understanding of how individual and institutional factors interact to influence IPC compliance, paving the way for further empirical research aimed at enhancing quality and safety within healthcare systems.

2 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction to the chapter

This chapter examines theoretical and empirical literature touching on determinants of behavior and IPC practices, as well as the formulation of a conceptual framework and the definition of variables for the study. The theoretical review is focused on Dejoy's Behavioural Diagnostic Model and the Donabedian Framework.

2.2 Theoretical review

2.2.1 Introduction to the theoretical review

The study was guided by Dejoy's Behavioural Diagnostic Model and the Donabedian Framework. Dejoy's Behavioral Diagnostic Model identifies various factors, including organizational, environmental, and individual elements, that impact HCWs' adherence to IPC guidelines. On the other hand, the Donabedian Framework offers a framework for assessing the quality of care by considering interconnected aspects of structure, process, and outcomes.

2.2.2 Dejoy's Behavioural Diagnostic Model

It's a theoretical model derived from previous research by Greene 1991 and DeJoy 1996. The model has three domains including organisational factors, environmental factors, and individual factors that influence compliance with IPC guidelines (Moore et al., 2005). Previously, the model has been employed to explore self-protective behaviors in the workplace and has been used as a guiding framework in research focusing on healthcare workers' perceptions regarding compliance with IPC practices (Moore et al., 2005). Furthermore, the model has been utilized in a review to identify obstacles and enablers influencing healthcare workers' adherence to IPC practices, particularly in cases of infectious respiratory illnesses such as tuberculosis, Middle East respiratory syndrome (MERS), severe acute respiratory syndrome (SARS), and influenza (Houghton et al., 2020).

The organizational factors assess how the healthcare organization either supports or impedes HCWs' adherence to IPC practices. These factors consist of three subdomains: safety climate, communication of IPC guidelines, and availability of training programs. Safety climate entails the creation of a safe work environment by the management, through developing and

implementing IPC guidelines and ensuring the workload is manageable by having adequate staffing. Communication of IPC guidelines entails the dissemination of IPC guidelines in a manner easily accessible and understandable by the HCWs. The availability of training programs subdomain examines the training requirements of the HCWs regarding IPC guidelines and delivers the training (Houghton et al., 2020; Moore et al., 2005).In relation to this study, the organizational factors that have the potential to influence adherence include, having IPC guidelines in place, having an IPC committee, dissemination of IPC guidelines to healthcare workers, work safety climate, workload and staffing, and training on IPC guidelines.

Environmental factors encompass the workplace environment's structure and the availability of resources that can either facilitate or impede healthcare workers' adherence to IPC guidelines. This category includes the physical attributes of the workplace, such as the presence of essential facilities like isolation rooms and handwashing sinks with running tap water, which are crucial for supporting IPC practices. Additionally, the availability of Personal Protective Equipment (PPE) is a significant aspect within this domain, as it determines whether there is sufficient and appropriate PPE to ensure adherence to IPC guidelines (Houghton et al., 2020; Moore et al., 2005). Concerning this study, the environmental factors that are expected to impact adherence to IPC guidelines consist of the presence of IPC infrastructure, including handwashing facilities, waste disposal systems, availability of PPEs, and access to negative pressure isolation rooms.

Individual factors examine how the knowledge, beliefs, and attitudes of HCWs impact their compliance with IPC guidelines. These factors encompass individual knowledge, which pertains to the understanding healthcare workers have regarding IPC guidelines and their significance in promoting compliance. Individual attitudes refer to how healthcare workers perceive the importance of adhering to IPC measures as a means of safeguarding themselves, their families, and their patients. Lastly, individual beliefs encompass the influence of healthcare workers' sense of responsibility and duty of care, as well as their fears and concerns, on their adherence to IPC guidelines (Houghton et al., 2020; Moore et al., 2005).

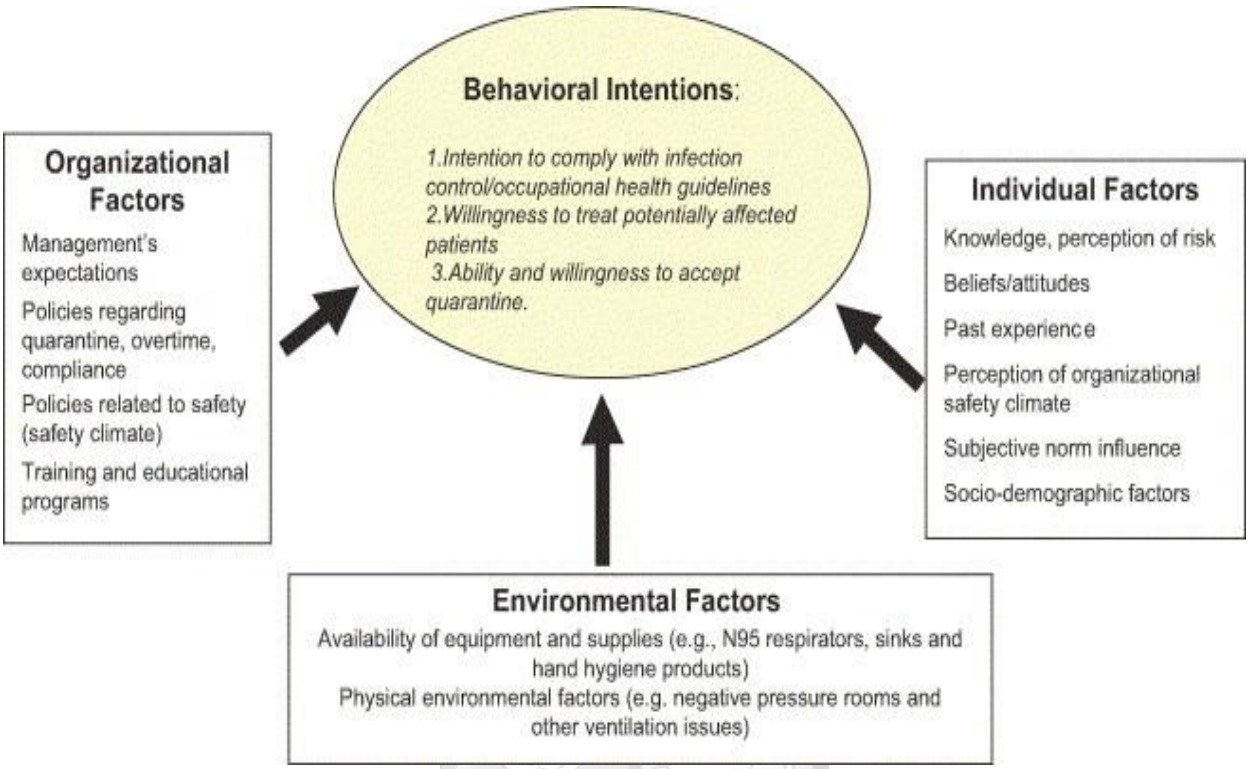


Figure 1: Dejoy behavioural-diagnostic model

Adapted from DeJoy D.A behavioural-diagnostic model for fostering self-protective behaviour in the workplace.

2.2.3 The Donabedian Framework

It is a healthcare quality framework that utilizes three constructs to assess the quality of healthcare delivery. The three constructs include structure, process, and outcome (Cohen & Shang, 2015). It was developed by Avedis Donabedian. According to his postulation, a favorable structure should foster positive processes, and these positive processes in turn, should lead to favorable outcomes in a unidirectional manner (Donabedian, 1988).

Structures for healthcare delivery include physical and organizational resources utilized in the provision of healthcare such as the availability of PPE; while processes are activities done to provide patient care, and the outcome is the desired result of healthcare provision. There are two distinct types of outcomes: technical outcomes, which involve the physical and functional

results of care, including the absence of complications; and interpersonal outcomes, which pertain to the patient's satisfaction with the care received and the effect of that care on their perceived well-being and quality of life (Donabedian, 1988).

The structures of care include organizational factors such as work safety climate, having IPC guidelines in place, and infrastructure for IPC implementation such as handwashing facilities, and waste segregation facilities among others. The process of care entails healthcare workers practising the existing IPC guidelines such as handwashing, waste segregation, and use of PPE in the routine care of patients. The desired outcome is an increased compliance rate with standard IPC guidelines.

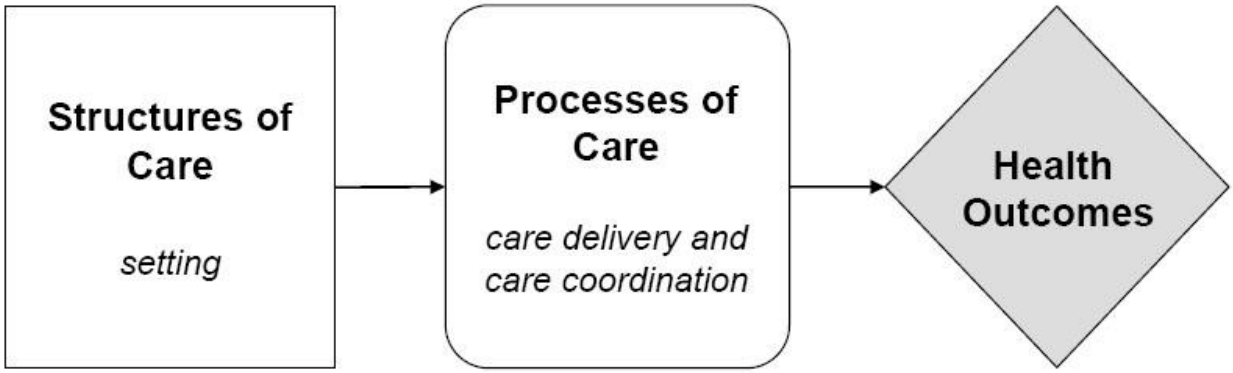


Figure 2: Donabedian framework

Adopted from Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination

2.3 Conceptual literature review

2.3.1 Introduction to the Conceptual Literature Review Section

This section details the key concepts of the study, including the IPC strategies

2.3.2 Infection prevention and control strategies

The CDC defines IPC as a practical, evidence-based approach aimed at preventing both health workers and patients from acquiring nosocomial infections. IPC practices are

categorized into universal or standard precautions and transmission-based precautions (CDC, 2016). Universal precautions are fundamental infection prevention measures that are universally applicable in all patient care settings, regardless of the patient's infection status. These precautions encompass essential practices like hand hygiene, utilization of PPE such as gloves and masks, respiratory hygiene (cough etiquette), proper disposal of sharps, safe injection practices employing aseptic techniques, sterilization of instruments and devices, as well as the maintenance of clean and disinfected hospital surfaces. Transmission-based precautions constitute the second level of IPC practices and are implemented when patients have illnesses that are prone to spreading through contact, aerosolization, or droplets (CDC, 2016). The CDC recommends the use of SPs on all patients. Adherence to standard precautions reduces the risk of exposure to blood and other body fluids, as well as cross-contamination between patients thus minimizing HAIs (Sreedharan et al., 2011).

2.4 Empirical Literature Review

2.4.1 Introduction to the empirical review section

This section examines literature related to the study's objectives, namely, the level of adherence to IPC, and organizational and individual factors that play a role in influencing adherence to IPC guidelines.

2.4.2 Adherence to Standard IPC Practices

Adherence to standard IPC practices remains a challenge in healthcare facilities across the world. The LMICs have been shown to have the lowest rates of compliance with standard IPC practices despite having the highest burden of HAIs.

In a cross-sectional study conducted at an Ethiopian tertiary health facility to assess compliance with standard Infection Prevention and Control (IPC) practices, it was found that the overall adherence of healthcare workers (HCWs) to standard precautions (SPs) was remarkably low, standing at only 12%. Nevertheless, when analyzing individual components of SPs, certain items showed more positive results. For instance, a relatively higher percentage of HCWs demonstrated consistent compliance with specific actions, such as handwashing after exposure to body fluids (92.2%), immediately following removal of gloves (80.6%), and wearing clean gloves when at risk of exposure to body fluids (88.7%). Moreover,

a substantial proportion of HCWs changed gloves between interactions with different patients (88.9%) and disposed of used sharps in puncture-resistant containers at the point of use (87.2%) (Haile et al., 2017).

A locally conducted study in the western part of Kenya found that only 53.2% of healthcare workers (HCWs) were compliant with hand hygiene practices. Among the respondents, a majority (57.7%) preferred using alcohol hand rub over soap and water (42.3%). The highest hand hygiene compliance was observed after high-risk exposure to body fluids (99.1%), while the lowest compliance was noted before handling patients (60.4%) (Kisaka, 2021). Regarding the appropriate utilization of Personal Protective Equipment (PPE), the study revealed that only 52.3% of HCWs were adhering to recommended practices during patient care. Among the PPEs, gloves were the most commonly used (77.5%), while goggles and facemasks were the least utilized. Safe injection practices had an above-average compliance rate among 59.5% of the respondents. An encouraging proportion (99.1%) reported that they do not reuse needles and syringes, and 93.7% stated they always dispose of sharps in safety boxes. However, some HCWs showed poor safe injection practices, with 23.4% reporting that they recap needles after use, putting themselves at risk of needle stick injuries (Kisaka, 2021).

2.4.3 Organizational and environmental factors that Influence Adherence to IPC practices

Organizational and environmental factors such as the safety climate of the organization, availability of IPC training and education programs, having IPC protocols in place, having an IPC committee, dissemination of IPC guidelines to the healthcare workers, and workload and staffing directly influence compliance to IPC guidelines.

2.4.3.1 Safety Climate

Work safety climate refers to the prevailing perceptions and attitudes about safety within an organization or workplace. It encompasses the collective beliefs, values, and behaviours of employees, supervisors, and management regarding safety practices and protocols. The work safety climate reflects how safety is prioritized, communicated, and integrated into the daily operations and culture of the organization. In healthcare institutions, safety climate comprises six distinct components: (1) endorsement and support from senior management for safety initiatives, (2) the absence of workplace obstacles that impede safe work practices, (3) the cleanliness and organization of the work site, (4) positive staff interactions marked by low

conflict and effective communication, (5) consistent safety-related feedback and training delivered by supervisors, and (6) the availability of personal protective equipment (PPE) and engineering controls (Gershon et al., 2000). Of these, the presence of robust support from senior management for safety programs, the absence of barriers hindering safe work practices, and the cleanliness and orderliness of the work site were found to have a significant positive correlation with compliance to standard IPC practices (Gershon et al., 2000).

Studies have shown that institutions with a strong commitment to creating a safe work climate have higher compliance levels to standard IPC protocols (Moore et al., 2005). A systematic review conducted to explore the obstacles and enablers influencing HCWs' adherence to IPC practices, revealed that HCWs were more likely to adhere to IPC practices if they received support from their organization's management. HCWs felt that supportive gestures by the hospital adminstration and management encouraged them to be more adherent to IPC guidelines. Supportive actions such as, administrators making rounds in units, offering words of encouragement, modeling appropriate infection control practices, and well-being checks in, motivated HCWs to adhere to guideline protocols. On the contrary, HCWs who felt unsupported were demotivated and had low adherence levels to guidelines including adhering to IPC protocols (Houghton et al., 2020). Similarly, a cross-sectional study done in Ethiopia found that HCWs who received management support and had a safe work climate, had 2.23 times higher adherence levels to SP, in contrast to those who received less support (Haile et al., 2017).

2.4.3.2 Workload and staffing

Increased workload and health worker fatigue associated with adhering to some of the IPC guidelines such as donning PPEs, especially in busy clinical situations, have also been identified as some of the barriers to IPC adherence (Houghton et al., 2020) (Moore et al., 2005). Similarly, another review identified a high workload and a high patient-to-nurse ratio as other predictors of noncompliance with IPC (Alhumaid et al., 2021).

2.4.3.3 Availability of IPC protocols

Moreover, healthcare workers' adherence to IPC measures is influenced by the availability of IPC protocols and the alignment of the guidelines with international standards. If the HCWs perceived the guidelines as long, ambiguous, or not aligned with international standards, they

felt unsure about which guidance to follow. Inappropriate guidelines were described as being too lengthy, difficult to follow, not reflecting national or international guidance, and lacking clarity. Ambiguous guidelines contributed to confusion among healthcare workers regarding the necessary elements of IPC. Additionally, the discrepancy between taught practices, personal beliefs, and recommended guidelines led to more confusion. In an intensive care setting during the H1N1 pandemic, the absence of clear recommendations on personal protective equipment (PPE) made the healthcare workers feel unprotected and undervalued (Houghton et al., 2020).

2.4.3.4 Communication of IPC Protocols

Additionally, successful implementation of IPC guidelines requires clear communication strategies and the sharing of new information regarding IPC protocols with the HCWs. Organizations with clear communication strategies, including focused communication, summarizing main points of the protocol updates, and coordination of the communique by a single department or source, facilitated timely and concise sharing of information which ultimately resulted in better adherence to IPC protocol. In contrast, poor communication strategies led to a fragmented approach, where healthcare workers gather information piecemeal from various sources, including the media, causing confusion among HCWs, and resulting in poor adherence to IPC guidelines (Houghton et al., 2020). Additionally, the use of multiple channels or methods of communication such as posters, daily case conferences, mobile phone messaging, and summary notices during shift changeovers were considered useful to ensure all staff receive accessible information and updates on IPC guidelines (Houghton et al., 2020). HCWs preferred communication channels other than email as they didn’t have access to and time to read emails while caring for patients (Houghton et al., 2020).

2.4.3.5 Availability of Training Programs

Adequate training and education on specific infections and proper use of PPE are essential for the successful implementation of IPC guidelines. Insufficient training on specific infections and proper use of (PPE) contributes to poor implementation of infection prevention and control (IPC) guidelines. Past studies have identified poor knowledge of risk factors associated with specific infections and lack of training on the specifics of PPE as factors limiting healthcare workers' understanding and adherence to IPC guidelines (Houghton et al., 2020). Additionally, institutions where IPC training is voluntary and the performance of HCWs is not assessed in

practice have been shown to have low adherence to standard IPC guidelines (Houghton et al., 2020). Similarly, another study found that the HCWs who had undergone infection prevention training were 2.9 times more likely to consistently follow standard precautions compared to those who had not received such training (Haile et al., 2017). Moreover, another systematic review found that higher IPC compliance was observed among HCWs who received regular IPC training and education and were involved in the activities of the IPC committee (Alhumaid et al., 2021).

However, evidence from other systematically reviewed literature seems to suggest that a deficit in knowledge of IPC is not a major barrier to IPC adherence. Therefore, conducting training sessions on IPC may not result in a substantial change in compliance with IPC. The review found that providing regular feedback to HCWs on their adherence to standard IPC was associated with higher compliance rates to universal IPC protocols (Moore et al., 2005).

2.4.3.6 Availability of PPEs and Engineering Controls

The lack of adequate and appropriate PPE supply and engineering controls poses significant barriers to ensuring the safety of both patients and healthcare workers, hindering adherence to IPC. Evidence from the literature indicates that the availability of sufficient space in healthcare facilities to isolate patients is important for healthcare workers to effectively follow infection control methods. Furthermore, studies have shown that healthcare workers perceive the physical environment and available space as crucial in managing and preventing cross-contamination. The lack of appropriate physical space with provisions such as good ventilation, negative pressure rooms with anterooms, and alarm systems hinders healthcare workers' ability to adhere to recommended infection control guidelines (Houghton et al., 2020). The systematic review also highlighted the significance of having accessible handwashing facilities and surface decontamination supplies as critical factors influencing healthcare workers' adherence to infection control practices (Houghton et al., 2020). Moreover, they found the challenges faced by healthcare workers in adhering to environmental decontamination practices and hand washing practices as lack of supplies and inadequate handwashing infrastructure such as the absence of adjacent sinks, insufficient handwashing soaps, and a lack of running water (Houghton et al., 2020).

Similar findings have been reported in other studies. A review of knowledge of IPC and factors that influence adherence, lack of IPC equipment including alcohol hand rub, handwashing

sink, soap, and hand towels were identified as some of the barriers to IPC adherence (Alhumaid et al., 2021). Furthermore, a cross-sectional study conducted in Ethiopia revealed that healthcare workers who had convenient access to personal protective equipment (PPE) were 2.87 times more likely to consistently adhere to standard precautions compared to those who did not have easy access to PPE (Haile et al., 2017). Locally, a study done in western Kenya, found a positive correlation between the provision of adequate PPE by management and full compliance with IPC guidelines (Kisaka, 2021).

2.4.4 Individual factors that influence adherence to IPC

Social demographic characteristics of respondents have been shown to have a bearing on compliance with standard IPC guidelines. From the literature, younger (below 40 years of age) HCWs have been shown to have higher compliance with SP compared to their older counterparts. This could be explained by their recent training, as opposed to a direct effect of age (Moore et al., 2005). The type of profession has also been shown to influence adherence to IPC, with one study showing that occupational therapists and physiotherapists had the highest compliance at 89 % while senior consultants had the lowest adherence at 22% (Moore et al., 2005). In another review, doctors were noted to have poor compliance with standard IPC precautions including handwashing, and PPE use as compared to nurses (Alhumaid et al., 2021). Similarly, a study done locally revealed a statistically significant correlation between the healthcare worker cadre with their compliance with IPC guidelines. Nurses were noted to have higher compliance with hand hygiene at 58.9% compared to doctors who had a compliance rate of 28.6%. This was attributed to superiority complex and negative attitude among doctors (Kisaka, 2021).

A systematic review of knowledge of IPC among HCWs and factors influencing compliance to IPC found that knowledge, education, and training on IPC were the major factors that determined HCWs' level of compliance with IPC guidelines. HCWs who were more knowledgeable about the benefits of IPC compliance and the potential consequences of not adhering to IPC practices were found to be more compliant (Alhumaid et al., 2021). Nevertheless, certain studies have demonstrated that while possessing knowledge about the appropriate use of Personal Protective Equipment (PPE) is essential, it may not be sufficient to ensure healthcare workers' adherence to standard Infection Prevention and Control (IPC) practices. For instance, in one study, the participating healthcare workers exhibited high levels of knowledge regarding standard IPC practices, but this knowledge did not necessarily lead

to correspondingly high levels of adherence (Gershon et al., 1995). This implies that other factors at the individual level may play a role in influencing compliance with IPC. One such factor is individual perception of risk, past studies have shown that HCWs who have had exposure to blood and other body fluids without acquiring an HAI may have a perception of decreased risk of acquiring HAI therefore decreasing their compliance to IPC guidelines (DeJoy et al., 2000). While, HCWs who perceive a higher risk of infection are 3.46 times more likely to consistently adhere to standard precautions compared to those with a lower perception of infection risk (Haile et al., 2017).

Moreover, individual attitudes play a role in influencing adherence to IPC guidelines. HCWs who have negative attitudes toward the use of PPEs such as masks due to the discomfort associated with use, have been shown to have lower compliance rates. Individual beliefs such as fear of infecting themselves or their loved ones with HAIs motivated HCWs to be more adherent to IPC guidelines (Alhumaid et al., 2021; Woith et al., 2012) Similarly, a qualitative study done in a Dutch institution, identified the lack of IPC knowledge, low-risk perception, and negative attitude such as laxness or refusal to implement IPC guidelines as some of the barriers to IPC adherence (Houben et al., 2022).

2.5 Conceptual Framework

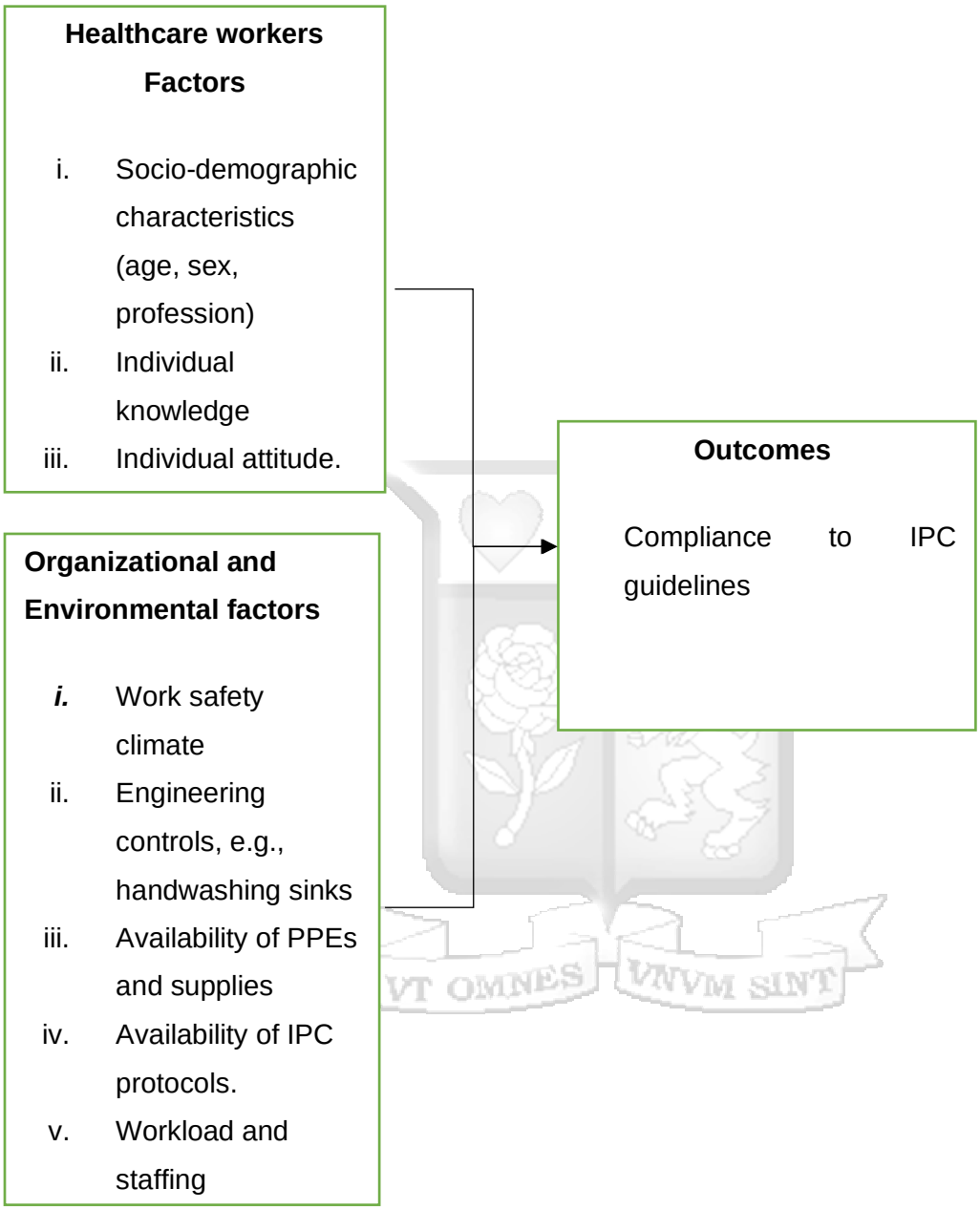


Figure 3: The conceptual framework

2.6 Operationalization of the variables

The conceptual framework of this study was structured to illustrate the connection between the independent variables and the dependent (outcome) variable.

2.6.1 Independent Variables

This category included the HCW factors and the organizational factors. The HCW factors included sociodemographic factors (age, sex, professional category, years of experience, level of education among others), individual knowledge, and attitude towards IPC. The organizational and environmental factors in this study encompassed several elements, including the safety climate within the organization, communication of Infection Prevention and Control (IPC) guidelines, the availability of IPC training, the presence and accessibility of Personal Protective Equipment (PPE), as well as the structural aspects of the physical environment, such as the availability of a handwashing sink with running water.

2.6.2 Dependent Variables

This category represented the outcome variable which is compliance with IPC guidelines.

2.7 Research Gap

The literature review demonstrates that despite the availability of proven and cost-effective standard infection prevention and control (IPC) measures, healthcare facilities in low- and middle-income countries (LMICs) continue to bear a high burden of nosocomial infections. The prevalence of healthcare-associated infections (HAIs) in LMICs ranges from 2.5% to 14.8%, as reported in a systematic review (Nejad et al., 2011). Additionally, another systematic review revealed that adult intensive care units in these countries experience HAI infection densities of 47.9% per 1000 patient days, which is three times higher than rates reported in developed nations (Allegranzi et al., 2011).

Despite the significance of IPC measures, there is limited data on compliance with these guidelines in our healthcare setup. Furthermore, existing studies often have a narrow focus, assessing only a few aspects of IPC practices. Additionally, there is a dearth of data on compliance with IPC guidelines in the intensive care unit setting, even though these units bear the highest burden of HAIs. This study aimed to address this gap by investigating the rate of compliance with standard IPC guidelines and identifying associated factors in the intensive care units of KNH.

3 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology that was employed to achieve the research objectives. It includes the following sub-sections: research philosophy, research design, study population, sampling procedure, sample size determination, data collection methods, data quality assurance measures, and data analysis techniques.

3.2 Research Philosophy

A positivist philosophical approach was employed, meaning that the research processes were focused on unearthing a stable truth through objective data collection and interpretation. In positivist studies, the researcher is confined to the tasks of collecting and objectively interpreting data, devoid of subjective biases(Park et al., 2020). Furthermore, it seeks to derive a functional relationship between independent variables and outcome variables (Park et al., 2020)

3.3 Research Design

The study adopted a hospital-based analytical cross-sectional design. It aimed to measure the association between organizational, environmental, and individual factors and compliance with IPC practices.

3.4 Study Site and Setting

The study took place at the Kenyatta National Hospital Intensive Care Units (ICUs). KNH is a public level six teaching and referral hospital based in Nairobi County, Kenya. It receives patients referred for specialized care including intensive care from different parts of the country. The hospital has the highest number of ICUs in the country, these include the main ICU, medical ICU, neurosurgical ICU, cardiothoracic ICU, obstetrics and gynecology ICU, paediatric ICU, neonatal ICU, and prime care ICU. It has a total bed capacity of approximately 1800 beds, with a total ICU bed capacity of approximately 52 beds. The focus of this study on ICUs was mainly because they are high-risk settings for HAIs, especially with MDROs due to suppressed immune status, multiple invasive devices, and shared equipment.

3.5 Population of the study

The study focused on healthcare workers involved with direct patient care in the intensive care units of KNH. These include doctors (specialists, senior house officers, and medical officers), nurses in different cadres, clinical officers, and allied healthcare workers (such as physiotherapists).

3.5.1 The inclusion criteria:

Healthcare workers working at the KNH ICUs who are involved in direct patient care. These include doctors (specialists, senior house officers, and medical officers), nurses in different cadres, clinical officers, and allied healthcare workers (physiotherapists).

3.5.2 The exclusion criteria:

Healthcare workers who are not involved in direct patient care such as the supportive staff (patients' porters and cleaners).

3.6 Sample size determination and sampling technique

3.6.1 Sample size determination

The sample size was calculated based on the existing population of healthcare providers in the KNH Intensive Care Units. There are approximately 301 healthcare providers in the KNH intensive care unit (211 nurses, 10 physiotherapists, 20 clinical officers, and 60 doctors including registrars). The sample size was calculated using Taro Yamane's formula (Uakarn, 2021) as follows:

$$n = \frac{N}{1+N(e^2)}$$

The variables in this formula are:

n = the sample size

N = the population of the study (301)

e = the margin error in the calculation (0.05)

Thus,

$$n = \frac{301}{1+301(0.05^2)}$$

= 171.75~ 172

Including a 10% non-response rate, (172+17) = 189

Thus, a sample size of 189 healthcare providers was recruited for the study.

Thus, the disaggregated sample size for each cadre will be:

Table 1: Disaggregated sample size for each cadre

	Total Population	**Sample per cadre**
Nurses	211	211/301*189 =132
Doctors including registrars	60	38
Clinical Officers	20	13
Physiotherapists	10	6
Total	**301**	**189**

3.6.2 Sampling technique

Sampling technique refers to the method used to select a subset of individuals, known as the sample, from a larger population for the purpose of conducting research. The sampling technique chosen should aim to represent the population accurately and minimize bias (Taherdoost, 2018). Consecutive sampling techniques were used to recruit study respondents in each of the cadres. Consecutive sampling technique is a non-probability sampling technique commonly used in research when it is not feasible or practical to use random sampling methods. With consecutive sampling, participants are selected based on their availability and willingness to participate in the study (Singh & Masuku, 2014). Healthcare workers who met the inclusion criteria were recruited consecutively until the sample size was attained.

3.7 Data collection methods and procedure

3.7.1 Data collection tools

A self-administered structured questionnaire was used for data collection. The questionnaire was uploaded onto a Google form (https://forms.gle/kHqC6zZNwDMx3LWu9) to ease the data collection process. The questionnaire was divided into four sections. The first section focused on the socio-demographic profile of the individual respondents, the second section focused on the level of adherence to SP using 20 items on a four-point Likert scale, section three looked into the organizational and environmental factors that influence adherence to IPC using a 4 factor (20-item) tool, section four focused on the individual factors i.e. knowledge and attitude that influence compliance to IPC. The study questionnaire was designed using the variables identified in the reviewed literature and was aligned with the primary objectives of the research. Some of the questions were adopted from the CDC guidelines of standard IPC practices (Centers for Disease Control and Prevention [CDC], 2022).

Data on the socio-demographic characteristics was captured using nine questions. The questions included age, sex/gender, profession, duty station, years of experience in an ICU setting, highest level of education obtained, and training on IPC.

Compliance with standard IPC practices was assessed using the self-reported compliance with standard precautions scale (CSPS). CSPS is a self-administered questionnaire

consisting of 20 items, which provide guidelines for the proper utilization of personal protective equipment, appropriate disposal of sharps and waste materials, handling spills and used items, and measures to prevent infection transmission between individuals. The CSPS scale has 16 positively worded items and four negatively worded (items 2, 4, 6, & 15) statements. Respondents indicated their level of adherence to standard precautions using a four-point Likert scale ranging from 0 (never), 1 (seldom), 2 (sometimes), to 3 (always). Those who responded with "always" in positively worded items and "never" in negatively worded items were considered fully compliant and awarded a score of one, while those who chose other options were categorized as non-compliant and assigned a score of zero (Lam, 2011). The total score on CSPS ranged from 0 to 20, with higher scores indicating greater compliance with standard precautions. The overall compliance rate was calculated by determining the average compliance across all 20 items and converting it to a percentage. A total compliance rate of ≥ 90% was considered optimal, between 80%-89% as satisfactory, between 50%-79% as suboptimal, and a score of < 49% as poor (Lam, 2014). CSPS has demonstrated satisfactory validity, acceptable internal consistency, and high reliability in previous studies (Lam, 2011, 2014). The items of The CSPS scale are further grouped into 5 dimensions based on the standard precaution guidelines as shown in the table below.

Table 2: Dimensions of the CSPS

Dimensions	**Total number of item(s)**
Use of protective devices	6 items (items 7,10,13,14,15, &16)
Disposal of waste	1 item (item 17)
Disposal of sharps	3 items (items 4,5, & 6)
Decontamination of spills and used articles	3 items (items 18, 19, & 20)
Prevention of cross-infection from person to person	7 items (items 1,2,3,8,9,11 &12)

To collect data on organizational and environmental factors that influence adherence to standard IPC, a 20-item tool was developed guided by literature. Each item was scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The maximum score was 100 points, with a range of 20 to 100 points.

For the individual factors that influence adherence to IPC practices, we focused on knowledge and attitude. Individual knowledge was assessed using 25 questions, with each question being scored on a 5-point Likert scale ranging from 0 (strongly disagree) and 4 (strongly agree). The maximum score was 100 points, with a range of 0 to 100. Overall knowledge was categorized as poor (< 50 points, <50%), moderate (≥ 50 to 79 points, ≥ 50-79%), and good (80- 100 points, 80-100%). The knowledge of respondents on the different aspects of IPC was summed and rated as either poor (< 50 points, <50%), moderate (≥ 50 to 79 points, ≥ 50-79%), and good (80- 100 points, 80-100%).

Individual attitude was assessed using 20 questions, each scored on a 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). The maximum possible score was 100 points with a range of 20 to 100 points. The attitude was classified as poor/negative (< 80 points, < 80%) and good/positive (80 to 100 points).

Table 3: Table showing the data collection method for each objective

Specific objective	Data collection method
Determine the level of adherence to standard IPC practices among HCWs in the KNH ICUs	Self-administered questionnaire
Determine the organizational and environmental factors that influence adherence to standard IPC protocols among HCWs in the KNH ICUs.	Self-administered questionnaire
Determine the individual factors that influence adherence to standard IPC protocols among HCWs in the KNH ICUs.	Self-administered questionnaire

3.7.2 Recruitment of the Research Assistants

One research assistant was recruited to aid in the data collection process. The research assistant selected was a qualified nurse who had experience in data collection at KNH. The research assistant was trained on the key data collection processes that were adopted in this study.

3.7.3 Recruitment and consenting

Upon obtaining approval from the Ethics and Review Committee and receiving permission from the KNH administration, the researcher, along with the research assistant, approached the nurse managers of the different intensive care units. The head of the unit was engaged to provide a list of healthcare workers in the department. The study's inclusion and exclusion criteria were then used to identify eligible healthcare workers. Potential participants received a detailed explanation of the informed consent process, including the study's purpose, potential risks, and benefits of participating. Only those who provided consent to participate were recruited for the study.

3.7.4 Data collection procedures

The data was collected by research assistants together with the principal investigator. A self-administered structured questionnaire uploaded on Google Forms was used. The researcher selected and involved only those participants who met the inclusion criteria and willingly consented to take part in the study. They were approached during their free time mainly during shift change when they were not fully engaged with patients or while resting in the staff room. The Google link to the structured questionnaire was shared via WhatsApp messenger or email, some of the participants were also given a tablet with the questionnaire to use to fill their responses. The participants were expected to respond to all the questions with honesty. The research assistant was on standby to help ensure that any questions that were not well understood were explained for clarity. Once the questionnaires were filled, the research assistants cross-checked to ensure completeness before submission. The researcher also selected filled questionnaires randomly to check for completeness and ensure that the data collected was quality.

3.8 Study variables

Table 4: Table showing study variables

Objective	Independent Variable	Outcome Variable	Source of Data

To determine the level of compliance with standard IPC precautions among HCWs in the KNH ICUs.	The proportion of those who fully complied as a percentage of the total sample size	Compliance (Yes, No)	Study questionnaire
To determine the organizational and environmental factors that influence adherence to standard IPC in KNH ICUs.	Training on Standard IPC, Workload and staffing, Safety climate of the organization Communication on IPC Availability of resources including PPEs	Compliance	Study questionnaire
To determine the individual factors that influence adherence to IPC practices in KNH ICUs.	Age Sex Professional category Level of education Years of experience Hours worked per week Individual knowledge of IPC Individual attitude towards IPC	Compliance	Study questionnaire

3.9 Data Quality

3.9.1 Pilot Test

The primary purpose of conducting a pilot test is to evaluate the suitability, validity, and reliability of the research instruments. Before the actual data collection, a pilot test was carried out at KNH, involving 10% of the study's intended sample size. The pilot test assessed the clarity of the study questions and their effectiveness in achieving the research objectives. Observations made during the pilot study were utilized to refine and modify the data collection instrument before initiating data collection for the main study.

3.9.2 Validity

The validity of a research study tool refers to how well the study instrument accurately measures the concept or variables the researcher intends to assess. It assesses whether the tool is capable of providing valid and reliable data for the research study. There are three primary types of validity: construct validity, content validity, and criterion validity.

Content Validity assesses how well the items or questions in the tool represent the entire range of the construct or phenomenon being measured. Content validity ensures that the tool includes a comprehensive and relevant set of items needed to evaluate the variable under study. Construct validity examines how well the tool measures the theoretical construct or concept it intends to assess. It determines the extent to which one can draw accurate inferences about scores that are associated with the concept being investigated. Criterion validity assesses how well the tool's scores correlate with external criteria or standards that are related to the construct being measured. To ensure content validity the tool was reviewed by content experts to ensure the tool comprehensively covers all the intended constructs being measured. Construct validity was ensured by conducting a pilot study with 10% of the study participants. It helped in evaluating the clarity and relevance of study items. Any necessary modifications were made to the study tool based on participant feedback.

3.9.3 Reliability

Reliability pertains to the extent to which a research instrument can consistently produce the same results upon repeated trials. To ensure internal consistency reliability, which measures

the consistency of results across items within a test, the study instrument was standardized and designed using simple language that's easily understood by all participants.

3.9.4 Practicality

Practicality is the degree to which a research tool is economical, convenient, and easy to administer, and results can be interpreted by other persons other than the designer of the research tool. The questionnaire was self-administered and written using simple language that was easily understood by all study participants.

3.10 Data Analysis

Data analysis was done using SPSS version 28. The level of significance was determined using a p-value < 0.05. Descriptive statistics (mean, mode, median, and standard deviation) were used to analyze the characteristics of participants.

The overall compliance rate was calculated by determining the average compliance across all 20 items of the CSPS tool and converting it to a percentage. A total compliance rate of ≥ 90% was considered optimal, between 80%-89% as satisfactory, between 50%-79% as suboptimal, and a score of <50% as poor.

In investigating organizational and environmental factors and the individual factors that influence compliance with standard IPC practices among HCWs in KNH ICUs, bivariate and multivariate analysis was performed using binary logistic regression. An odds ratio with a 95% confidence interval was used to determine the strength of association between dependent and independent variables. Variables with a p-value <0.05 on the bivariate analysis were subjected to a multivariate model to control for potential confounders. The following variables were subjected to multivariate analysis; management support/ work safety climate, absence of job hindrances, education and training of HCWs on IPC, individual knowledge of IPC, and individual's attitude towards IPC. Variables having a *p-value* of less than or equal to 0.05 in the multivariable logistic regression model were considered statistically significant variables.

3.11 Ethical Considerations

Approval to conduct the study was sought from the KNH/University of Nairobi Ethics and Research Committee and the Strathmore University Institutional Scientific and Ethical Review Committee.

Permission to conduct the study was also requested from the head of the anesthesia department of Kenyatta National Hospital.

A research permit was sought from the National Commission for Science, Technology, and Innovation (NACOSTI).

An Informed Consent form describing the nature of the study, risks involved, and potential benefits, was signed by all respondents before filling the questionnaire.

There were no risks to study respondents as data collection was performed by trained and experienced study personnel and involved filling self-administered questionnaires.

To ensure the privacy and confidentiality of the data during the study, we did not collect emails of the respondents when filling out the Google forms. Personal information was not collected to enhance the privacy of the participants. All study documents and data were stored in a password-protected database only accessible by the principal investigator and the statistician.

4 CHAPTER FOUR: RESULTS

4.1 Overview of the Chapter

This chapter focuses on the analysis and presentation of the study findings. Study findings are presented in line with the study objectives. The outline of the chapter is as follows, response rate, the socio-demographic profile of the participants, rate of adherence to standard IPC practices, the organizational and environmental factors that influence compliance to standard IPC practices, and the individual factors that influence adherence to standard IPC practices. It also includes the multivariate analysis of the correlation between organizational and individual factors, and the adherence to standard IPC practices.

4.2 Response rate

A total of 189 respondents took part in the study, representing a response rate of 100%.

4.3 Social demographic profile of the study participants

Of the total respondents, 62.4% (n =118) were aged between 31 and 40 years, 63% (n =119) were female, 62.4% (n=118) were bedside nurses and 45.5% (n=86) had attained a bachelor's degree. Further, 79.9% (n= 151) had ≤10 years of experience. Additionally, 98.4% (n =186) had received some form of IPC training. With 91% (n=174) reporting that the IPC training was done as part of in-service training at the hospital. Moreover, 95.8% (n=181) reported that they had been exposed to infection while working, as illustrated on

below.

Table 5: Characteristics of healthcare workers in the Intensive Care Units of the Kenyatta National Hospital

Characteristics	Frequency	Percent
Age		
20-30years	42	22.2
31-40 years	118	62.4
41-50 years	24	12.7
51-60 years	5	2.6
Gender		
Male	70	37.0
Female	119	63.0
Profession		
Bedside Nurse	118	62.4
Clinical Officer	19	10.1
Medical Officer	21	11.1
Nurse-in Charge	3	1.6
Physiotherapy	9	4.8
Registrars/senior house Officers	13	6.9
Specialist doctors/consultants	6	3.2
Duty station		
Cardiothoracic ICU	10	5.3
Main ICU	62	32.8
Medical ICU	26	13.8

Neurosurgical ICU	10	5.3
Obstetrics and gynecology ICU	31	16.4
Paediatric ICU	50	26.5
Years of experience		
0 to 10 years	151	79.9
More than 10 years	38	20.1
Highest level of education		
Bachelor's degree	86	45.5
Completed master (MMED, MSc Nursing)	3	1.6
Diploma	78	41.3
Pursuing master's (MMED, MSc Nursing)	21	11.1
Underwent IPC training		
Yes	186	98.4
No	3	1.6
Where did you undergo training (186)		
In-service training in this hospital	174	91.0
In the school curriculum	12	6.3
Exposed to infection while working		
Yes	181	95.8
No	8	4.2

4.4 Compliance with standard IPC precautions among HCWs in the KNH ICUs

4.4.1 Rate of Compliance with standard IPC precautions among HCWs in the KNH ICUs.

The findings established that 47.1% (n =89) had optimal overall IPC compliance, 45.5% (n =86) had satisfactory overall compliance, and 7.4% (n =14) had sub-optimal overall compliance. As for compliance with individual IPC components, 54.5% (n=103) were optimally compliant with to use of PPEs, 40.2% (n=76) were optimally compliant with the safe disposal of sharps, while 88.9% (n=168) were optimally compliant to the appropriate disposal

of waste as shown on Table 6: The rate of compliance with standard IPC precautions among HCWs in the KNH ICbelow.

Table 6: The rate of compliance with standard IPC precautions among HCWs in the KNH IC

Compliance measure	Frequency	Percent
Overall IPC compliance		
Optimal	89	47.1
Satisfactory	86	45.5
Sub-optimal	14	7.4
Compliance with the use of protective device		
Optimal	103	54.5
Satisfactory	74	39.2
Sub-optimal	12	6.3
Compliance with the disposal of sharps		
Optimal	76	40.2
Satisfactory	2	1.1
Sub-optimal	110	58.2
Poor	1	0.5
Compliance with the disposal of waste		
Optimal	168	88.9

Sub-optimal	20	10.6
Poor	1	0.5
Compliance with decontamination of spills and used article		
Optimal	169	89.4
Satisfactory	7	3.7
Sub-optimal	12	6.3
Poor	1	0.5
Compliance with the prevention of cross-infection		
Optimal	21	11.1
Satisfactory	118	62.4
Sub-optimal	50	26.5

4.5 The organizational and environmental factors that influence compliance with standard IPC practices among HCWs in KNH ICUs.

The findings as illustrated on Table 7, revealed that 96.3% (n =182) of the respondents felt that personal protective and engineering control equipment availability was adequate, 87.8% (n =166) rated management support/work climate as adequate, while 59.3%(n =112) considered education and training of HCWs on IPC practices to be adequate.

Table 7: Overall rating of organizational and environmental factors that influence compliance with standard IPC practices

	Frequency	Percent
Overall rating of Organizational support		
Adequate	107	56.6
Inadequate	52	43.4
Personal protective and engineering control equipment availability		
Adequate	182	96.3
Inadequate	7	3.7

Management support/ Work safety climate		
Adequate	166	87.8
Inadequate	23	12.2
Absence of Job hindrances		
Yes	149	78.8
No	40	21.2
Education and Training of healthcare personnel on Infection prevention		
Adequate	112	59.3
Inadequate	77	40.7

4.5.1 Association between Organizational and environmental factors and compliance with standard IPC practices

On being subjected to bivariate analysis, management support/work safety climate (OR 3.69 (1.31- 10.40) 95% C.I P value 0.013), absence of job hindrances (OR 3.69 (1.31- 10.40) 95% C.I, P-value 0.013), and education and training of HCWs on IPC practices (OR 2.09 (1.16 - 3.79) 95% C.I, P value-0.018) were found to have significant association with adherence to standard IPC practices.

Table 8: Bivariate analysis of the organizational and organizational factors that influence compliance with standard IPC practices

	Compliance			
	Yes n(%)	**No n(%)**	**OR (95%CI)**	**P-value**
Personal Protective and Engineering control Equipment availability				
Adequate	88(48.4)	94(51.6)	5.62(0.66 - 47.59)	0.122
Inadequate	1(14.3)	6(85.7)	Ref	
Management Support / Work Safety Climate				
Adequate	84(50.6)	82(49.4)	3.69 (1.31 – 10.40)	0.013

Inadequate	5(21.7)	18(78.3)	Ref	
Absence Of Job Hindrances				
Yes	79(53.0)	70(47.0)	3.69 (1.31 - 10.40)	0.013
No	10(25.0)	30(75)	Ref	
Education and Training of healthcare personnel on Infection prevention				
Adequate	61(54.5)	51(45.5)	2.09(1.16 - 3.79)	0.018
Inadequate	28(36.4)	49(63.6)		

4.6 Individual factors that influence adherence to standard IPC practices among healthcare workers in the Intensive Care Units at KNH

4.6.1 Individual knowledge of IPC guidelines among health workers

The findings as illustrated on Table 9 below, showed that 43.4% (n =82) of the respondents had good overall knowledge of standard IPC practices, while 56.6% (n =107) had moderate overall knowledge of standard IPC practices.

Table 9: Overall knowledge of standard IPC practices

	Frequency	Percent
Overall, Knowledge of IPC		
Good	82	43.4
Moderate	107	56.6
Knowledge of hand hygiene		
Good	88	46.6
Moderate	101	53.4
Knowledge of the use of personal Protective equipment such as gloves, gowns		
Good	53	28.0
Moderate	134	70.9

Poor	2	1.1
Knowledge of Safe Injection Practices		
Good	11	5.8
Moderate	178	94.2
Knowledge of Waste segregation		
Good	17	9.0
Moderate	170	89.9
Poor	2	1.1
Knowledge on reprocessing of Reusable medical equipment		
Good	6	3.2
Moderate	183	96.8

4.6.1.1 The Correlation between knowledge and compliance to standard IPC Practices among health workers at the KNH ICUs

On being subjected to bivariate analysis an individual's knowledge of standard IPC practices (OR-3.28 (1.80 - 5.98) 95 % C.I, P-value <0.001) was found to be significant as shown on Table 10.

Table 10: The bivariate analysis of the influence of an individual's knowledge on adherence to standard IPC practices

	Compliance			
	Yes n(%)	**No n(%)**	**OR(95%CI)**	**P-value**
Knowledge on IPC				
Adequate	52(63.4)	30(36.6)	3.28(1.80 - 5.98)	<0.001
Moderate	37(34.6)	70(65.4)	Ref	

4.6.2 Attitude towards IPC among Healthcare personnel at the Kenyatta National Hospital ICUs

The findings as illustrated on Table 11 below reveal that overall, 11.1% (n =21) of the respondents had a good attitude toward standard IPC guidelines while 88.9% (n =168) had a poor attitude.

Table 11: Attitude towards IPC practices

	Frequency	Percentage (%)
Attitude towards IPC practices		
Good	21	11.1
Poor	168	88.9

4.6.2.1 Correlation between an individual's attitude and compliance with IPC guidelines among health workers at the KNH ICUs.

An individual's good attitude towards IPC (OR-4.16(1.46 - 11.89) 95% C.I, P-value 0.005) was found to be significant as shown on Table 12.

Table 12: The bivariate analysis of the influence of an individual's attitude on compliance with standard IPC guidelines

	Compliance			
	Yes n(%)	**No n(%)**	**OR(95%CI)**	**P-value**
Attitude on IPC guidelines				
Good	16(76.2)	5(23.8)	4.16(1.46 - 11.89)	0.005
Poor	73(43.5)	95(56.5)	Ref	

4.7 The multivariable analysis of determinants of compliance with IPC guidelines

On being subjected to multivariate analysis, education and training (aOR-1.46 (1.09 - 2.16), 95% C.I, P-value 0.007), adequate individual's knowledge on IPC (aOR 2.96(1.46- 5.98), 95% C.I, P-value-0.003), and good attitude towards IPC practice (aOR 6.89(1.82 - 25.95) 95% C.I, P-value 0.004) were found to be significant as shown on Table 13.

Table 13: The multivariate analysis of the determinants of compliance with standard IPC guidelines

	AOR(95%CI)	P-value
Management Support / Work Safety Climate		
Adequate	1.35(0.65 - 2.80)	0.418
Inadequate	Ref	
Absence Of Job Hindrances		
Yes	1.29(0.76 - 2.17)	0.348
No	Ref	
Education and Training of healthcare personnel on Infection prevention		
Adequate	1.46(1.09 - 2.16)	0.007
Inadequate	Ref	
Knowledge		
Adequate	2.96(1.46 - 5.98)	0.003

Inadequate	Ref	
Attitude		
Good	6.89(1.82 - 25.95)	0.004
Poor	Ref	

5 CHAPTER FIVE: DISCUSSION

5.1 Overview of the Chapter

This chapter entails the discussion of the key findings outlined in chapter four and will be presented as per the study objectives. These include the rate of compliance with standard IPC precautions, the organizational and environmental factors that influence adherence to standard IPC practices, and the individual factors that influence adherence to standard IPC practices.

Moreover, the chapter will also cover the limitations of the study, the conclusion, and the study recommendations.

5.2 Rate of Compliance with Standard IPC Practices

The findings of the study revealed that only 47.1% of the respondents were optimally compliant with standard IPC practices, meaning more than half of the participants were at risk of exposure to HAIs and cross-infection due to suboptimal adherence to the standard IPC practices. Moreover, the low levels of optimal compliance could be a contributing factor to the high burden of HAIs observed in ICUs. This was in line with the findings of a Nigerian study (Alice et al., 2013). However, it was lower than the 60.8% reported by (Gichuhi et al., 2015) and the 53.2% reported by (Kisaka, 2021). This could be attributed to the fact that our study setting was in the ICU which is generally associated with higher workload compared to other hospital settings, therefore compromising on strict adherence to SPs. Increased workload and

health worker fatigue associated with adhering to some of the IPC guidelines such as donning PPEs, especially in busy clinical situations, have been identified as some of the barriers to IPC adherence (Houghton et al., 2020; Moore et al., 2005).

On analysis of compliance with individual IPC components, 54.5% were optimally compliant with the use of PPEs. This is despite 96.3% of the respondents reporting that PPEs were readily available and adequate. This is comparable to the findings reported in a locally conducted study that found that 52.3% of HCWs were compliant with PPE use (Kisaka, 2021). This finding reinforces the fact that adherence to the use of PPE is influenced by factors other than availability. Such factors include individual beliefs and attitudes.

Furthermore, 40.2% of the respondents were optimally compliant with the safe disposal of sharps. This implies that more than half of the respondents were putting themselves and their colleagues at risk of needle stick injuries, which is a potential source of blood-borne pathogens. Findings were lower than the 82.7% reported by (Haile et al., 2017) and the 80% reported by (Alice et al., 2013).

Additionally, 88.9% of the study respondents showed optimal compliance with the disposal of waste. This was higher than the findings of (Haile et al., 2017), where only 30.2% segregated non-infectious wastes in black color-coded dust bins, and merely 34.4% segregated infectious medical wastes in yellow color-coded dust bins. Proper waste segregation has been shown to reduce the rate of exposure to blood-borne pathogens and reduce HAIs.

Compliance with the prevention of cross infection by IPC activities like adhering to hand hygiene practices had the lowest optimal compliance with only 11.1% of the respondents optimally complying. This implies that more than three-quarters of the ICU HCWs were not keen on adhering to the recommended hand hygiene practices, thus putting their patients and themselves at risk of cross-infection with HAIs. Our finding was lower than what was reported in a study conducted in the western part of Kenya, which that found 53.2% of the HCWs were compliant with hand hygiene practices (Kisaka, 2021). The difference in findings can be explained by the fact that the latter study was conducted at the height of the COVID-19 pandemic when there was a lot of emphasis on adhering to hand hygiene practices to curtail the spread of the COVID-19 virus.

5.3 Organizational factors that influence adherence to standard IPC practices.

The influence of organizational and environmental factors on IPC practices was evident in this study. On the bivariable analysis of organizational factors that influence adherence to standard IPC practices; management support and work safety climate, absence of job hindrances, and education and training of HCWs on standard IPC practices were found to have significant correlation with adherence to standard IPC practices.

The study found that 87.8% of the respondents felt that management support and work safety climate were adequate. Respondents who perceived management support and work safety climate as adequate had a 3.69 times higher chance of adhering to standard IPC practices. Similar findings have been reported in past studies, for instance (da Silva Felix et al., 2013) reported that the HCWs who perceived management support was adequate had a 3.49 chance of adhering to standard IPC practice. Similarly, a cross-sectional study done in Ethiopia found that HCWs who received management support and had a safe work climate, had 2.23 times higher adherence levels to SP, in contrast to those who received less support (Haile et al., 2017). This underscores the pivotal role the management plays in ensuring accessibility to adequate PPE, modeling appropriate IPC practices for all staff, and allocating sufficient budget for IPC activities. Moreover, having adequate management support could aid in strengthening IPC efforts by having a vibrant IPC committee that monitors IPC activities and implements corrective actions for non-compliant healthcare workers. Moreover, studies have shown that institutions with a strong commitment to creating a safe work climate have higher compliance levels to standard IPC protocols (Moore et al., 2005). On the contrary, HCWs who feel unsupported, are usually demotivated and have low adherence levels to guidelines including adhering to IPC protocols (Houghton et al., 2020). Nevertheless, on subjection to multivariable regression analysis, management support was not found to be statistically significant in influencing adherence to IPC practices.

Moreover, 78.8% of the participants reported there were no job hindrances that could impede their adherence to IPC practices. Absence of job hindrances was associated with 3.69 times) more likelihood of adhering to standard IPC practices. This is in line with the findings of (da Silva Felix et al., 2013) that reported that those with a lower perception of work-related obstacles were 4.5 times more likely to adhere to SP. Job hindrances such as increased workload and high patient-to-nurse ratio have been identified as predictors of non-compliance to IPC practices in past studies (Alhumaid et al., 2021; Moore et al., 2005).

Only 59.3% of the study participants reported that the education and training of healthcare personnel on IPC practices was adequate. In the bivariate analysis, adequate education and training of HCWs on standard IPC practices was associated with a 2.09 times higher chance of adhering to IPC guidelines as compared to inadequate education and training. Furthermore, after being subjected to multivariate analysis, adequate education and training of healthcare personnel on Infection prevention practices was associated with 1.46 times more likelihood to comply with IPC guidelines. Similar findings were reported by (Haile et al., 2017), who found that HCWs who had regular training on standard IPC practices were 2.9 times more likely to adhere to standard IPC practices. Moreover, a systematic review found that higher IPC compliance was observed among HCWs who received regular IPC training and education and were involved in the activities of the IPC committee (Alhumaid et al., 2021). This could be attributed to the fact that providing training based on the latest standard IPC guidelines enhances the HCWs' knowledge and ability to grasp fundamental principles, recommendations, and practice standards, therefore enabling them to consistently implement the practices in routine patient care. Additionally, staying updated on best practices could boost healthcare workers' confidence in adhering to these guidelines.

Further, 96.3% of the respondents reported that the availability of personal protective and engineering control equipment was adequate. However, the study did not find any statistically significant correlation between having adequate personal protective and engineering control equipment available and compliance with standard IPC practices. This is unlike findings from other studies, for instance, a cross-sectional study conducted in Ethiopia by (Haile et al., 2017) and another one conducted in western Kenya by (Kisaka, 2021) that revealed 2.87 times and 1.6 times more likelihood of complying with IPC if PPE were available, respectively. The findings could be explained by the fact that the utilization of PPE by healthcare workers ultimately relies on their individual initiative, attitudes, perceptions, and the unique situations they encounter in the course of providing care to patients.

5.3 Individual factors that influence adherence to standard IPC practices

In this study, only 43.4% of the respondents had good overall knowledge of standard IPC practices. This was lower than the 55.4% reported in a study done in Addis Ababa (Biniyam et al., 2018) and the 50.2% reported in a Nigerian study (Alice et al., 2013). This could be attributed to the difference in study setting and study populations**.** In the bivariate analysis, we found that those who had adequate knowledge were 3.28 times more likely to comply with

standard IPC guidelines. Furthermore, in the multivariable analysis, health workers with adequate knowledge were 2.96 times more likely to comply with IPC guidelines. This was comparable to the findings of a study done by (Alice et al., 2013), which reported a significant association between good knowledge and adherence to standard IPC practices. These findings could be explained by the fact that individuals with a deeper understanding of standard IPC practices are likely to place higher importance on IPC in preventing occupational exposures to hospital-acquired infections, therefore positively influencing their adherence to IPC practices. Past studies have identified poor knowledge of risk factors associated with specific infections and lack of knowledge on the specifics of PPE use as factors limiting healthcare workers' understanding and adherence to IPC guidelines (Houghton et al., 2020).This finding further reinforces the need for regular training of HCWs on SP to improve their knowledge.

Nonetheless, some studies have found that having a high knowledge of Standard IPC practices does not necessarily translate to higher levels of IPC adherence (Gershon et al., 1995). This implies that other factors at an individual level may play a role in influencing compliance with IPC. One such factor is individual perception of risk. For instance, past studies have shown that HCWs who have had exposure to blood and other body fluids without acquiring an HAI may have a perception of decreased risk of acquiring HAI therefore decreasing their compliance with IPC guidelines (DeJoy et al., 2000). HCWs who perceive a higher risk of infection are 3.46 times more likely to consistently adhere to standard precautions compared to those with a lower perception of infection risk (Haile et al., 2017).

As for an individual's attitude toward standard IPC practices, only 11.1% of the respondents had a good attitude towards IPC. This was lower than the 61.55% that was reported in a study done in Saudi Arabia (Abalkhail et al., 2021) and the 80% reported in a study done in Addis Ababa (Biniyam et al., 2018). On the bivariate analysis health workers who had good attitude towards standard IPC practices were 4.16 times more likely to comply with IPC guidelines compared to those who had poor attitude. Moreover, in the multivariate analysis, those with good attitude were 6.89 times more likely to comply with standard IPC guidelines. This implies that an individual's attitude plays a major role in influencing adherence to IPC guidelines. HCWs who have negative attitudes toward the use of PPEs such as masks due to the discomfort associated with use, have been shown to have lower compliance rates. Individual beliefs such as fear of infecting themselves or their loved ones with HAIs, and an individual's perception of risk have an impact on their attitude towards IPC and may motivate them to be

more adherent to IPC guidelines (Alhumaid et al., 2021; Woith et al., 2012). Lack of IPC knowledge, low-risk perception, and negative attitude such as laxness or refusal to implement IPC guidelines have been identified as some of the barriers to IPC adherence (Houben et al., 2022).

5.4 Study limitations

The reliance on self-reported data might somewhat compromise the reliability of the results due to potential response bias. The respondents may have responded based on what is expected of them as opposed to their actual practice.

The study setting was in the intensive care units; therefore, the findings of the study may not be generalizable to the rest of the hospital setting.

5.5 Conclusion

In conclusion, more than half of the intensive care units HCWs were not optimally compliant with standard IPC practices. Furthermore, the findings of this study underscore the importance of organizational support and safety atmosphere of a healthcare institution, in ensuring employees adhere to safe work protocols. Therefore, HCWs' perception regarding their hospitals' safety climate and organizational support significantly impacts their adherence to standard IPC practices.

Moreover, the findings of the study reveal the interplay of the organizational, environmental, and individual factors in influencing behavior toward IPC adherence as illustrated in Dejoy's Behavioural Diagnostic Model. The findings further underscore the importance of having the right structures of care such as work safety climate and availability of IPC infrastructure, to foster positive processes such as handwashing, and waste segregation during healthcare delivery, which in turn results in quality healthcare due to increased IPC adherence as illustrated in the Donabedian framework.

5.6 Recommendations

Having adequate knowledge of IPC practices was found to influence adherence to standard IPC practice, this reinforces the need for management through the IPC committee to organize regular training on SPs for all healthcare worker cadres. This could be in response to identified

gaps or a routine update of new IPC guidelines and to reinforce the already existing knowledge. This will go a long way in ensuring that we improve the compliance rate for SPs.

The management should employ a multifaceted approach in designing interventions aimed at improving adherence to standard IPC practices. The interventions should focus on both the institutional level and individual level factors that have the potential to hinder adherence to SPs. The organization should actively invest in measures like consistent feedback, communication, creating a safety climate, and conducting training on IPC. These efforts serve as enablers in modifying individual behaviors to foster an infection-control-oriented organizational culture.

5.7 Areas for Further Research

A comparative analysis of adherence to IPC practices and the associated factors, in both private and public healthcare institutions in our setting.

Financial implications of poor adherence to infection prevention and control standards to an healthcare institution

Impact of adherence to IPC practices on the quality of care and patient safety

REFERENCES

Abalkhail, A., Al Imam, M. H., Elmosaad, Y. M., Jaber, M. F., Hosis, K. Al, Alhumaydhi, F. A., Alslamah, T., Alamer, A., & Mahmud, I. (2021). Knowledge, Attitude, and Practice of Standard Infection Control Precautions among Health-Care Workers in a University Hospital in Qassim, Saudi Arabia: A Cross-Sectional Survey. *International Journal of Environmental Research and Public Health*, *18*(22). https://doi.org/10.3390/ijerph182211831

Alhassan, A. R., Kuugbee, E. D., & Der, E. M. (2021). Surgical Healthcare Workers Knowledge and Attitude on Infection Prevention and Control: A Case of Tamale Teaching Hospital, Ghana. *Canadian Journal of Infectious Diseases and Medical Microbiology*, *2021*, 6619768. https://doi.org/10.1155/2021/6619768

Alhumaid, S., Al Mutair, A., Al Alawi, Z., Alsuliman, M., Ahmed, G. Y., Rabaan, A. A., Al-Tawfiq, J. A., & Al-Omari, A. (2021). Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial Resistance and Infection Control*, *10*(1), 86. https://doi.org/10.1186/s13756-021-00957-0

Alice, T. E., Akhere, A. D., Ikponwonsa, O., & Grace, E. (2013). Knowledge and practice of infection control among health workers in a tertiary hospital in Edo state, Nigeria. *Direct Res J Health Pharm*, *1*(2), 20–27.

Allegranzi, B., Bagheri Nejad, S., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). The burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet (London, England)*, *377*(9761), 228–241. https://doi.org/10.1016/S0140-6736(10)61458-4

Alp, E., & Damani, N. (2015). Healthcare-associated infections in intensive care units: Epidemiology and infection control in low-to-middle income countries. *Journal of Infection in Developing Countries*, *9*(10), 1040–1045. https://doi.org/10.3855/jidc.6832

Biniyam, S., Sahiledengle, B., Gebresilassie, A., Getahun, T., & Hiko, D. (2018). *Infection Prevention Practices and Associated Factors among Healthcare Workers in Governmental Healthcare Facilities in Addis Ababa*.

CDC. (2016). *Summary of Infection Prevention Practices in Dental Settings Basic Expectations*. Centers for Disease Control and Prevention (CDC). http://www.cdc.gov/oralhealth/infectioncontrol/pdf/safe-care.pdf

Centers for Disease Control and Prevention [CDC]. (2022). CDC's Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings. *Healthcare Infection Control Practices Advisory Committee HICPAC*, *July 2014*, 1–15. https://www.cdc.gov/infectioncontrol/guidelines/core-practices/index.html#anchor_72633%0Ahttps://www.cdc.gov/hicpac/recommendations/core-practices.html

Cohen, C. C., & Shang, J. (2015). Evaluation of conceptual frameworks applicable to the study of isolation precautions effectiveness. *Journal of Advanced Nursing*, *71*(10), 2279–2292. https://doi.org/10.1111/jan.12718

da Silva Felix, A. M., Toffano Malaguti, S., & Gir, E. (2013). Individual, work-related, and institutional factors associated with adherence to standard precautions. *Journal of Infection Control*, *2*(2), 106–111.

DeJoy, D. M., Searcy, C. A., Murphy, L. R., & Gershon, R. R. (2000). Behavioral-diagnostic analysis of compliance with universal precautions among nurses. *Journal of Occupational Health Psychology*, *5*(1), 127–141. https://doi.org/10.1037//1076-8998.5.1.127

Dewi, wulandari kartika, Noviyati, putri rahadjo, Lamria, S., Raden, S., & Yofa, utama anggriani. (2019). Patient Safety – Patient Safety. *The Patient Safety Council of Malaysia*, *23*(6), 1–14.

Donabedian, A. (1988). The Quality of Care: How Can It Be Assessed? *JAMA*, *260*(12), 1743–1748. https://doi.org/10.1001/jama.1988.03410120089033

Donaghy, J. (2022). Organizational support improves adherence to infection prevention and control guidelines. *Evidence-Based Nursing*, *25*(1), 10 LP – 10. https://doi.org/10.1136/ebnurs-2020-103305

Gershon, R. R., Karkashian, C. D., Grosch, J. W., Murphy, L. R., Escamilla-Cejudo, A., Flanagan, P. A., Bernacki, E., Kasting, C., & Martin, L. (2000). Hospital safety climate and its relationship with safe work practices and workplace exposure incidents. *American Journal of Infection Control*, *28*(3), 211–221. https://doi.org/10.1067/mic.2000.105288

Gershon, R. R., Vlahov, D., Felknor, S. A., Vesley, D., Johnson, P. C., Delclos, G. L., & Murphy, L. R. (1995). Compliance with universal precautions among health care workers at three regional hospitals. *American Journal of Infection Control*, *23*(4), 225–236. https://doi.org/10.1016/0196-6553(95)90067-5

Gichuhi, A. W., Kamau, S. M., Nyangena, E., & Otieno-Ayayo, Z. N. (2015). *Health care workers adherence to infection prevention practices and control measures: A case of a level four district hospital in Kenya*.

Haile, T. G., Engeda, E. H., & Abdo, A. A. (2017). Compliance with Standard Precautions and Associated Factors among Healthcare Workers in Gondar University Comprehensive Specialized Hospital, Northwest Ethiopia. *Journal of Environmental and Public Health*, *2017*, 2050635. https://doi.org/10.1155/2017/2050635

Houben, F., van Hensbergen, M., den Heijer, C. D. J., Dukers-Muijrers, N. H. T. M., & Hoebe, C.

J. P. A. (2022). Barriers and facilitators to infection prevention and control in Dutch psychiatric institutions: a theory-informed qualitative study. *BMC Infectious Diseases*, *22*(1), 243. https://doi.org/10.1186/s12879-022-07236-2

Houghton, C., Meskell, P., Delaney, H., Smalle, M., Glenton, C., Booth, A., Chan, X. H. S., Devane, D., & Biesty, L. M. (2020). Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis. *The Cochrane Database of Systematic Reviews*, *4*(4), CD013582. https://doi.org/10.1002/14651858.CD013582

Hugonnet, S., Chevrolet, J.-C., & Pittet, D. (2007). The effect of workload on infection risk in critically ill patients. *Critical Care Medicine*, *35*(1), 76–81. https://doi.org/10.1097/01.CCM.0000251125.08629.3F

Kisaka, Y. N. (2021). Factors affecting compliance to infection prevention and control measures among frontline health workers: a case study of the Kitale County Referral Hospital. *Journal of Hospital Infection*, *105*(20), 866–873. http://hdl.handle.net/11071/12649

Lee, M. H., Lee, G. A., Lee, S. H., & Park, Y.-H. (2019). Effectiveness and core components of infection prevention and control programs in long-term care facilities: a systematic review. *Journal of Hospital Infection*, *102*(4), 377–393. https://doi.org/https://doi.org/10.1016/j.jhin.2019.02.008

Maina, J. W., Onyambu, F. G., Kibet, P. S., & Musyoki, A. M. (2023). Multidrug-resistant Gram-negative bacterial infections and associated factors in a Kenyan intensive care unit: a cross-sectional study. *Annals of Clinical Microbiology and Antimicrobials*, *22*(1), 85. https://doi.org/10.1186/s12941-023-00636-5

Moore, D., Gamage, B., Bryce, E., Copes, R., & Yassi, A. (2005). Protecting health care workers from SARS and other respiratory pathogens: organizational and individual factors that affect adherence to infection control guidelines. *American Journal of Infection Control*, *33*(2), 88–96. https://doi.org/10.1016/j.ajic.2004.11.003

Ndegwa, L. (2015). Hospital-Acquired Infections Surveillance in Three Kenyan Hospitals, 2010-2012. *Open Forum Infectious Diseases*, *2*(suppl_1). https://doi.org/10.1093/ofid/ofv133.1279

Organización Mundial de la Salud. (2011). Report on the Burden of Endemic Health Care-Associated Infection Worldwide Clean Care is Safer Care. *World Health Organization*, *3*, 1–21. www.who.int

Organization, W. H. (2016). *Health care without avoidable infections: the critical role of infection prevention and control*. World Health Organization.

Park, Y. S., Konge, L., & Artino, A. R. J. (2020). The Positivism Paradigm of Research. *Academic Medicine*, *95*(5). https://journals.lww.com/academicmedicine/fulltext/2020/05000/the_positivism_paradigm_of_research.16.aspx

Rosenthal, V. D., Maki, D. G., & Graves, N. (2008). The International Nosocomial Infection Control Consortium (INICC): goals and objectives, description of surveillance methods, and operational activities. *American Journal of Infection Control*, *36*(9), e1-12. https://doi.org/10.1016/j.ajic.2008.06.003

Singh, A., & Masuku, M. (2014). Sampling Techniques & Determination of Sample Size in Applied Statistics Research: an Overview. *Ijecm.Co.Uk*.

SIXTY-NINTH WORLD HEALTH ASSEMBLY. (2016). *May*, 23–28.

Sreedharan, J., Muttappillymyalil, J., & Venkatramana, M. (2011). Knowledge about standard precautions among university hospital nurses in the United Arab Emirates. *Eastern Mediterranean Health Journal = La Revue de Sante de La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, *17*(4), 331–334.

Stone, P. W. (2009). Economic burden of healthcare-associated infections: an American perspective. *Expert Review of Pharmacoeconomics & Outcomes Research*, *9*(5), 417–422. https://doi.org/10.1586/erp.09.53

Taherdoost, H. (2018). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3205035

Tikhomirov, E. (1987). program for the control of hospital infections.WHO. *Chemioterapia : International Journal of the Mediterranean Society of Chemotherapy*, *6*(3), 148–151.

Tomczyk, S., Twyman, A., de Kraker, M. E. A., Coutinho Rehse, A. P., Tartari, E., Toledo, J. P., Cassini, A., Pittet, D., & Allegranzi, B. (2022). The first WHO global survey on infection prevention and control in health-care facilities. *The Lancet Infectious Diseases*, *22*(6), 845–856. https://doi.org/10.1016/S1473-3099(21)00809-4

Vincent, J.-L., Rello, J., Marshall, J., Silva, E., Anzueto, A., Martin, C. D., Moreno, R., Lipman, J., Gomersall, C., Sakr, Y., & Reinhart, K. (2009). International study of the prevalence and outcomes of infection in intensive care units. *JAMA*, *302*(21), 2323–2329. https://doi.org/10.1001/jama.2009.1754

Vincent, J. L., Bihari, D. J., Suter, P. M., Bruining, H. A., White, J., Nicolas-Chanoin, M. H., Wolff, M., Spencer, R. C., & Hemmer, M. (1995). The prevalence of nosocomial infection in intensive care units in Europe. Results of the European Prevalence of Infection in Intensive Care (EPIC) Study. EPIC International Advisory Committee. *JAMA*, *274*(8), 639–644.

Wangai, F. K., Masika, M. M., Lule, G. N., Karari, E. M., Maritim, M. C., Jaoko, W. G., Museve, B., & Kuria, A. (2019). Bridging antimicrobial resistance knowledge gaps: The East African perspective on a global problem. *PloS One*, *14*(2), e0212131. https://doi.org/10.1371/journal.pone.0212131

WHO. (2009). *WHO multimodal improvement strategy In other words, the WHO multimodal improvement strategy addresses these five areas :* 5.

WHO, 2022. (2022). *Report by the Director-General*. *January*.

https://apps.who.int/gb/ebwha/pdf_files/EB150/B150_12-en.pdf

Woith, W., Volchenkov, G., & Larson, J. (2012). Barriers and motivators affecting tuberculosis infection control practices of Russian health care workers. *The International Journal of Tuberculosis and Lung Disease : The Official Journal of the International Union against Tuberculosis and Lung Disease*, *16*(8), 1092–1096. https://doi.org/10.5588/ijtld.10.0779

World Health Organization. (2022). *Global report on infection prevention and control Global report on infection prevention and control*. https://www.who.int/publications-detail-redirect/9789240051164#:~:text=The WHO global report on, new data from WHO studies.

Appendix 1: Letter of Introduction and Consent Form

STUDY TITLE: ADHERENCE TO STANDARD INFECTION PREVENTION AND CONTROL GUIDELINES AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT THE KENYATTA NATIONAL HOSPITAL, INTENSIVE CARE UNITS.

Principal Investigator: Dr. Glory Wanja Mutia (Reg no: **MBA-HCM/135761/2020)**

Master of Business Administration in Healthcare Management

Strathmore University Business School

Supervisor: Prof. Francis Wafula

Institute of Healthcare Management

Strathmore Business School

Introduction

I would like to tell you about a study being conducted by the above-listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form.

Participants Rights

Your rights as a participant in this research are:

- Your decision to participate is entirely voluntary
- You may withdraw from the study at any time without necessarily giving a reason for your withdrawal
- Refusal to participate in the research will not affect your employment in this organization in any way. No disciplinary action will be taken for refusal.
- We will give you a copy of this form for your records.

May I continue? YES / NO

Ethics and Research Committee Approval

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. **P912/12/2022**

Purpose of the study

We wish to carry out a study on adherence to standard infection prevention and control (IPC) practices and associated factors among healthcare workers in the Kenyatta National Hospital Intensive Care units. The study aims to determine the compliance rates and the organizational and individual factors that influence adherence to IPC practices among HCWs in KNH ICUs. The findings of the study will enable management to identify challenges that hinder adherence to IPC and guide them in coming up with targeted interventions to improve adherence to IPC in the hospital. The findings will also play a role in policy formulation around IPC that can be implemented across other facilities. We are asking for your consent to consider participating in this study.

Procedure

If you agree to participate in this study, a self-administered questionnaire uploaded on a Google form will be shared with you to fill out during your free time. The questionnaire will have a section to document your age, gender, professional category, years of experience, and your duty station. There will be sections that will test your compliance with IPC guidelines and factors that influence your adherence to IPC.

Risks, harms discomforts associated with this study

One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database. We will not collect the emails of respondents during data collection.

Benefits of being in this study

The information you provide will help us better understand factors that affect adherence to IPC in our setup.

Cost

Being in this study will not cost you anything, the link to the study questionnaire will be shared with study participants to fill out at their convenience.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement: I have read this consent form and I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I freely agree to participate in this research study. I understand that all efforts will be made to keep information regarding my identity confidential. By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:

Yes

No

Participant signature / Thumb stamp _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name:_____ Date: _____

Signature_____

Role in the study: _____ [i.e., study staff who explained the informed consent form.]

For more information contact **Glory Wanja Mutia,** on **0705079318** from 8 am to 6 pm

Appendix 2: The Study Questionnaire

Adherence to Standard Infection Prevention and Control practices and associated factors among the Kenyatta National Hospital, Intensive Care Units Healthcare workers.

Participants' Identification Code…….

Date…….

This questionnaire has been divided into four sections and you are kindly requested to respond to questions in all sections. Your participation in this research is voluntary and your informed consent will be sought before being issued with this questionnaire. There will be no monetary benefit in participating.

Information provided will be treated as confidential. Therefore, you are requested to not write your name on any page. Findings from this study will serve to provide feedback to the hospital management on ways to improve infection prevention and control practices at the hospital hence you are requested to provide truthful information that would enable the right generalizations.

Section 1: Demographic Profile of Study Participants

(Please circle your responses)

1. What is your age in years?
    - 20-30years
    - 31-40 years
    - 41-50 years
    - 51-60 years

2. What is your sex/gender?
    - Male
    - Female

3. What is your profession?
    - Specialist doctors/ consultants
    - Registrars / senior house officer
    - Medical officer
    - Clinical officers
    - Nurse-in charge
    - Bedside Nurse
    - Physiotherapist
    - Occupational therapist

4. Which is your duty station?
    - Medical ICU
    - Main ICU
    - Neurosurgical ICU
    - Cardiothoracic ICU
    - Pediatric ICU
    - Obstetrics and gynecology ICU

5. Years of experience in ICU?
    - 0 to 10 years
    - 11 to 20 years
    - More than 20years

6. Highest education level attained?
    - Diploma
    - Bachelor's degree
    - Pursuing master's (MMED, MSc Nursing)

- Completed masters (MMED, MSc Nursing)

7. Have you undergone any training on IPC?
    - Yes
    - No
8. If '**yes**' to Qn 7, how did you undertake the training?
    - In the school curriculum
    - In-service training in this hospital

9. Have you been exposed to infection while working?
    - Yes
    - No

Section 2: Compliance with standard IPC guidelines

Please mark a ✓ in the box that best reflects your current clinical practice. Please answer all 20 questions.

QN		Never	seldom	Sometimes	Always
1	I wash my hands between patient contacts				
2	I only use water for hand washing				
3	I use alcoholic hand rubs as an alternative if my hands are not visibly soiled				
4	I recap used needles after giving an injection				
5	I put used sharp articles into sharps boxes.				

6	The sharps box is disposed of only when it is full.				
7	I remove Personal Protective Equipment (PPE) in a designated area				
8	I take a shower in case of extensive splashing even after I have put on Personal Protective Equipment (PPE).				
9	I cover my wound(s) or lesion(s) with a waterproof dressing before patient contact.				
10	I wear gloves when I am exposed to body fluids, blood products, and any excretion of patients				
11	I change gloves between patient contacts.				
12	I decontaminate my hands immediately after the removal of gloves				
13	I wear a surgical mask alone or in combination with goggles, face shield, and apron whenever there is a possibility of a splash or splatter				
14	My mouth and nose are covered when I wear a mask				
15	I reuse a surgical mask or disposable Personal Protective Equipment (PPE)				

16	I wear a gown or apron when exposed to blood, body fluids, or any patient excretions.				
17	Waste contaminated with blood, body fluids, secretion, and excretion is placed in red plastic bags irrespective of the patient's infection status.				
18	I decontaminate surfaces and equipment after use				
19	I wear gloves to decontaminate used equipment that is visibly soiled.				
20	I clean up spillage of blood or other body fluids immediately with disinfectants				

Section 3: Assessing Organizational Factors That Influence Adherence to IPC

	Factor	**Strongly disagree (1)**	**Disagree (2)**	**Not sure (3)**	**Agree (4)**	**Strongly agree (5)**
Personal protective and engineering control equipment availability						
1	Sharp containers are readily accessible in my work area					
2	Disposable gloves are readily available in my work area					
3	PPE such as masks, and aprons are readily					

	available in my work area					
4	Handwashing facilities such as sink, handwashing soap, and alcohol hand rub are readily available in my place of work					
5	Isolation rooms are readily available in my area of work					
Management support/ Work safety climate						
6	The protection of workers from occupational exposure to HAIs is a high priority with management where I work.					
7	The institution has an active IPC committee that oversees the IPC program in the hospital					
8	The hospital IPC committee regularly monitors adherence to IPC practices					
9	The IPC committee provides regular feedback on adherence to IPC and related outcomes to the healthcare personnel					

10	Employees are encouraged to become involved in safety and health matters.					
11	Managers in my unit do their part to ensure employees' protection from occupational exposure to HAIs					
Absence of Job hindrances						
12	My job duties do not often interfere with my being able to follow standard Precautions.					
13	I have enough time in my work to always follow Standard Precautions.					
14	I usually do not have too much to do so I can always follow standard Precautions.					
Education and Training of healthcare personnel on Infection prevention						
15	In my unit, unsafe work practices are corrected by supervisors.					
	HCWs are undergoing IPC training during the onboarding process and get at least one annual refresher					

16	My supervisor often discusses safe work practices with me.					
17	I have had the opportunity to be properly trained to use personal protective equipment devices so that I can protect myself from occupational exposures					
18	Additional training on IPC is provided in response to recognized lapses and to address newly discovered infection transmission threats					
19	Employees are taught to be aware of and recognize potential health hazards at work					
20	In my unit, there is a copy of up-to-date and evidence-based IPC guidelines					

Section 4: Assessing Individual Factors That Influence Adherence to Standard IPC Practices

Part 1: Assessing Knowledge of IPC

Questions		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hand hygiene (handwashing or use of alcohol hand rub)						
1	Performing hand hygiene is required before and after patient care					
2	Hand washing after contact with the patient's environment is an element of standard precautions					
3	Hand hygiene should be performed before an aseptic procedure such as placing an indwelling device					
4	Hands should be washed with soap and water after handling potentially infectious materials irrespective of wearing gloves					
5	Alcohol hand rub can be used to perform hand hygiene when hands are visibly soiled					
6	Hand hygiene should be performed before moving from working on a soiled body site to a clean body site on the same patient					

7	Hand hygiene should be performed in between patient contact					
	Use of personal Protective equipment such as gloves, gowns					
8	Gloves can be used for more than one patient as long as they have not been exposed to blood or other body fluids.					
9	When using gloves, washing hands is not necessary after examining a patient?					
10	Gloves must be changed during patient care if you move hands from 'contaminated body site' to 'clean body site'					
11	All PPE should always be removed and discarded before leaving the area where the patient was seen					
12	Surgical masks can protect the nose and mouth when procedures and activities are likely to generate splashes or sprays of blood and body fluids					
13	Gloves and a gown should be worn during procedures and activities					

	that could cause contact with body fluids, blood, and secretions					
14	Gloves should be worn before touching a contaminated surface or contaminated waste					
	Safe Injection Practices					
15	Needles should be used for only one patient					
16	Injections should be administered aseptically					
17	Syringes can be reused on more than one patient since they do not come into contact with the patient's body fluids					
18	Needles can be recapped before disposal into a sharp's container					
19.	Needles can be removed from disposable syringes before disposal into a sharp's container					
	Waste segregation					
20	Red-coded waste bins are for highly infectious waste					
21	Yellow-coded waste bins are for hazardous healthcare waste					
22	Used gloves and gowns can be discarded in black-coded waste bins					

23	Clinical and non-clinical wastes can be discarded in the same waste bin					
24	Used needles should segregated into a leak-proof, puncture-resistant sharps container					
	Reprocessing of Reusable medical equipment					
25	Reusable medical equipment such as stethoscopes, blood pressure cuffs, and oximeter probes can be used on another patient without disinfecting.					

Part 2: Assessing Attitude Towards IPC

	QUESTION	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1	Standard precaution is not easy to follow					
2	PPE can be used during emergencies					
3	A new set of PPEs should be used for each new patient					
4	Decontaminating equipment with 10%					

	sodium hypochlorite for 10 minutes is enough.					
5	An increased workload increases the risk of hospital-acquired infections.					
6	Following standard operating procedures decreases the risk of contamination.					
7	Keeping proper hand hygiene decreases the risk of contamination					
8	HCWs should not use PPE because it may harm patients psychologically					
9	Segregation of clinical and non-clinical waste is useful to prevent transmission of infections from one to another					
10	Prefers to perform hand hygiene before and after any intervention with patients					
11	Adequate disinfection of medical equipment should be ensured by all HCWs					
12	It is not logical to assume all patients are contagious unless their					

	infection has been confirmed					
14	Transmission of infectious organisms can be reduced by adhering to standard and contact precautions					
15	Changing gloves is not necessary during procedures even if heavily contaminated					
16	It is difficult to work wearing PPE					
17	Standard precautions prevent the spread of infections from patients to HCWs and vice versa					
18	Stationeries, telephones, and doorknobs are not sources of infections					
19	Hospital management should ensure the availability of adequate PPEs for its staff					
20	Infectious diseases can be treated hence PPE is not required					

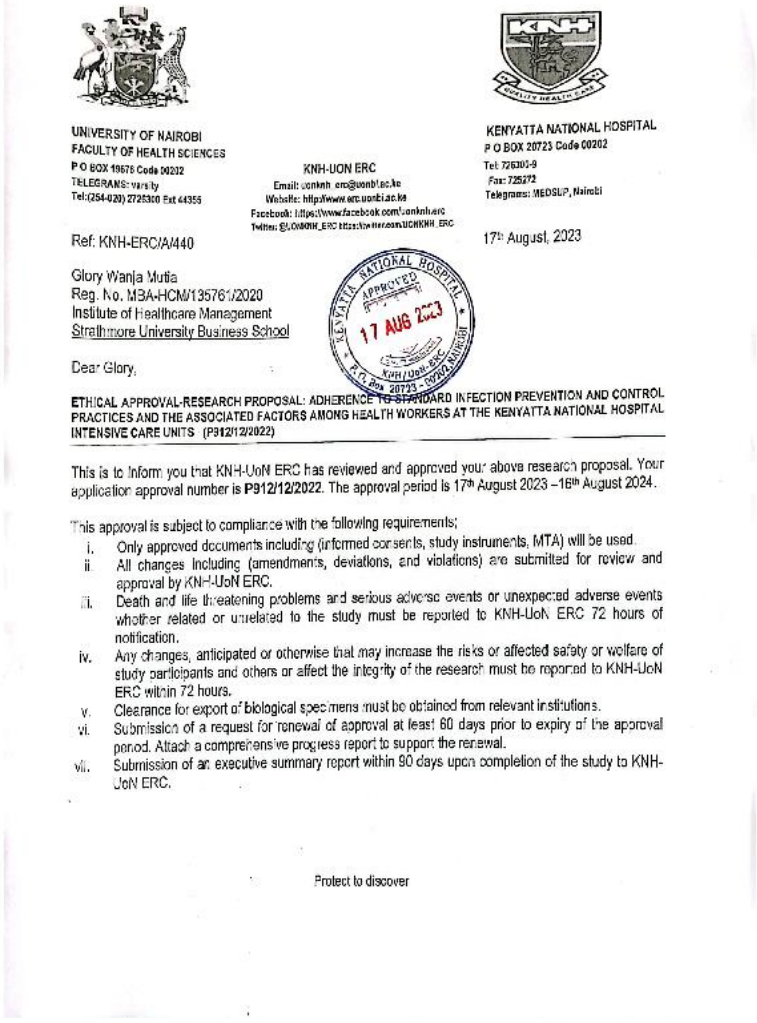
Appendix 3:Study Budget

Item	Cost Per Item	Total Cost
Study Assistants (1)	Ksh. 1000 per day for each for 20 days	Ksh. 20,000
Statistician	Ksh. 30000	Ksh. 30,000
Stationery and Printing		Ksh. 10,000
Ethics fee		Ksh 2000
Contingencies (miscellaneous)		Ksh. 10,000
Total		Ksh.72,000

Appendix 4:Gantt Chart

Year	2022			2023				
Month / Activity	Aug -	Dec	Dec	Jan	April	May - July	Aug	Se
Proposal Development								
Thesis proposal Défense								
Submission to ERC								
Data collection								
Data analysis								
Thesis development								
Thesis Défense								
Thesis Submission								

APPENDIX 5: KNH/UoN ERC Approval



UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
TELEGRAMS: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/440

17th August, 2023

Glory Wanja Mutia
Reg. No. MBA-HCM/13576/2020
Institute of Healthcare Management
Strathmore University Business School

KENYATTA NATIONAL HOSPITAL APPROVED 17 AUG 2023 KNH/UON-ERC P.O. Box 20723 - 00202 NAIROBI

Dear Glory,

ETHICAL APPROVAL-RESEARCH PROPOSAL: ADHERENCE TO STANDARD INFECTION PREVENTION AND CONTROL PRACTICES AND THE ASSOCIATED FACTORS AMONG HEALTH WORKERS AT THE KENYATTA NATIONAL HOSPITAL INTENSIVE CARE UNITS (P912/12/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P912/12/2022**. The approval period is 17th August 2023 –16th August 2024.

This approval is subject to compliance with the following requirements;

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

Protect to discover

Appendix 6: SU-ISERC Approval

66

Strathmore University Institutional Scientific and Ethical Review Committee (SU-ISERC)

Final Decision

This is to certify that the application for ethics clearance submitted by:
Principal Investigator: Dr. MUTIA, GLORY WANJA
Reference number: SU-ISERC1873/23
For Study: "Adherence to Standard Infection Prevention and Control Practices and associated factors at the Kenyatta National Hospital, Intensive Care Units"
Was reviewed and received the following status: "done"
Reviewer Comments
Final decision: **not-approved**
Comments sent:
PI no longer needed to obtain ethical approval
The SU-ISERC wishes you all the best with this research undertaking.
03 October 2023 09:57:41

Appendix 6: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **493251**

Date of Issue: **29/January/2024**

RESEARCH LICENSE

This is to Certify that Dr.. GLORY WANJA of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Adherence to standard IPC practices and the associated factors among Healthcare workers at the Kenyatta National Hospital, Intensive Care Units for the period ending : 29/January/2025.

License No: **NACOSTI/P/24/32655**

493251

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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

See overleaf for conditions