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Factors affecting compliance to infection prevention and control measures among frontline health workers: a case study of the Kitale County Referral Hospital

Yvette Nafula Kisaka,
Strathmore Business School
Strathmore University

Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital

By

YVETTE NAFULA KISAKA

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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.

Yvette Nafula Kisaka

2nd November 2021

Approval

The dissertation of Yvette Nafula Kisaka was reviewed and approved for examination by the following:

Dr. Francis Wafula (Supervisor)

Strathmore University Business School

2nd November 2021.

Dr. George Njenga

Executive Dean

Strathmore University Business School.

Dr. Bernard Shibwabo

Director, Office of Graduate Studies

ABSTRACT

The quality of services provided at a healthcare facility is greatly influenced by compliance to infection prevention and control (IPC) standards. Low adherence increases the risk of transmitting pathogens like Covid-19 and exposure to occupational hazards. This study sought to assess factors that affect compliance to the IPC standards by frontline healthcare workers at the Kitale County Referral Hospital in Trans-Nzoia County. For purpose of the study, frontline healthcare workers include nurses and doctors only. The study objectives were to (i) examine the implementation of infection prevention and control (IPC) measures relating to hand hygiene, personal protective equipment (PPE) usage, and safe injection practices at the Kitale County Referral Hospital (ii) describe the patterns of association between selected health worker socio-demographic characteristics and compliance to the IPC standards and (iii) examine health facility factors that affect compliance to the IPC standards. A mixed-methods study design was employed. Actual data was collected from healthcare workers, who were stratified into two groups: nurses and doctors. For quantitative data, participants were selected using the stratified random sampling method, and data collected using a semi-structured questionnaire, followed by analysis using the Statistical Package for Social Sciences (SPSS). For the qualitative component, purposive sampling was employed to select participants, data collected through in-depth interviews guided by a topic guide and analyzed using the by NVivo Pro software. A total of 111 participants were involved in the survey, with eight being included in the in-depth interviews. Of the 111, 81% were nurses, and 65% female. Nearly two-thirds said they had had IPC training. The survey found the level of full compliance to be 53.2% for hand hygiene, 52.3% for PPE use, and 59.5% for injection safety which was lower than expected considering the global efforts towards improving IPC practices in the covid-19 era. Additionally, it showed a significant correlation between health worker cadre and compliance to hand hygiene. Existence of an IPC committee, provision of adequate PPE and injection safety boxes, management support, availability of policies and guidelines, and their ease of accessibility were also linked to level of compliance to hand hygiene, PPE use and injection safety. The findings add to ongoing research aimed at understanding how IPC policy and practice can be improved to eliminate transmission of nosocomial infections, especially in the Covid-19 pandemic.

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LIST OF ABBREVIATIONS

CDC	Centre for Disease Control and Prevention
HAI	Hospital-Acquired Infections
HCWs	Healthcare workers
HIV	Human Immunodeficiency Virus
IPC	Infection prevention and control
KCRH	Kitale County Referral Hospital
PPE	Personal protective equipment
QI	Quality improvement
SP	Standard precautions
WHO	World Health Organization

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DEDICATION

I dedicate this dissertation to my son Adriel King Baraka. You are my sole source of motivation and I hope this contributes to creating a better world for you.

Special dedication to my unmatched support system: my sister Christine Kisaka, my best friend Stellah Wabwile, and my house manager Jenny Nabusandu. For stepping into my parental roles while I was away for school and your terrific emotional support. I would not have made it without you.

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

In 2015, the United Nations (UN) General assembly adopted the 2030 Sustainable Development Agenda and identified 17 goals towards its achievement. Goal three focuses on ensuring healthy lives and promoting wellbeing for all at all ages. To achieve this goal, the attainment of universal health coverage (UHC) by member states was identified as a key target (Verrecchia, Thompson, & Yates, 2019). In this sense, the WHO defined UHC as a means by which all individuals and communities receive the health services they need without suffering financial hardship (WHO, 2014). Overall, UHC has three components: healthcare coverage, financial risk protection, and healthcare quality. However, global efforts have mainly focused on the first two goals, resulting in expanded access to low-quality services, resulting in poor outcomes and harm in some cases (Kruk & Pate, 2020).

According to WHO, quality of care refers to the degree to which healthcare services for individuals and populations increase the likelihood of achieving the desired health outcomes and are consistent with the current professional knowledge(WHO, 2020). This involves the provision of safe, effective, timely, efficient, equitable, and patient-centered healthcare (WHO, 2018). Effective implementation of infection prevention and control (IPC) programs is paramount in the delivery of quality health services(WHO, 2016).

IPC has been defined by WHO as a scientific approach to preventing harm caused by infection to patients and health workers and can be divided into standard and transmission-based precaution measures (Folan & Baillie, 2014). Standard precaution measures refer to the prevention practices applied to patients irrespective of their infectious status while transmission-based measures are the additional measures applied when patients are suspected to have infections that can spread through contact, droplet, or airborne routes and are often applied to supplement standard measures(Siegel, Rhinehart, Jackson, & Chiarello, 2009).

IPC elements include hand hygiene, use of personal protective equipment (PPE), proper management of medical waste, safe injection practices, processing of instruments, linen processing as well as cough and respiratory etiquette (Faller, Sampathkumar, & Ung, 2020**).** This study focused on the three elements of IPC namely: - hand hygiene, use of PPE and safe injection practices.

Healthcare workers are predisposed to infectious exposures which can occur percutaneously via needle stick injuries as well as via splashes of infectious body fluids (Amoran & Onwube, 2013). Despite the high exposure risk, compliance to IPC measures such as proper handwashing remains low (Longtin, Sax, Allegranzi, Schneider, & Pittet, 2011). Past studies have identified some of the reasons underlying poor IPC practices within health systems as the absence of IPC policies, stock-outs, low availability of personal protective equipment (PPE), low staff numbers resulting in overworking of existing staff, and poor planning of health service delivery processes among others (Houghton et al., 2020). Findings in (Auta et al., 2017) showed that elderly HCWs and those who worked for more than 40 hours a week had a greater risk of occupational exposure.

In Kenya, health services were devolved to 47 counties under the 2010 Constitution, presenting counties with the opportunity to design systems that meet their citizens' unique health sector needs, backed by autonomy in decision-making and resource allocation. However, most counties have struggled with managing different facets of health services, including human resources and service delivery leading to a deterioration of the quality of the healthcare services offered (Kimathi, 2017). Poor planning of services and management of staff has resulted in low adherence to IPC standards and a subsequent rise in cases of hospital-acquired infections (Haque, Sartelli, McKimm, & Abu Bakar, 2018). The COVID-19 pandemic made matters worse, exposing inadequacies in existing systems, with reports of healthcare workers getting exposed at their places of work, further putting patients at risk of infection (Maina, Tosas-auguet, English, Mcknight, & Schultsz, 2020)

A 2013 nationally representative survey of patient safety found that less than 2% of Kenyan facilities comply with patient safety measures broadly (Ministry of Health, 2013), which means that patients are potentially exposed to unsafe practices while seeking health services at the majority of the health facilities. This necessitates the need to carry out facility-level studies to acquire detailed hospital-level data identifying the specific healthcare worker and facility determinants that influence compliance to IPC standards and recognize how they can all be aligned to improve IPC practices. This study seeks to do this at the Kitale County Referral Hospital.

1.2. Problem Statement

Kenya's commitment to achieving UHC is underscored by its inclusion in the government's Big Four Agenda, a national project priority list declared by the President in 2018. The government emphasized the intention of achieving the Constitutional target of having all Kenyans access the highest attainable standards of health. Under UHC, the government's efforts were to be directed towards expanding coverage of safe and quality health services minus financial impoverishment (KEMRI Welcome Trust, 2019).

However, policy efforts have mainly centered around expanding geographic access and removing financial barriers. The two goals have been achieved through the building of new healthcare facilities and encouraging uptake of health insurance among other strategies. Much less effort has been directed towards ensuring good quality (Wangie & Kandie, n.d.). Yet, according to the Lancet Global Health Commission on Quality Health Systems, more than eight million lives are lost annually due to the poor quality of healthcare (Kruk et al., 2018). Most of these lives are lost across low- and middle-income countries (LMICs) such as Kenya, where governments emphasize the construction of new facilities at the expense of what happens when patients visit these facilities. The result is unsafe care characterized by high incidences of hospital-acquired infections (HAIs) (Kruk & Pate, 2020).HAIs are among the most common adverse events reported during health service delivery and serve as an indicator of the quality of service provided (Palomar et al., 2008).

Although the global prevalence of HAIs is unknown, LMIC studies report figures in the region of 20%, much higher when compared to 4-12% in wealthier countries (Auta et al., 2017). Furthermore, WHO estimates that at any given time 7% and 10% of patients in developed and developing countries respectively will acquire at least one HAI(WHO, 2016). These infections have mainly been attributed to low adherence to IPC measures (Hopmans, Blok, Troelstra, & Bonten, 2007). It is estimated that low IPC compliance contributes to roughly 66,000 Hepatitis B infections annually among healthcare workers (Mbaisi, Ng'ang'a, Wanzala, & Omolo, 2013). More recently, poor IPC standards have been linked to the increased spread of Covid-19 disease, a pandemic that has devastated health systems across the world (Wang, Zhou, & Liu, 2020)

To promote quality and safe healthcare services, the Kenyan Ministry of Health (MOH) established the Kenya Quality Model for Health (KQMH), a framework designed to guide and expedite movement towards better quality services through regular assessment of services and implementation of quality improvement (QI) interventions including IPC programs (Ministry of Health, 2018). Outside of the government, private institutions have also signed up to other QI models such as SafeCare and the Joint Commission International Accreditation process. The overall objective of these efforts was to encourage healthcare organizations to recognize the importance of developing policies and guidelines needed to uphold IPC standards, form IPC committees, train healthcare workers on IPC and develop motivation strategies that encourage HCWs to adhere to set IPC standards.

Despite efforts to improve the quality of health services, adherence to IPC measures at public health facilities in Kenya remains low resulting in a high prevalence of HAIs (Ndegwa, 2015). A 2019 study in 14 county public hospitals on water, sanitation, and hygiene (WASH) revealed poor practices generally with ward level adherence to hand hygiene being placed at 35% (Maina et al., 2019).

Among County public health facilities in Kenya is the Kitale County Referral Hospital, which is the largest public healthcare facility in Trans-Nzoia County. Anecdotal reports at the hospital indicate incidences of hazardous occupational exposures and consequent transmission of nosocomial infections including COVID-19 among healthcare workers. This underscores the importance of examining the implementation of IPC standards at the hospital to identify the specific determinants of the compliance levels and enable the implementation of corrective measures aimed at improving the safety and quality of health services being provided at the facility.

1.3 Research Objectives

1.3.1 Overall objective

To describe factors affecting compliance to infection prevention and control (IPC) standards among frontline healthcare workers at the Kitale County Referral Hospital and understand underlying reasons.

1.3.2 Specific Objectives

1. To examine the implementation of infection prevention and control measures relating to hand hygiene, PPE use, and safe injection practices at the Kitale County Referral Hospital.

2. To describe the patterns of association between selected health worker socio-demographic characteristics and compliance to these IPC standards at the Hospital.

3. To examine the health facility determinants that affect the compliance to these IPC standards at the Hospital.

1.4 Research Questions

i. How is the implementation of infection prevention and control measures relating to hand hygiene, PPE use, and safe injection practices at the Kitale County Referral Hospital?
ii. What are the patterns of association between selected health worker sociodemographic characteristics and compliance to IPC standards at the hospital?
iii. What are the health facility determinants affecting compliance to IPC standards at the Hospital?

1.5 Scope of the study

This study will be focused on the factors that affect compliance to standard infection prevention and control practices among frontline healthcare workers with an emphasis on doctors and nurses. This will include activities relating to hand hygiene, use of PPE, and injection safety. With regards to the geographical location, it is based in Trans-Nzoia County, particularly the Kitale County Referral Hospital.

Thematically, the focus will be on the current implementation of the standard IPC practices as well as the determinants of compliance to IPC measures divided into the healthcare worker determinants and the health facility determinants.

1.6 Significance of the study

Non-compliance to IPC measures can contribute to the spread of infectious pathogens in healthcare organizations, causing death, disease, and suffering. This can only be reversed if detailed knowledge is gained on factors underlying transmission patterns observed, and especially, the role of frontline healthcare workers in spreading the pathogens through poor IPC adherence.

This study will contribute to our understanding of the contributory factors to the poor adherence to IPC measures among frontline healthcare workers.

Understanding this will allow policy and practitioners to design more effective interventions to promote safety and implement QI strategies more effectively. For managers, findings will show how clinical governance and leadership can be deployed more effectively at a county-level hospital. From a research perspective, findings will contribute to our understanding of how various factors intersect to affect IPC compliance, providing a platform for additional empirical work aimed at improving quality and safety within health systems.

CHAPTER TWO: LITERATURE REVIEW

2.1. Overview of the chapter

This chapter covers the theoretical and empirical review of literature, weaving these into a conceptual framework to guide the research.

2.2. Theoretical review

The study was guided by the Donabedian Framework and the Health Belief Model. IPC practices are key in the delivery of quality health services. The Donabedian Framework was employed to identify the key components that affect quality and safety while the Health Belief Model was used to explain the compliance behavior among healthcare workers to health promotion activities including IPC.

2.2.1. Donabedian Framework

Developed in 1966 by Avedis Donabedia, the Donabedian Framework is a fundamental tool for evaluating the quality of health services. It is founded on three interrelated constituents: the structure, the processes, and the outcomes (Ayanian & Markel, 2016). Structural measures are defined as the characteristics of the space where delivery of care occurs which may include the architecture and equipment availability; the process includes the workflows involved in the delivery of care; while the outcome describes the overall effects of health care on populations(Binder, Torres, & Elwell, 2021). Clinical outcomes may include hospital-acquired infections and patient satisfaction levels (ACT Academy, 2017). Non-compliance to IPC measures increases the prevalence of HAIs (Haque, Sartelli, Mckimm, & Abu Bakar, 2018). This study, therefore, aimed to measure the level of compliance to IPC as a contributory factor to acquiring and transmitting HAI. The constituents under structure included healthcare worker characteristics and the health facility determinants that could potentially influence adherence to IPC. Among the health facility determinants are the existence of an IPC committee, management support, provision of adequate IPC supplies as well as provision of policies and guidelines needed to guide proper IPC implementation. Components under processes included supervision of HCWs while delivering care, communication, and consultations among healthcare workers and between HCWs and management, training of healthcare workers on IPC, the use of the approved guidelines by HCWs as well as the utilization of the approved standard operating procedures while delivering

services. The outcome of interest was the compliance of HCWs to standard IPC measures related to hand hygiene, injection safety and appropriate use of PPE.

2.2.2. The Health Belief Model (HBM)

Established by four psychologists in the 1950s, this model has been widely used in explaining individuals' motivation and engagement in health promotion behavior and as a tool for promoting compliance to preventive health behaviors (Nutbeam, Harris, & Wise, 2010). Therefore, the HBM model can play an important role in explaining the factors that either facilitate or hinder compliance to IPC practices given that compliance to IPC is a health promotion behavior aimed at preventing the spread of HAIs. HBM is based on the following theoretical constructs: a person's perceived risk of acquiring a disease (perceived susceptibility), the belief of the resulting consequences (perceived severity), the potential positive benefits of the action (perceived benefits), the perceived barriers to that action, the exposure to factors which prompt action (cues to action), an individual's confidence in their ability to succeed (self-efficacy) as well as modifying variables (a person's characteristics)(Glanz, Rimer, & Viswanath, 2008). Combined, the perceived susceptibility and perceived severity are referred to as perceived threats.

A higher perceived threat, perceived benefit, and high self-efficacy encourage compliance to the identified health promotion behavior. HCWs would be more compliant to IPC measures when their perception of a risky exposure is high and when they feel they get to benefit more with compliance to IPC measures. Nonetheless, despite having a high perceived threat and benefit, an individual may be prevented from engaging in health-promoting behavior by perceived barriers such as unavailability of IPC supplies. Additionally, the magnitude of the above perceptions is greatly influenced by one's individual characteristics (modifying variables) including structural, demographic, and psychological factors (Abraham & Sheeran, 2014). Among the structural factors are one's history of contracting a particular illness and their depth of knowledge of the aforesaid illness. A healthcare worker with a history of contracting a nosocomial infection due to non-compliance to IPC measures would most likely adhere to the set standards to avoid contracting HAIs. Demographic factors may include age, sex, ethnicity, race as well as the individual's education level, while psychological factors include an individual's personality and attitude. All these have been shown to influence adherence to IPC as revealed in the literature review below.

Furthermore, the HBM model postulates that a trigger or cue is essential in prompting one to engage in a certain behavior (Laranjo, 2016). These cues may include posters on proper IPC practices, availability of color-coded waste bins, warning labels on products, as well as the availability of explicitly displayed standard operating procedures and guidelines. A healthcare worker is likely to comply to proper hand hygiene if they can follow the steps on proper hand hygiene practice from a well-displayed poster.

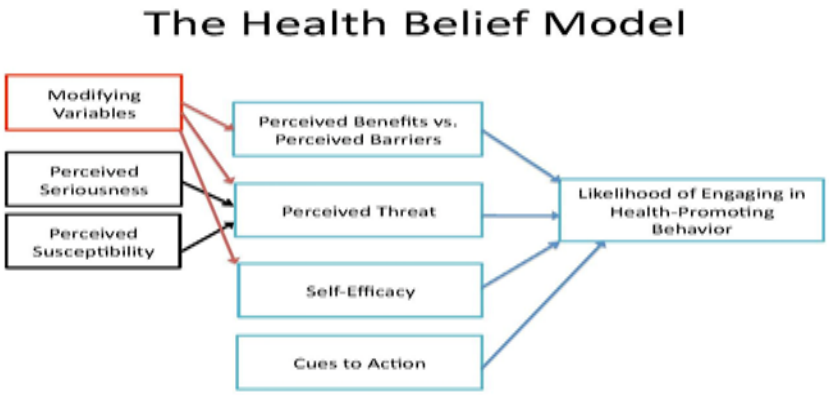

Figure 2. 1: The Health Belief Model

Source: Cambridge Handbook of Psychology, Health, and Medicine, Second Edition page 97

2.3. Empirical review

This chapter presents a review of literature related to the objectives of the study.

This review highlights the background of standard IPC measures and narrows down to focus on the level of compliance of the three key elements of standard precaution being studied namely: - hand hygiene, PPE use and safe injection practices. Additionally, it expounds on the related healthcare workers and health facility determinants affecting this compliance.

2.3.1 Background of standard infection prevention and control measures

Infection prevention and control (IPC) refers to the practical, evidence-based approach aimed at preventing harm to healthcare workers and patients due to avoidable infections (Folan & Baillie, 2014). Effective IPC programs need collaborative actions between policymakers, health care workers, health managers, as well as the users of the health services. Without effective IPC, it is impossible to achieve quality health care delivery (Baillie, 2014).

In August 1987, the CDC defined the term "Universal Precautions" to refer to preventive measures that are applied to patients to prevent transmission of pathogens via blood- or blood-stained body fluids. Under this definition, blood and blood-stained body fluids of all patients were considered potentially infectious for HIV, hepatitis B virus (HBV), and other bloodborne pathogens (CDC, 1988). The CDC later changed the term to standard precautions in 1996, which extended the elements of universal precautions to include contact with all body fluids (except sweat), irrespective of whether blood was present or not(CDC, 2008).

Standard infection prevention measures that healthcare workers engage in include hand hygiene, appropriate use of PPE, injection safety, cough etiquette, waste disposal, disinfection and sterilization of medical instruments, as well as cleaning of the environment (Kumar & Kumar, 2015). This study focused on the level of compliance of three elements of standard precautions namely: hand hygiene, use of PPE, and safe injection practices. Each element is discussed separately below.

2.3.2 The level of Compliance to IPC measures

2.3.2.1 Hand hygiene

HAIs are commonly spread via HCW's contaminated hands. Hand hygiene, therefore, is the most important mechanism to prevent the transmission of nosocomial infections (Joseph, Sistla, Dutta, Badhe, & Parija, 2010). Hand hygiene refers to the cleaning of hands by use of soap and clean water or an alcohol-based hand rub (Pittet, Allegranzi, & Boyce, 2009). WHO defines five moments of hand hygiene, namely: before touching a patient, after touching a patient, after touching a patient's surroundings, before performing a clean or aseptic procedure, and after body fluid exposure or risk (Chou, Achan, & Ramachandran, 2012).

Previous studies sone revealed that HCWs do not practice hand hygiene more than 50% of the recommended times (I. M. Ali, Y. Y. Jusoh, R. Abdullah & Faculty, 2001). Furthermore, most HCW only perform hand hygiene after a procedure. An Ethiopian study assessing the knowledge and practice of HCWs relating to IPC revealed a 69% compliance to hand hygiene with 82.5% of the practice being after and 50.8% before a procedure. Hand hygiene was commonly performed using soap and water at 98% while the use of disinfectant solution was at 8.8% (Gulilat, 2014).

A study done by Haile et al reported that only 18.4 % of the HCW reported to have washed their hands before touching a patient while 39.6% of the respondents cleaned their hands before performing a medical procedure(Haile, Engeda, & Abdo, 2017). This is comparable to the results found by Mukwato et al on the frequency of hand hygiene after touching a patient conducted at Ronald Ross General Hospital. In this study, only 61% of HCWs practiced hand hygiene after patient contact all the time while 3.9% of the respondents rarely washed their hands (Mukwato, Ngoma, & Maimbolwa, 2009). In contrast to the findings in (Gulilat, 2014), hand hygiene was performed more commonly using an alcohol-based hand rub (36.4% of the respondents) as compared to 27.3% who used soap and water. The study finding also showed that 41.6% of the respondents washed their hands to prevent cross-infection, 9.1% were motivated to wash hands based on the patient's appearance and 9.1% were influenced to practice hand hygiene by the patient's HIV status.

In a study conducted at Lions Hospital, Addis Ababa, 71% of nurses were reported to practice effective hand hygiene compared to physicians at 38%. Among the physician's 7% washed their hands before and 48% after patient contact (Tenna et al., 2013).

Conclusions from research on IPC in a level four hospital in Kenya pointed out that hand hygiene by use of soap and water was habitually done by 75% of the nurses, 57.1% of clinicians, 71.4% of the laboratory staff, and 91.3% of the support staff. For HCWs who did not use soap and water, the majority cleaned their hands by use of diluted sodium hypochlorite solution as opposed to alcohol hand rub as recommended.(Gichuhi, Kamau, Nyangena, & Ngalo Otieno-Ayayo, 2015)

In a study on factors influencing IPC at a Kisii level 5 hospital by Maosa, it was noted that 61.2% of the medical staff considered hand hygiene a big challenge. Only 55% of the staff adhered to the recommendation of washing hands before and after a procedure (Maosa, 2012). The low rate of hand hygiene among HCWs was supported by a study that focused on hand hygiene in a newborn unit whereby the compliance rate was found to be 15%. Moreover, HCWs were twice probable to perform hand hygiene after as opposed to before carrying out a procedure.

Additionally, 52% of HCW were not aware of the WHO's five moments of hand hygiene. (Ngugi, Murila, & Musoke, 2019).

2.3.2.2 Safe injection practices

A safe injection is defined by WHO as one that is administered by use of appropriate equipment, does not cause any harm to the recipient nor exposes the provider to risk that can be avoided, and does not result in dangerous waste(WHO, 2002). Unsafe injection practices include the use of a needle or syringe on two or more patients, the recapping of used needles, poor disposal of syringes and needles as well as the administration of unnecessary injections (Luby, 2001).

WHO reports that of the injections performed in Sub-Saharan Africa in 2000, 17-19% were unsafe (Ezzati, Lopez, Rodgers, & Murray, 2004). According to a 2005 study done in South Africa, syringe reuse was a common practice and most healthcare workers considered injections safe as long as the needle was changed even if the syringe was not changed. Additionally, 30% of HCWs did not consider the use of a new needle for each patient as an important practice (Shisana, Mehtar, Mosala, & Zungu-Dirwayi, 2005). This contrasted the findings in the study done in Zambia at Ronald Ross Hospital whereby no respondent reported to have re-used needles nor syringes. The study further reported that 62.3% of used syringes and needles were disposed in boxes improvised for disposal of sharps. Only 9.1% of the HCWs had had a needle-stick injury one year before the study (Mukwato et al., 2009).

Findings relating to safe injection practices in Benin identified that adherence to the recommended practice was below average. Only 48.4% of the nurses had good injection practices while 47.5% were reported to have excellent practice. Furthermore, 23% of the nurses reported to practice recapping of needles regularly, and consequently, 58.2% got needle-stick injuries(Omorogbe, Omuemu, & Isara, 2012)

The high levels of unsafe injection practices were also noted in a Nigerian study on safe injection practices amongst primary healthcare workers. In this study, the recapping of needles was detected in 86.7% of the participating health facilities. Poor disposal of used needles was rampant as 80% of the facilities had needles sighted outside the safety box within the hospitals, while in 33.3% of the cases, needles were found disposed outside the facilities. Although a majority (95.2%) of the participants stated having used the safety boxes for syringes and needle disposal, 53.9% disposed them by burning or burying the used needles while 29.2% did the same via local incineration.

Moreover, 3.3% of the participating facilities reported having disposed the used needles in open dumpsites. However, only a small percentage (1.5%) reported having dumped the needles in a pit (Akeem Bolarinwa et al., 2014).

In Kenya, the ministry of health (MOH) launched the National policy on safe injection practices and waste management in 2007 intending to promote safer injection practices and proper management of medical waste through training, provision of adequate supplies, and behavior change communication (Lepkowski, 2007). Despite this policy being in place, in 2018 needle-stick injuries prevalence amongst HCWs at the main tertiary facility - Kenyatta National Hospital (KNH) was high at 45.6% (Njihia, 2017). Conspicuously 31.9% of HCW recapped their needles and 8% of them subsequently got needle stick injuries (Njihia, 2017).

2.3.2.3 Compliance relating to the use of PPE

According to the Occupational Safety and Health Administration (OSHA), personal protective equipment (PPE) refers to equipment worn to reduce exposure to hazards that may result in serious injuries and illnesses at the workplace (OSHA, 2004). There are various PPE recommended for different procedures and the choice is dependent on the anticipated exposure, durability, and appropriateness of use (Centers for Disease Control and Prevention, 2016). PPE include full-body suits, gloves, eye protection, footwear, respirators among others.

Despite the proven efficacy in preventing nosocomial infections, proper use of recommended PPE is still suboptimal. According to Gulilat, the overall practice of PPE in Ethiopia is relatively low (roughly 36%). In this same study, the use of gowns when carrying out procedures was optimal (99%), while only 73% of the respondents reported having put on a glove when required. Furthermore, only 31.1% of HCWs reported having donned gloves regardless of the patient's condition. Donning of caps was indicated to be low at 15.8% (Gulilat, 2014).

A study done in Nigeria by Okechuku indicated that gloves were the most commonly used PPE. The majority of HCWs (88.44%) wore a gown or plastic apron only when carrying out procedures likely to generate splashes while 68.95% reported using masks and eye protectors (Okechukwu & Modteshi, 2012). The trend was also evident in a study by Haile who noted that the majority of the HCWs used PPE based on the likelihood of exposure and patient's diagnosis. Additionally, 88.7% of the respondents reported to always put on gloves when there was a risk of being exposed to infectious body fluids and only 32.4% of the respondents wore PPE regardless of patients' diagnosis. Wearing goggles and a waterproof apron was noted to be below 50% (Haile et al., 2017).

Okello et al (2017) studied the barriers and factors affecting the use of PPE at St.Marys Hospital in Lacor, Northern Uganda. From their findings, 2% of the 59 respondents were not aware of the purpose of PPE, 13% of the HCW did not use PPE when indicated and among those who donned protective gear, 10% used an inappropriate one. Moreover, 23.7% of the respondents did not know how to properly don and doff PPE. Among the barriers to compliance included unavailability of adequate PPE, poor fitting, substandard gloves, and lack of training on PPE usage (Okello, Kansime, Odora, Apio, & Pecorella, 2017).

2.3.3 Health care worker determinants of compliance

The individual characteristics of HCWs such as age, sex, years of experience, training, and attitude have an impact on the level of compliance to IPC measures. Studies done among healthcare workers in Nigeria have concluded that implementation of IPC measures is greatly influenced by suboptimal knowledge on and poor interpretation of IPC measures among healthcare workers (Amoran & Onwube, 2013). A study done in Benin on injection safety found that only 55.7% of the respondents had adequate knowledge on safe injection practices and this was greatly influenced by their experience in nursing, age, and sex (Omorogbe et al., 2012).

In a study assessing the standard precaution practices in public hospitals in Addis Ababa, Ethiopia, low educational level, older age, and a positive attitude were positively associated with good standard precaution practice. Health professionals with a positive attitude were eight times likely to adhere to the recommended IPC measures compared to those with a negative attitude. Furthermore, compliance to IPC measures decreased by half among degree holders compared to health care workers with diploma qualifications. Conversely, older health professionals were more compliant in comparison to the younger colleagues aged between 20-29 years (Angaw, Gezie, & Dachew, 2019). These findings were consistent with that in a Saudi Arabian Study where older nurses (60-69) years were noted to practice better surgical site infection prevention techniques compared to the younger ones. This was attributed to the added years of experience in practice among older HCWs (Alabdulrazaq, Almutairi, Alhsaon, & Alsaigh, 2018).

In a recent study done on IPC in outpatient facilities in Tanzania, Powell et al noted that the age and gender of healthcare workers influenced compliance levels. The age of HCW was associated negatively with the correct use of gloves with compliance noted to be lower among those who were above 30 years old. Furthermore, female HCW were likely to adhere to hand hygiene compared to their male counterparts (Powell-Jackson et al., 2020).

This was upheld in (Haile et al., 2017) where female HCWs were 2.18 times more compliant to standard precautions as compared to male HCWs. In a study on the perceived barriers to preventive measures of COVID- 19, it was reported that age, sex, profession, and work experience were significantly associated with adherence levels to IPC standards. On the contrary, however, male HCWs were four times likely to comply with preventive measures compared to their female counterparts (Birihane, Bayih, Alemu, & Belay, 2020).

The effect of HCWs attitude and perception of risk on compliance to IPC measures was also made evident in a study done in Addis Ababa. In this study, it was revealed that doctors were likely to perform hand hygiene when the risk of infection was perceived to be higher. Similarly, in (Akagbo, Nortey, & Ackumey, 2017) 39% of the respondents did not comply with standard precautions due to the perceived unlikelihood of exposure. Hand hygiene was performed 97% of the time after evident contact with blood or other body fluids, 82% after caring for wounds, and 82% of the time when hands looked or felt dirty (82%) (Tenna et al., 2013). Likewise, in a study done in Virginia among healthcare professionals, only 83% of the respondents always wore gloves when attending to patients. 53% of those who did not always use gloves reported that patients appeared to be of low risk while 43% among them attributed the lack of using gloves to forgetfulness. Correspondingly, in a Kenyan study whereby low rates of compliance to hand hygiene was evident, HCWs reported that the likelihood of washing hands increased double-fold after a procedure due to the high perception on the possibility of a risky exposure (Ngugi et al., 2019). The relationship between HCW attitude and proper IPC practice was also eminent in (Maosa, 2012) whereby the low adherence levels to hand hygiene reported was because HCWs felt they could easily substitute handwashing with the use of gloves.

2.3.4 Health facility determinants of compliance

Health facility determinants have a significant impact on the implementation of IPC measures. These factors include the availability of IPC policies and guidelines, adequate supplies, adequate staffing, availability of IPC Committees as well as supportive hospital management.

Findings in a Brazilian study revealed that institutional related factors were the main reasons for non-adherence to standard precautions (Piai-Morais, Orlandi, & De Figueiredo, 2015). This was consistent with the results in (Okechukwu & Modteshi, 2012) where lack of infection prevention supplies was cited as the main reason why HCWs did not always don the right PPE while performing medical procedures.

One study found that the existence of IPC committees was positively associated with adherence levels (Abdella et al., 2014). According to the study in question, HCWs who were aware of the existence of an IPC committee were 2.6 times more likely to comply as opposed to those not aware. This was in agreement with a study done in Italy which revealed that the presence of an IPC committee led to reduced HAIs (Sydnor & Perl, 2011).

HCWs who receive frequent support from management have been shown to have a higher likelihood of complying with IPC measures (Haile et al., 2017). Similar results were also observed in a previous study done in Brazil where management support had the greatest impact on the adherence levels of HCWs to IPC (Brevidelli & Cianciarullo, 2009).

Frequent training of healthcare workers has also been proven to increase compliance levels as evidenced in (Teshager, Haileselassie Engeda, & Worku, 2015) whereby knowledge and prevention of surgical site infections were significantly associated with a history of undertaking training on infection prevention methods.

The management of a health facility is obligated to provide resources that would ensure the working environment is safe and promote the proper implementation of IPC precautions to prevent HAI. (Mpamize, 2016) reported that regular supply of PPE and training of HCWs significantly affected the practice of IPC. Alike, (Moyo, 2013) conveyed that lack of water supply, inadequate PPE, poor maintenance of medical equipment, and inadequate staffing contributed to the non-compliance to IPC measures among nurses at Mbagathi District Hospital. These findings were maintained in (Birihane et al., 2020) and (Akagbo et al., 2017).

2.3.5 Gaps from empirical review

From the review, it was evident that few studies related to IPC have been done in Kenya and particularly no such study has been done in Tran-Nzoia County limiting evidence-based decision making that could improve IPC practices in the County and the whole region at large. This study purposes to fill this gap by contributing towards the body of knowledge needed to boost the attainment of the government's UHC goal of providing affordable quality health services to all. Moreover, most of the studies focused on one component of quality at a time, either by looking at the input, a process, or the outcome. For example,(Akeem Bolarinwa et al., 2014) only focused on safe injection practices, while (Tenna et al., 2013) focused on healthcare workers' characteristics that affected their IPC practices.

This study proposes to look at IPC as a component of quality from a wider perspective, examining both the inputs (healthcare worker determinants and health facility determinants) as well as the processes (implementation of hand hygiene, PPE use, and safe Injection practices).

2.4. Conceptual framework

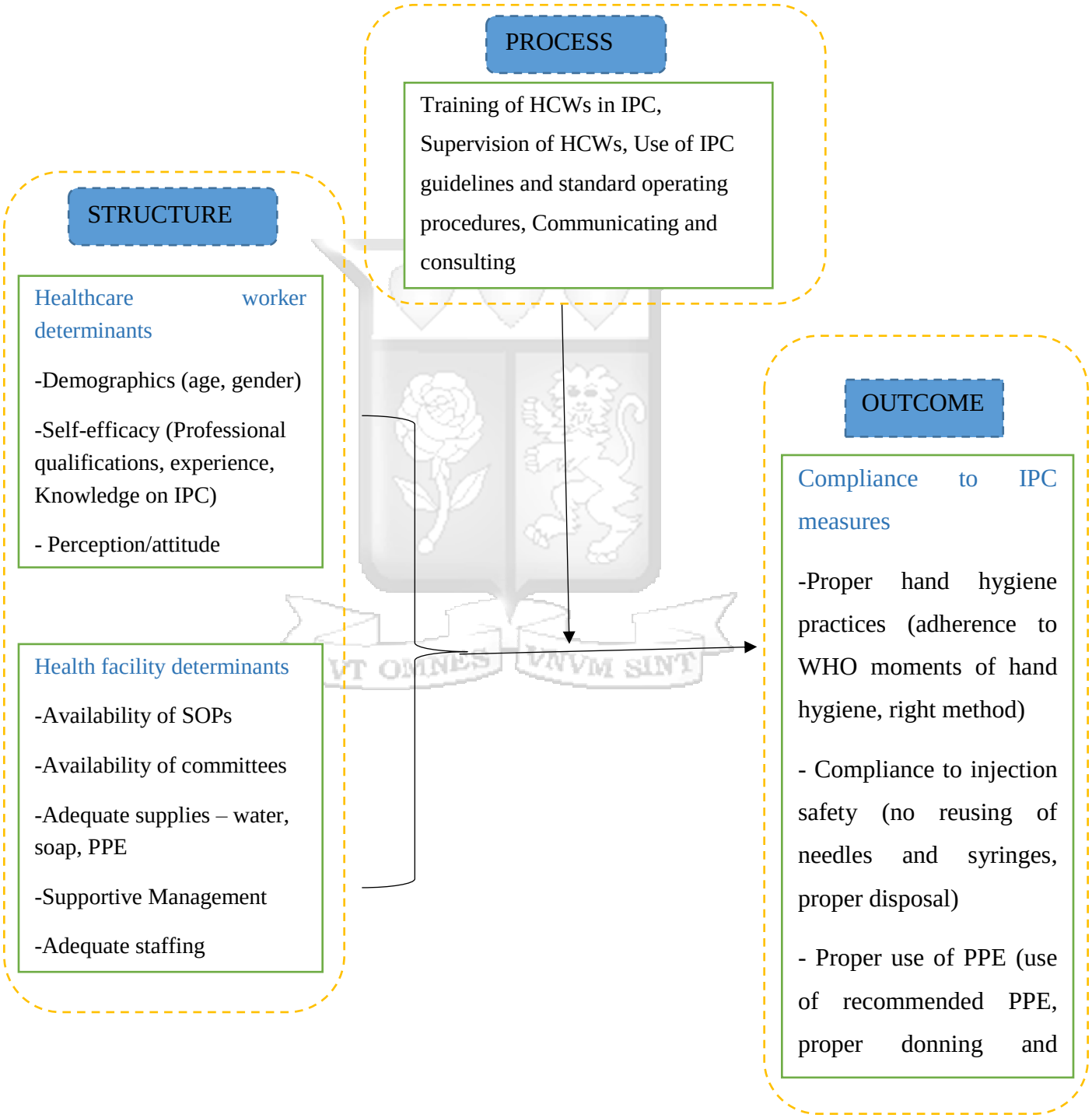

Figure 2. 2: The conceptual Framework

The framework's outcome and the dependent variable is compliance to IPC standards namely: - proper hand hygiene, injection safety and proper use of PPE. Compliance to IPC standards relies on two broad factors under the structure arm: the health care worker determinants and health facility determinants which constitute the independent variables. Past evidence and the reviewed literature propose that individual health worker determinants including demographic characteristics, technical capability, and HCW attitude and perceptions interact with health facility determinants such as adequate supplies and supportive management to influence compliance to IPC. Attitudes, perceptions, demographic characteristics, self-efficacy are also key features of the HBM.

In complying with the IPC measures, HCWs are engaged in several activities including the use of appropriate guidelines, utilization of provided standard operating procedures, consultations, on job training in IPC as well as the supportive supervision of HCWs while they perform their duties. These constitute the process component of the Donabedian Framework. These activities affect the strength of the effect the health facility and healthcare worker determinants have on the actual compliance to IPC measures, hence can be considered as the moderating variables. For example, despite favorable structural factors, HCWs may not adequately comply if they are not being supervised. Moreover, a health worker with no training in IPC may comply better with the use of PPE just because they are following displayed instructions on donning and doffing PPE while delivering care.

CHAPTER THREE: METHODOLOGY

3.1 Overview of the chapter

This chapter presents the methods employed to achieve the research objectives organized under the following subtitles: research design, target population, study site, and setting, sampling procedures and sample size estimation, data collection tools and methods, data analysis, research quality, and ethical considerations.

3.2 Research design

The study utilized a mixed-method approach. According to (Schulze, 2003), mixed-method research offers a wider breath and enhanced depth compared to the use of either quantitative or qualitative approach alone by building on the strengths of both approaches. These findings were supported by (McKim, 2017).

3.3 Study Site and setting

The 250-bed capacity Kitale County Referral Hospital (KCRH) was purposively selected because the study investigator is based there and will have access to information and interview data on compliance to safety and quality. Studies looking at compliance to standards tend to be sensitive, creating the risk of participants withholding key information, presumably to protect themselves. However, familiarity with the study investigator and assurance of their intentions can help to build trust and allow the collection of more valid information (Anglewicz, Akilimali, Eitmann, Hernandez, & Kayembe, 2019). However, there is little concern over the choice of hospital, because KCRH is a typical Kenyan public referral hospital, governed and staffed in a manner similar to most other public hospitals.

The KCRH is the largest health facility in Trans-Nzoia County, serving patients from within Trans-Nzoia and the neighboring Bungoma, Uasin-Gishu, and West Pokot Counties. Trans- Nzoia county is located 380 kilometers Northwest of Nairobi between Mt. Elgon and river Nzoia in the former Rift valley Province with an average area of 2495km^2 and a population of 990,341(Kenya National Bureau of Statistics (KNBS), 2019).

3.4 Target population

This study will target frontline healthcare workers working at the Kitale County Referral Hospital. For this study, frontline healthcare workers will refer to nurses and doctors only. Nurses were purposely targeted because they constitute the highest percentage of the health workforce in Kenya providing the bulk of direct patient care services (Ministry of Health in Kenya, 2015). Moreover, nurses are the HCWs engaged in activities with a high risk of transmitting HAI such as administration of injections, wound dressing, conducting deliveries as well as instrument processing (Moyo, 2013). Despite their active involvement in patient care, nurses have few leadership opportunities in the Kenyan health system which has largely been a reserve for doctors (Juma, Edwards, & Spitzer, 2014). Doctors have been involved in this study because, in addition to their involvement in patient care, they largely comprise the leadership of the system tasked with developing policies, guidelines, and mechanisms to ensure compliance.

The inclusion criteria: Frontline healthcare workers working at KCRH who have been working at the hospital for at least six months and are directly involved in patient care.

The exclusion criteria: Frontline healthcare workers who have been working at the hospital for less than six months and those who will not consent to participate.

3.5 Sampling

3.5.1 Sampling Methods

To obtain quantitative data, participants were selected using stratified random sampling where participating healthcare workers were stratified into two groups: nurses and doctors. A list of the nurses and doctors working in the facility was obtained from the hospital administration. Thereafter a simple random technique was applied to each stratum to select the eligible respondents. If one was unavailable or did not wish to participate, the next person on the list was selected. Purposive sampling was used to select participants who were interviewed. This technique was chosen particularly because it enables the inclusion of knowledgeable and experienced participants with the greatest potential to aid in achieving the research objectives (Creswell & Clark, 2011). A heterogenous approach was particularly employed since this method allows the researcher to obtain a wider range of views (Laerd dissertation, 2012). This was accomplished by including participants with different qualifications, years of experience, demographic characteristics as well as behavior relating to IPC practice.

3.5.2 Sample size estimation

Sample size estimation was done using Fischer's formula.

This formula is given as follows: -

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

Whereby,

N = the desired sample size

Z = the standard deviation at 95% Confidence level which is 1.96

d = the degree of precision set at 0.05

P = 0.5

P is the proportion of the desired characteristic. The recommended 50% was be used

Hence n was estimated as

$$n = \frac{1.96^2 \times 0.5(1- 0.5)}{0.05^2}$$

$$= 384$$

However, our target population was below 10,000, hence we used: -

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

Whereby

nf was the desired sample size when the population is less than 10,000

n was the desired sample size when the population is more than 10,000

N was the estimate of the population size.

The estimated total number of nurses and doctors at the facility is 214.

Number of nurses = 172

Number of doctors = 42

Hence the value of N was 214

$$nf = \frac{384}{1+(384/214)}$$

= 138.

Hence the sample size was 138.

Number of doctors included in the study = (42/214) ×138 = 27

Number of nurses included in the study = (172/214) × 138 = 111.

For the interview, purposive sampling was employed to select the participants, a heterogenous approach being employed to get a wide range of responses until a level of saturation was reached.

3.6. Data collection

3.6.1 Data collection tools

Data was be collected using a self-administered semi-structured questionnaire and a standard interview guide. The study instruments were developed based on the variables identified in the literature reviewed and aligned with the key objectives of the study.

The questionnaire was divided into three sections. The first section focused on the individual factors influencing compliance to IPC divided into the HCWs' socio-demographic characteristics. The second section included questions related to the health facility's determinants of adherence to IPC measures while the third section concentrated on the actual practice regarding implementation of IPC measures at the hospital.

The interview guide aimed to get in-depth factors that affect compliance to IPC.

3.6.2 Data collection methods

Quantitative data was collected via a survey while qualitative data was obtained via interview.

3.7 Data Analysis

Quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) while analysis of qualitative data was by NVivo Pro software. The Completed data collection tools were reviewed to ascertain their comprehensiveness. Subsequently, the data collected was cleaned, classified, and coded before being fed into the software programs. Descriptive statistics were utilized to analyze the characteristics of the respondents. Significance and the relationship between the variables were determined using a two-sided chi-square test, the level of significance defined by a p-value of <0.05.

3.8 Research Quality – Reliability and validity

Validity refers to the extent to which the research instruments used measure what they assert to measure (Taherdoost, 2018). There are three main types of validity namely: construct validity, content validity, and criterion validity (Heale & Twycross, 2015). Content validity focuses on whether the study instruments cover all aspects that it needs to cover concerning the variable under study. Construct validity identifies whether one can be able to draw inferences about scores linked to the concept being studied, while criterion validity identifies whether any other study instrument would be able to measure the same variable (Heale & Twycross, 2015).To ensure construct and content validity, a pre-test was conducted among ten frontline healthcare workers at Endebess Sub-County Hospital. According to Mugenda, the pre-test sample size could be between 1% to 10% of the study sample size (Mugenda & Mugenda, 2003). This hospital has similar characteristics to KCRH regarding the health services provided and the cadres of healthcare workers deployed. The pretest was useful in evaluating the appropriateness and clarity of the questions and instructions to ensure that they match the objectives of the study. Additionally, it aided in identifying potential challenges likely to be encountered during the study and informed appropriate adjustments on the data collection tools. Furthermore, to ensure precision, the supervisor did a peer review on the study instruments to guarantee compliance with the existing knowledge on IPC and alignment with the study objectives before commencement.

Reliability refers to the consistency of a research instrument or procedure (Bryman, 2016). Four cases of reliability estimates have been defined namely: - (i) Inter-rater reliability which assesses the extent to which different participants give consistent evaluations of the same variable, (ii)Test-retest reliability which examines the consistency of a measure over time,(iii) internal consistency reliability which measures the consistency of results across items within a test and (iv) parallel-form reliability which evaluates the consistency of the results of two tests constructed in the same way from the same content domain (William M.K. Trochim, 2020). To ensure internal consistency reliability, the study instruments were all standardized and designed using simple language easily understood by all participants. Additionally, questionnaires were self- administered, and all participants were allowed to fill them during their off time. Interviews were also conducted at the participant's most convenient times. The study was purely descriptive, there were no inferential statistics and therefore coefficient calculations for reliability were not applicable.

3.9 Ethical considerations

The study was conducted after approval from the Institutional Review Board of Strathmore University and the National Commission for Science Technology and Innovation (NACOSTI).

Permission to conduct the study at KCRH was sought from the Director of Health who is also the acting Medical Superintendent of the hospital.

Informed consent was obtained from all the study participants. Confidentiality of the participants was ensured by identifying them using unique identifier codes as opposed to their names.

CHAPTER FOUR: RESULTS

4.1 Overview of the chapter

This chapter focuses on the analysis and presentation of the data collected. The study findings have been presented in line with the objectives in the following order: Response rate, participants' socio-demographic characteristics, implementation of hand hygiene, safe injection practices and use of PPE, correlation and significance between socio-demographic characteristics and compliance to IPC measures, institutional factors affecting IPC measures, correlation and significance between institutional determinants and compliance to IPC measures and findings of the interviews.

4.2 Response rate.

A total of 111 respondents took part in the study out of a sample size of 138 giving a response rate of 80.4%.

4.3 Participants socio-demographic characteristics

The study included nurses and doctors who constituted 81% and 19% (n=111) respectively. Females represented 64.9% and males 35.1%. Concerning age, the distribution was as follows; 36.9%, 31.5%, 28.8%, and 2.8% for age groups 20-29, 30-39, 40-49, ≥50 years respectively. Results on the highest level of qualification revealed degree and diploma holders comprised 38.7% and 41.5% respectively with only 14.4% having attained a master's degree. Additionally, 72% of the HCWs had had training in IPC. On marital status, 58.6% were married while the singles constituted 37.8%. Regarding religion 95.5% of the respondents were Christians. In terms of their clinical experience, 45% had had between one to five years of clinical experience. Additionally, 47.7% of the participants had been employed at the hospital for a period of between six months and five years.

Table 4. 1: Participants' socio-demographic characteristics

Demographic characteristics	Frequency	Percentage
Age (in years)		
20-29	41	36.9%
30-39	35	31.5%
40-49	32	28.8%
≥50	3	2.8%
Sex		
Male	39	35.1%
Female	72	64.9%
Cadre		
Nurse	90	81.0%
Doctor	21	19.0%
Highest Qualification		
Masters	16	14.4%
Degree	43	38.7%
Higher diploma	6	5.4%
Diploma	46	41.5%
Training in IPC		
Yes	80	72.0%
No	31	28.0%
Marital status		
Married	65	58.6%
Single	42	37.8%
Divorced	1	0.9%
Widowed	3	2.7%
Religion		
Christian	106	95.5%
Muslim	6	3.6%
Atheist	1	0.9%
Years of clinical experience		
1-5	50	45.0%
6-10	23	20.7%
11-15	15	13.5%
16-20	19	17.1%
>20	4	3.7%
Duration at KCRH (in years)		
0.5- 5		
>5 - <10	53	47.7%
>10 - <15	26	23.5%
>15 - < 20	16	14.4%
	16	14.4%

4.4 Implementation of standard infection prevention and control measures

4.4.1 Hand hygiene

4.4.1.1. Hand hygiene method used.

Out of a total of 111 participants, 57.7% indicated that they commonly use alcohol hand rub as opposed to 42.3% who mentioned soap and water. Moreover, 81% (n=21) of doctors preferred using alcohol hand rub while this was the case for only 52.2% (n=90) of the nurses.

4.4.1.2 Compliance to WHO five moments of hand hygiene

The results showed that 99.1% (n=111) of the participants always performed hand hygiene after body fluid exposure risk, 94.6% did the same after performing a clean or aseptic procedure and 88.3% after touching a patient. Only 60.4% of the participants reported to always perform hand hygiene before touching a patient.

Table 4. 2: Compliance to WHO five moments of hygiene

	Frequency	**Percentage**
Before touching a patient		
Always	67	**60.4%**
Sometimes	29	**26.1%**
Rarely	14	**12.6%**
Never	1	**0.9%**
After touching a patient		
Always	98	**88.3%**
Sometimes	13	**11.7%**
After performing a clean or aseptic procedure		
Always	105	**94.6%**
Sometimes	4	**3.6%**
Rarely	1	**0.9%**
Never	1	**0.9%**
After touching patients surrounding		
Always	88	**79.3%**
Sometimes	18	**16.2%**
Rarely	5	**4.5%**
After body fluid exposure risk		
Always	110	**99.1%**
Sometimes	1	**0.9%**

4.4.1.3 Overall compliance to hand hygiene practices

WHO recommends to always perform hand hygiene during all five moments. The interest of this study was those who were fully compliant. Compliance level was calculated as a percentage of the total scores from the responses over the maximum possible score. The responses were scored as follows: Always=3, sometimes =2, rarely = 1, never= 0 giving 15 (3 x 5) as the maximum possible score for all the five moments of hand hygiene. The percentage scores were graded as fully compliant at 100%, substantially compliant (75-99.9%), minimally compliant (50-74.9%) and non-compliant (<50%).

Table 4. 3: Overall compliance to hand hygiene practices

	Frequency	Percentage
Fully compliant	59	53.2%
Substantially compliant	41	36.9%
Minimally complaint	11	9.9%
Non- complaint	0	0.0%
Grand Total	111	100.0%

From the analysis, 53.2% (n=111) of the participants were fully compliant with the recommended hand hygiene practices.

4.4.2. PPE Use

4.4.2.1. Compliance to the use of specific PPE

From the results, 77.5% (n=111) of the HCW reported to always put on gloves when performing procedures. This was reported for 64.9% and 64% of HCWs who used gowns and face masks respectively when performing procedures likely to generate splashes. Additionally, 9.9% of the respondents indicated to have put on gowns depending on the patient's condition. This was also seen among 14.4% who wore facemasks/googles and 0.9% who wore gloves.

Table 4. 4: Compliance to the Use of Specific PPE

	Frequency	**percentage**
Use of Gloves when performing procedures.		
Always	86	**77.5%**
Sometimes	24	**21.6%**
Depend on patient's condition	1	**0.9%**
Use of Gowns when performing procedures likely to generate splashes.		
Always	72	**64.9%**
Sometimes	27	**24.3%**
Depends on patient's condition.	11	**9.9%**
Rarely	1	**0.9%**
Use of Face masks/goggles when performing procedures likely to generate splashes.		
Always	71	**64%**
Sometimes	23	**20.7%**
Depends on patient's condition.	16	**14.4%**
Never	1	**0.9%**

4.4.2.2 Overall compliance to the use of PPE

Compliance level was calculated as a percentage of the total scores from the responses over the maximum possible score. The responses were scored as follows: Always=3, sometimes/depends on patient's condition =2, rarely = 1 and never= 0, giving 9 (3x3) as the maximum possible score for all the three indications for PPE use (use of gloves, use of gowns and use of face masks/goggles). The percentage scores were graded as fully compliant at 100%, substantially compliant (75-99.9%), minimally compliant (50-74.9%) and non-compliant (<50%

Table 4. 5: Overall compliance to the use of PPE

	Frequency	**Percentage**
Fully Compliant	58	52.3%
Substantially Compliant	36	32.4%
Minimally Compliant	17	15.3%
Non-Compliant	0	0.0%
Grand Total	**111**	**100.0%**

The analysis revealed that 52.3% of the respondents were fully compliant to the recommendations of PPE use.

4.4.3. Safe Injection practices

4.4.3.1 Compliance to specific safe injection practices

From the analysis, 99.1% (n=111) participants reported never reuse needles or syringes, while 93.7% always disposed needles and syringes in safety boxes. However, 60.4% of the participants reported to sometimes dispose syringes in dustbins after disposing needles in safety boxes. Additionally, 13.5% of the respondents stated they used burning as an alternative method of disposing used needles and syringes.

Furthermore, 59.5% of the HCWs reported to never recap needles while 24.3% said they sometimes did this.

Table 4. 6: Compliance to specific safe injection practices

	Frequency	**Percentage**
Recapping of needles		
Never	66	**59.5%**
Rarely	18	**16.2%**
Sometimes	27	**24.3%**
Reusing needles		
Never	110	**99.1%**
Rarely	1	**0.9%**
Reusing syringes		
Never	110	**99.1%**
Rarely	1	**0.9%**
Disposing of needles and syringes in safety boxes after use		
Always		
Sometimes	104	**93.7%**
	7	**6.3%**
Disposing needles in safety boxes and syringes in dustbins		
Always		
Sometimes	6	**5.4%**
Rarely	67	**60.4%**
Never	1	**0.9%**
	37	**33.3%**
Other methods of disposing other than safety boxes		
None	96	**86.5%**
Burning	15	**13.5%**

4.2.3.1 Overall compliance to safe injection practices

Compliance level was calculated as a percentage of the total scores from the responses over the maximum possible score.

For disposing needles and syringes in safety boxes responses were scored as follows: always=3, sometimes=2, rarely = 1 and never= 0. For recapping of needles, reusing of needles and syringes and disposing syringes in dustbins after disposing needles in safety boxes, responses were scored as follows: always=0, sometimes=1, rarely = 2 and never= 3. The maximum possible score was 15 (3 x 5) for all the five injection practices evaluated. The percentage scores were graded as fully compliant at 100%, substantially compliant (75-99.9%), minimally compliant (50-74.9%) and non-compliant (<50%

Table 4. 7: Overall Compliance to safe injection practices

	Frequency	**Percentage**
Fully compliant	66	59.5%
Substantially complaint	19	17.1%
Minimally compliant	26	23.4%
Non-compliant	0	0.0%
Grand Total	**111**	**100.0%**

The results showed that 59.5% of the HCWS were fully compliant to safe injection practices.

4.5. Correlation and significance between the healthcare worker socio-demographic characteristics and full compliance to IPC measures

4.5.1 Hand hygiene

Analysis of the results revealed the HCW cadre as the only statistically significant demographic factor affecting full compliance to hand hygiene with a 58.9% (n=90) rate among nurses compared to doctors at 28.6% (n=21)

Table 4. 8: Correlation and significance between participants socio-demographic characteristics and full compliance to hand hygiene

Variable	**Fully Compliant**	**Not fully compliant**	**n**	**X^2**	**P-value**
Age (in years)					**0.695**
20-29	20 (48.8%)	21(51.2%)	41	**1.447**	
30-39	21(60%)	14(40%)	35		
40-49	17(53.1%)	15(46.9%)	32		
50-60	1(33.3%)	2 (66.7%)	3		
Sex					
Male	20 (51.3%)	19 (48.7%)	39	**0.085**	**0.771**
Female	39 (54.2%)	33 (45.8%)	72		
Cadre					
Nurse	53 (58.9%)	37 (41.1%)	90	**6.285**	**0.012****
Doctor	6 (28.6%)	15 (71.4%)	21		
Highest Qualification					
Masters	6 (37.5%)	10 (62.5%)	16		
Degree	24 (55.8%)	19 (44.2%)	43	**1.930**	**0.587**
Higher diploma	3 (50%)	3 (50%)	6		
Diploma	26 (56.5%)	20 (43.5%)	46		
Training in IPC					**0.091**
Yes	47 (58%)	34 (42%)	81	**2.856**	
No	12 (40%)	18 (60%)	30		

4.5.2 PPE Use

From the results, there was no statistical significance between any of the selected socio-demographic characteristics and full compliance to PPE use.

Table 4. 9: Correlation and significance between participants socio-demographic characteristics and full compliance PPE Use

Variable	**Fully Compliant**	**Not fully compliant**	**n**	**X^2**	**P-value**
Age (in years) 20-29 30-39 40-49 50-60	 21(51.2%) 19 (54.3%) 17 (53.1%) 1(33.3%)	 20 (48.8%) 16 (45.7%) 15 (46.9%) 2 (66.7%)	 41 35 32 3	**0.516**	**0.915**
Sex Male Female	 24 (61.5%) 34 (47.2%)	 15 (38.5%) 38 (52.8%)	 39 72	**2.078**	**0.149**
Cadre Nurse Doctor	 47(52.2%) 11(52.4%)	 43 (47.8%) 10 (47.6%)	 90 21	**0.000**	**0.990**
Highest Qualification Masters Degree Higher diploma Diploma	 9 (56.3%) 21(48.8%) 3 (50%) 25 (54.3%)	 7 (43.7%) 22 ((51.2%) 3 (50%) 21(45.7%)	 16 43 6 46	**0.397**	**0.941**
Training in IPC Yes No	 44 (54.3%) 14 (46.7%)	 37 (45.7%) 16 (53.3%)	 81 30	**0.514**	**0.473**

4.5.3. Safe injection practices

Analysis of the results revealed that none of the socio-demographic characteristics had a significant association with full adherence to safe injection practices.

Table 4. 10: Correlation and significance between participants socio-demographic characteristics and full compliance to safe injection practices

Variable	**Fully Compliant**	**Not fully compliant**	**n**	**X^2**	**P-value**
Age (in years) 20-29 30-39 40-49 50-60	 24 (58.5%) 22 (62.9%) 17 (53.1%) 3 (100%)	 17 (41.5%) 13 (37.1%) 15 (46.9%) 0 (0%)	 41 35 32 3	**2.760**	**0.430**
Sex Male Female	 22 (56.4%) 44 (61.1%)	 17 (43.6%) 28 (38.9%)	 39 72	**0.232**	**0.630**
Cadre Nurse Doctor	 53 (58.9%) 13 (61.9%)	 37 (41.1%) 8 (38.1%)	 90 21	**0.064**	**0.800**
Highest Qualification Masters Degree Higher diploma Diploma	 9 (56.3%) 22 (51.2%) 5 (83.3%) 30 (65.2%)	 7 (43.7%) 21(48.8%) 1(16.7%) 16 (34.8%)	 16 43 6 46	**3.348**	**0.341**
Training in IPC Yes No	 48 (59.3%) 18 (60%)	 33 (40.7%) 12 (40%)	 81 30	**0.005**	**0.944**

4.6 Institutional determinants of compliance to IPC

The study revealed that 91%(n=111) of the participants agreed that the hospital had an IPC committee while 9% were unaware. Out of the total 73% of the HCWs agreed that the management conducts training 13.5% disagreed and a similar percentage reporting to be unaware. With regards to the provision of adequate supplies, 46.8% reported that management provided adequate PPE, 79.3% agreed that management provided adequate hand hygiene supplies while 77.5% agreed to the provision of adequate injection safety boxes.

Additionally, 56.8% of the respondents agreed that management availed IPC policies and guidelines with only 45% agreeing that the policies and guidelines were easily accessible. Out of the total, 37.8% disagreed regarding management providing adequate support concerning IPC.

Table 4. 11: Institutional determinants of compliance to IPC

	Yes (n=111)	**No (n=111)**	**Unaware (n=111)**
Existence of an IPC committee in the hospital	101(91%)	0 (0%)	10 (9%)
Management conducts training on IPC	81(73%)	15 (13.5%)	15(13.5%)
Management provides adequate hand hygiene supplies	86(77.5%)	25(22.5%)	0(0%)
Management provides adequate PPE	52 (46.8%)	59 (53.2%)	0 (0%)
Management provides adequate safe injection boxes	88 (79.3%)	22 (19.8%)	1 (0.9%)
Availability of written policies on IPC	63 (56.8%)	19(17.1%)	29 (26.1%)
Policies and guidelines are easily accessible	50 (45%)	35 (31.5%)	26 (23.5%)
There is adequate support from management	66 (59.5%)	42 (37.8%)	3 (2.7%)

4.7 Correlation and significance between the institutional determinants and full compliance to IPC measures

4.7.1. Hand hygiene

The results revealed a statistically significant relationship between full compliance to hand hygiene and three variables namely: the existence of an IPC committee (X^2= 4.851, p-value = 0.028), availability of policies and guidelines (X^2 =13.497, p-value 0.001), and ease of accessibility of the policies and guidelines (X^2=16.390, p-value 0.000). Full Compliance to hand hygiene was 56.4% (n=101) for those aware of the existence of an IPC committee compared to 20% (n=10) for those unaware. With regards to the availability of policies and guidelines, compliance level was at 68.3% (n=63), 36.8%(n=19), and 31%(n=29) for those who agreed, disagreed or were unaware of their existence respectively.

Additionally, the adherence level among those who agreed that the policies and guidelines were accessible was 74% (n=50) (n=35) and 30.8%(n=26) among those who disagreed or were unaware. Amongst those who agreed that management provided adequate hand hygiene supplies, 54.7%(n=86) were compliant.

Table 4. 12: Correlation and significance between the institutional determinants and full compliance to hand hygiene

Variable	**Compliant**	**Not compliant**	**n**	**X^2**	**P-value**
Existence of an IPC committee					
Yes	57 (56.4%)	44 (43.6%)	101	**4.851**	**0.028****
Unaware	2 (20%)	8 (80%)	10		
Management conducts training					
Yes	47 (58.0%)	34 (42.0%)	81	**3.392**	**0.183**
Unaware	7 (46.7%)	8 (53.3%)	15		
Management provides adequate hand hygiene supplies				**0.334**	**0.557**
Yes	47 (54.7%)	39 (45.3%)	86		
No	12 (48.0%)	13 (52.0%)	25		
Availability of written policies and guidelines					
Yes	43 (68.3%)	20 (31.7%)	63	**13.497**	**0.001****
No	7 (36.8%)	12 (63.2%)	19		
Unaware	9 (31.0%)	20 (69.0%)	29		
Policies and guidelines are easily accessible					
Yes	37 (74.0%)	13 (26.0%)	50	**16.390**	**0.000****
No	14 (40.0%)	21(60.0%)	35		
Unaware	8 (30.8%)	18 (69.2%)	26		
There is adequate support from management					
Yes	41(62.1%)	25 (37.9%)	66	**5.316**	**0.070**
No	17 (40.5%)	25 (59.5%)	42		
Unaware	1(33.3%)	2 (66.7%)	3		

4.7.2 PPE Use

Table 4. 13: Correlation and significance between the institutional determinants and full compliance to PPE Use

Variable	Compliant	Not fully compliant	n	X^2	P-value
Existence of an IPC committee					
Yes	54 (53.5%)	47 (46.5%)	101	**0.661**	**0.416**
Unaware	4 (40.0%)	6 (60.0%)	10		
Management conducts training					
Yes	45 (55.6%)	36 (44.4%)	81	**1.444**	**0.486**
No	6 (40.0%)	9 (60.0%)	15		
Unaware	7 (46.7%)	8 (53.3%)	15		
Management provides adequate PPE					
Yes	34 (65.4%)	18 (34.6%)	52	**6.762**	**0.009****
No	24 (40.7%)	35 (59.3%)	59		
Availability of written policies and guidelines					
Yes	41(65.1%)	22 (34.9%)	63	**10.172**	**0.006****
No	8 (42.1%)	11(57.9%)	19		
Unaware	9 (31.0%)	20 (69.0%)	29		
Policies and guidelines are easily accessible					
Yes	36 (72.0%)	14 (28.0%)	50	**21.990**	**0.000****
No	18 (51.4%)	17 (48.6%)	35		
Unaware	4 (15.4%)	22 (84.6%)	26		
There is adequate support from management					
Yes	39 (59.1%)	27(40.9%)	66		
No	18 (42.9%)	24 (57.1%)	42	**3.153**	**0.207**
Unaware	1 (33.3%)	2 (66.7%)	3		

The results revealed a statistically significant relationship between full compliance to PPE use and provision of adequate PPE (X^2=6.762, p-value 0.009), availability of policies and guidelines (X^2=10.172, p-value=0.006) as well as policies and guidelines being easily accessible (X^2= 21.990, p-value= 0.000). Compliance to PPE use among those who agreed that management provided adequate PPE was 65.4% (n=52) while those who disagreed had a 40.7%(n=59) rate.

Regarding the availability of policies and guidelines, 65.1% (n=63) of those in agreement were compliant compared to 42.1% (n=19) who disagreed(n=29) and 31% who were unaware. Furthermore, 72% (n=50) of those who said the policies and guidelines were easily accessible reported full compliance

4.7.3 Safe injection practices

The results revealed a significant relationship between full compliance to safe injection practices with the existence of an IPC committee (X^2=3.957, p-value = 0.047), provision of adequate safe injection boxes (X^2 = 10.316, p-value =0.006), and adequate support from management (X^2 =6.695, p value =0.035).

The analysis revealed that 62.4%(n=101) of those who agreed to the existence of an IPC committee were fully compliant to injection safety compared to 30%(n=10) who were unaware. With regards to the conduction of training by management, the compliance rate was 63.3%(n=81) among those who agreed compared to 53.3% (n=15) and 46.7% (n=15) of those who disagreed or were unaware, respectively. Furthermore, in relation to the provision of adequate safe injection boxes, adherence among those who agreed was noted to be 61.4% (n=88) and 54.5%(n=22) for those who disagreed. Additionally, compliance among those who said management provided adequate support was noted to be 66.7% (n=66) in comparison to those who opposed whose rate was 52.4% (n=42)

Table 4. 14: Correlation and significance between the institutional determinants and full compliance to safe injection practices

Variable	**Compliant**	**Not fully compliant/non-compliant**	**n**	**X^2**	**P-value**
Existence of an IPC committee					
Yes	63 (62.4%)	38 (37.6%)	101	**3.957**	**0.047****
Unaware	3 (30.0%)	7 (70.0%)	10		
Management conducts training					
Yes	51(63.0%)	30 (37.0%)	81		
No	8 (53.3%)	7 (46.7%)	15	**1.664**	**0.435**
Unaware	7 (46.7%)	8 (53.3%)	15		
Management provides adequate safe injection boxes					
Yes	54 (61.4%)	34 (38.6%)	88		
unaware	0 (0.0%)	1 (100.0%)	1	**10.316**	**0.006****
No	12 (54.5%)	10(45.5%)	22		
Availability of written policies and guidelines					
Yes	40 (63.5%)	23 (36.5%)	63	**1.014**	**0.602**
No	10 (52.6%)	9 (47.4%)	19		
Unaware	16 (55.2%)	13 (44.8%)	29		
Policies and guidelines are easily accessible					
Yes	33 (66.0%)	17 (34.0%)	50		
No	19 (54.3%)	16 (45.7%)	35	**1.616**	**0.446**
Unaware	14 (53.8%)	12 (46.2%)	26		
There is adequate support from management					
Yes	44 (66.7%)	22 (33.3%)	66	**6.695**	**0.035****
No	22 (52.4%)	20 (47.6%)	42		
Unaware	0 (0.0%)	3(100.0%)	3		

4.8 Interview Results

A total of eight participants were interviewed. These were purposely selected, and interviews were conducted until a level of saturation. Four main themes were identified (i) benefits of adherence to IPC (ii) factors hindering adherence (iii) factors promoting adherence and (iv) recommendations for improvement of IPC practices. These and the sub-themes identified under each are presented below: -

4.8.1. Benefits of adhering to infection prevention and control measures.

Under this theme, sub-themes identified included (i) reduction of nosocomial transmission, (ii) improving quality of services, and (iii) attraction of clientele. P30 said, *"adhering to the standards ensures we do not transmit infections from one patient to another. It also ensures we do not get infections from patients"*. P24 said, *"in this Covid-19 era, you have to always wear a mask because you can easily get infected if you come close to an infected patient"*. P17 said, *"If you do not comply to the basic practice of infection prevention, patients will not take you seriously, they will even question your qualifications, and right now patients are very cautious of acquiring infections from hospitals."*

4.8.2 Factors hindering adherence to IPC standards

From the results, the sub-themes identified under this theme included (i)inadequate provision of IPC supplies (ii) increased workload, and (iii) healthcare worker attitudes and perceptions. P15 said, "*You are only provided with one box of gloves to be used for the whole department, if you change gloves from one patient to another, they will not be enough to last the whole day"*. P22 said, "*It doesn't matter how many times you train; people will still do things the way they feel like even if it is not the right thing, especially the consultants in the wards. You cannot correct them"*. P24 said, *"If you keep washing hands from one patient to another, you will never finish your work on time. You only wash when they are dirty or when you touch a patient with a skin condition.*"

4.8.3 Factors that promote adherence to IPC standards

The sub-themes revealed under this theme included (i) training of healthcare workers in IPC (ii) existence of an IPC committee (iii) supportive supervision and (iv) fear of contracting nosocomial infections. P30 said, *"We have an IPC department that monitors infection prevention measures in each department. No one wants their department to be graded as the least compliant"*. P17 said, *"The training and mentorship in IPC have greatly helped. You are always in the know of the current recommendations."* P15 said, *"Masks may not be adequate but during this corona era you have to protect yourself lest you become a statistic or even take the virus back home"*. P19 said, *"If a patient has bleeding bedsores and is HIV positive, you will have to wear gloves when cleaning him. If the gloves are unavailable, I will not do it. My safety first."*

4.8.4. Factors that could improve adherence to IPC

Sub-themes identified from the results included (i) Provision of adequate infection prevention supplies (ii) Indiscriminate IPC training and (iii) supportive leadership. P22 said *"We know management is trying but it is not enough. If only we had adequate PPE, we would adhere to the recommendations"* P30 said *"Training on IPC should be continuous and should target all cadres, not just nurses as has been the pattern. Departmental heads, supervisors, and mentors need to take up this responsibility. Responsibility should not be entirely left to the hospital management."*

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Overview of the chapter

This chapter includes a discussion of the key findings in chapter four presented as per the study objectives. This includes the implementation of standard IPC measures at KCRH, socio-demographic characteristics and their patterns of association with compliance levels as well as the institutional factors affecting compliance to IPC. Additionally, it includes information on the limitations of the study as well as conclusions and recommendations.

5.2 Implementation of standard infection prevention measures

Only 53.2% of the HCWs were fully compliant to hand hygiene. This means that putting into consideration the influence of HCWs hands in transmitting nosocomial infections, almost half (46.8%) of the HCWs were at risk. The compliance rate in this study was in line with the 55% found in (Maosa, 2012). It was however low compared to the 69% hand hygiene compliance rate in (Gulilat, 2014). The similar findings between this study and that in (Maosa, 2012) could be attributed to the fact that facilities in which these studies were conducted are located within the same region and the hand hygiene practice could as well be similar. The adherence level to hand hygiene was noted to be higher than the 15% found in (Ngugi et al., 2019). This could be explained by the fact that the latter study was done in a newborn unit which usually has a higher workload compared to other departments. A high workload has been identified as a great contributor to poor compliance to hand hygiene practices (Garus-Pakowska, 2011).

The study also found that hand hygiene was commonly done by use of alcohol hand rub (57.7%) as opposed to washing hands using soap and water (42.3%). This inclination towards alcohol hand rub was also evident in (Mukwato et al., 2009). Alcohol hand rub could be preferred because it is equally effective in decontamination and could be packed in portable bottles that are easy to carry around in pockets making it easier for HWs to clean their hands at their convenience. Additionally, the Covid-19 pandemic brought forth a season where HCWs were extensively sensitized on the use of alcohol hand rub as an alternative to using soap and water for hand hygiene. It is likely that many of them were embracing this practice.

Regarding the WHO five moments of hand hygiene, compliance was greatest after body fluid or risk exposure (99.1%) and lowest before touching a patient (60.4%). These findings were consistent with those found in a study done in Kosovo where nurses had the highest compliance after body fluid exposure (93%) and lowest before touching a patient (18.1%) (Sopjani, 2016).

The high compliance rates after as opposed to before a procedure was also evident in (Gulilat, 2014) and (Mukwato et al., 2009). This practice reveals that HCWs are keener to comply with hand hygiene when they perceive a higher personal risk as opposed to the potential risk that may accrue to the patient. This was also evident from the interview responses such as where P24 said *"….. You only wash hands when they are soiled or when you touch a patient with a skin condition*" and when P19 said *"If a patient has bleeding bedsores and is HIV positive, you will have to wear gloves when cleaning him. If the gloves are unavailable, I will not do it. My safety first."*

With regards to the implementation of proper use of PPE, the study revealed a full compliance rate of 52.3%. This was greater than the 36% compliance found in (Gulilat, 2014). Other than the difference in methods used to measure compliance, the higher compliance level could be because the study was done during the Covid-19 pandemic and therefore healthcare workers were being keener on the proper use of PPE. Additionally, it could be due to the scaled availability of PPE by several donors such as the Equity Foundation. However, it still means that almost half of the HCWs were at risk of exposure to HAIs. Gloves were the commonly used PPE with more than three quarters (77.5%) of the respondents reporting to have always donned gloves when performing procedures, findings which were consistent to those in (Okechukwu & Modteshi, 2012) and (Moyo, 2013). Face masks and goggles were the least used PPE, a deviation from the expectation considering the popularization of the use of face masks in mitigating the spread of Covid-19 (Sikakulya et al., 2021). With only 64% of the respondents indicating to always put on face masks, it could mean that almost 36% of the health care workers were at risk of acquiring and transmitting Covid-19 among other HAIs. Additionally, some HCWs reported having used PPE depending on the patient's condition. This included 14.4% who used facemasks and goggles and 9.9% of those who used gowns. These findings and those from the interview responses exposed the influence of HCWs attitude in utilizing PPE as has also been shown in previous studies (Brisibe, Ordinioha, & Gbeneolol, 2014).

However, the influence revealed in this study was less compared to that in (Haile et al., 2017) where only 32.4% donned PPE regardless of the patient's condition. The difference could be explained by the extensive training of HCWs at KCRH on the use of PPE as a preventive measure towards combating Covid-19 and the general fear of contracting the novel virus.

Furthermore, results in this study showed a full compliance rate of 59.5% to safe injection practices, meaning almost 40% of the HCWs were exposed to risks associated with unsafe injection practices. Nearly a quarter (24.3%) of the respondents reported to sometimes recap needles after use exposing themselves to the risk of needle stick injuries and associated nosocomial infections. These results were in line with 23% noted in (Omorogbe et al., 2012) but lower than findings in (Njihia, 2017) who noted a 31.9% recapping rate. Positively, almost all (99.1%) respondents reported to never reuse needles nor syringes, a practice that greatly reduces the risk of transmitting infections. This was steady with the results in (Mukwato et al., 2009). Concerning the disposal of used needles and syringes, a majority (93.7%) of the respondents reported to always dispose both the syringes and needles in the safety boxes. Similar findings were reported in an Ethiopian study (Akeem Bolarinwa et al., 2014). The high use of safety boxes could be explained by the fact that management provided adequate safe injection boxes as alluded by the majority (79.3%) of the respondents.

5.3 Patterns of association between selected health worker socio-demographic characteristics and compliance to the IPC standards at the hospital

Healthcare worker cadre had a statistically significant relationship with full compliance to hand hygiene ($X2 = 6.285$, $P=0.012$). Adherence was noted to be greater among nurses at 58.9% (n=90) compared to doctors who scored 28.6% (n=21). The higher compliance rate among nurses was evident in most of the literature reviewed including (Abdella et al., 2014) and (Maosa, 2012). These findings are however in contrast to that by (Kamau, 2018) who noted a higher compliance rate among doctors of 57.1% compared to nurses at 51.6%. Previous studies attributed the poor adherence among doctors to their negative attitude and superiority complex, claiming to have more pressing responsibilities to attend to and wouldn't want to waste time on repetitive processes (Karaaslan et al., 2014). Additionally, doctors tend to occupy senior positions in hospitals and would rarely agree to be corrected or trained by people they feel are inferior to them.

This was seen from the interview where P22 said "*It doesn't matter how many times you train; people will still do things the way they feel like even if it is not the right thing, especially the consultants in the wards. You cannot correct them"*.

From the analysis, none of the other socio-demographic characteristics had a significant relationship with compliance to hand hygiene and conspicuously, no significant relationship existed between any of the HCW characteristics and compliance to PPE use or injection safety. This finding has contrasted findings in several studies reviewed in the literature that showed the impact of HCW socio-demographic characteristics such as age, qualifications, IPC training, and years of experience on compliance to standard IPC measures. A possible explanation could be the fact that hand hygiene has been singled out as the most important element in infection prevention and control (CDC, 2016), and nurses identified as the healthcare worker cadre involved in the majority of the activities requiring infection prevention measures (Barrera-Cancedda, Riman, Shinnick, & Buttenheim, 2019) as well as the cadre that spends the most time with the patients (Butler et al., 2018). This may mean that cognizant of the high risk they face and hand hygiene being the single most important element in IPC, nurses would be keener with hand hygiene compliance. Consequently, the complementary effect of hand hygiene being a key IPC element and nursing as the HCW cadre mostly involved in IPC activities would explain why the HCW cadre would be the only significant characteristic that would influence IPC practices and particularly hand hygiene. These findings however identify a gap for further empirical studies.

5.4 Health facility determinants affecting compliance to IPC standards at the Hospital

The effect on health facility determinants on compliance to IPC measures was evidently seen in this study.

There was a significant relationship between the existence of an IPC committee and full compliance to hand hygiene (X^2 =4.851, P value= 0.028) and injection safety (X^2 = 3.957, P-value =0.047). HCWs who were aware of the existence of an IPC committee were 2.8 and 21 times likely to adhere to hand hygiene and safe injection practices respectively, contrasted to those unaware. Similar results were noted in (Abdella et al., 2014) and(Sydnor & Perl, 2011) where knowledge of the IPC committee led to increased compliance and subsequent reduction in HAIs. The existence of an IPC committee enhances adherence due to the heightened supervision. Additionally, IPC committees act as a bridge between the hospital management and the healthcare providers communicating expectations, feedback, and concerns to and from both parties.

Therefore, HCWs with knowledge on the existence of an IPC committee would request and be provided with the needed resources such as IPC supplies, training, and updated guidelines. This would also mean that their grievances would be timely addressed hence motivating them to comply to IPC practices. However, the existence of an IPC committee did not reveal a significant relationship with the use of PPE. This could be explained by the fact that despite the heightened supervision that an IPC committee offers, the use of PPE by HCWs is entirely dependent on the healthcare worker's own initiative, perceptions, attitude, and specific circumstances. Whether or not they are being supervised, some healthcare workers would only use PPE depending on their perception of risk (Akagbo et al., 2017). Moreover, in some situations such as emergency cases, in a bid to save a patient's life, a healthcare worker may overlook their own safety by rushing to attend to the patient without donning the appropriate PPE, especially if putting on the appropriate PPE would take more time and delay a life-saving intervention.

The study also revealed an association between the availability of policies and guidelines and full compliance to hand hygiene (X^2 =13.497, p-value = 0.001) and PPE use (X^2 =10.172, p-value =0.006). HCWs who approved of the existence of policies and guidelines were averagely twice likely to adhere to hand hygiene and PPE use compared to those who disapproved. Furthermore, beyond just their availability, there was also a significant relationship between the ease of accessibility of these guidelines and adherence to hand hygiene (X^2=16.390, p-value =0.000) as well as PPE use (X^2 = 21.990, P-value =0.000). Hand hygiene compliance was 1.9 times and 2.4 times more among those who agreed that the guidelines were easily accessible compared to those who disagreed or were unaware, respectively. PPE use adherence rate was 1.4 times and 1.8 times more among those who agreed compared to those who disagreed or were unaware, respectively. These findings were consistent with those in an Ethiopian study where lack of policies and guidelines was identified as a barrier to adherence to preventive measures against COVID-19 (Birihane et al., 2020). Availability of policies and guidelines provides HCWs with updated evidence-based recommendations and standard structure on the optimum preventive measures. Additionally, ease of accessibility means HCWs can undoubtedly refer to the guidelines on a need basis.

Availability of IPC supplies and equipment was recognized as a factor affecting compliance. The study found a significant relationship between management providing adequate PPE and full compliance to PPE use ($X^{2\ =}$ 6.762, P-value= 0.009). There was also a significant association between the provision of adequate safe injection boxes and full compliance to injection safety (X^2=,10.316, p-value =0.006). HCWs who agreed that management provided adequate PPE and safe injection boxes were 1.6 times and 1.1 times more compliant than those who did not, respectively. These findings were consistent with those in (Mpamize, 2016), (Teshager et al., 2015) (Haile et al., 2017) and (Moyo, 2013) where the provision of adequate supplies improved compliance levels. For health professionals to provide safe and quality services, all the necessary infection prevention supplies and equipment need to be availed at their disposal. Furthermore, all standard precaution measures require the use of personal protective equipment thus provision of adequate PPE becomes a motivation for compliance. The lack of a significant relationship between the provision of hand hygiene supplies and the actual practice could largely be explained by the negative effect on adherence by HCWs' attitude and increased workload as evidenced from the interviews.

Additionally, the study noted a significant relationship between adequate support from management and full compliance to safe injection practices ($X^{2=}$ 6.695, p-value = 0.035). This finding is not unique as previous studies have indicated that management support significantly influences adherence to IPC measures including injection safety (Haile et al., 2017). This could be because apart from providing adequate supplies, management plays a key role in developing rewarding systems for proper adherence to set standards as well as availing adequate funds for activities that improve IPC practices including injection safety.

5.5 Limitations of the study

This study had the following limitations: -

There was a risk of recall bias as this study relied on the HCWs' ability to recall their past conduct concerning IPC practices. Additionally, the study was dependent on self-reported data and since the information obtained from the respondents was not validated via direct observation, the results could be affected by response bias.

The study focused on compliance levels among doctors and nurses only. Compliance levels among other healthcare cadres was not determined. Additionally, only three elements of the standard IPC measures were studied excluding other elements.

The study was also conducted during the Covid-19 pandemic where the practice of infection prevention and control had been heightened in a bid to contain the pandemic. Likely, the findings may not be generalized to other periods.

5.6 Conclusions

At KCRH, health care worker compliance to hand hygiene, PPE use and injection safety is above average. However, ≥40% of the HCWs are at risk of acquiring and transmitting nosocomial infections associated with non-compliance to the three standard IPC measures.

The cadre of the healthcare personnel was identified as a key characteristic influencing the level of compliance to hand hygiene. Nurses were more compliant compared to doctors.

The existence of an IPC committee, provision of adequate supplies (PPE and safe injection boxes), adequate support from management as well as the availability and ease of access of IPC policies and guidelines were identified as the institutional factors influencing the level of compliance to the standard IPC measures.

Moreover, the attitudes and perceptions of HCWs were recognized as factors affecting the actual implementation of the IPC measures irrespective of the availability of favorable structural factors.

5.7 Recommendations

The hospital management in collaboration with the IPC committee should organize for more IPC training opportunities especially for doctors and institute measures to monitor their adherence particularly to hand hygiene practices. This can be done by incorporating IPC training in the hospital's continuous medical education programs.

The IPC committee should conduct programs to acquaint the staff with their existence as well as the various responsibilities they undertake in the hospital.

The management should provide adequate IPC supplies to promote adherence to IPC standards.

Policies and guidelines should be made available in all departments. This can be done by ensuring hard copies are available in each department and scanned soft copies of the same distributed among the staff.

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APPENDIX A: ETHICAL APPROVAL

Strathmore UNIVERSITY

9th June 2021

Dr Kisaka Yvette
yvette.kisaka95@gmail.com

Dear Dr Kisaka,

RE: Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital

This is to inform you that SU-IERC has reviewed and **approved** your above **SU-master's** research proposal. Your application reference number is **SU-IERC1041/21.** The approval period is **9th June 2021 to 8th June 2022.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-IERC.
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 SU-IERC within 48 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 SU-IERC within 48 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 SU-IERC.

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

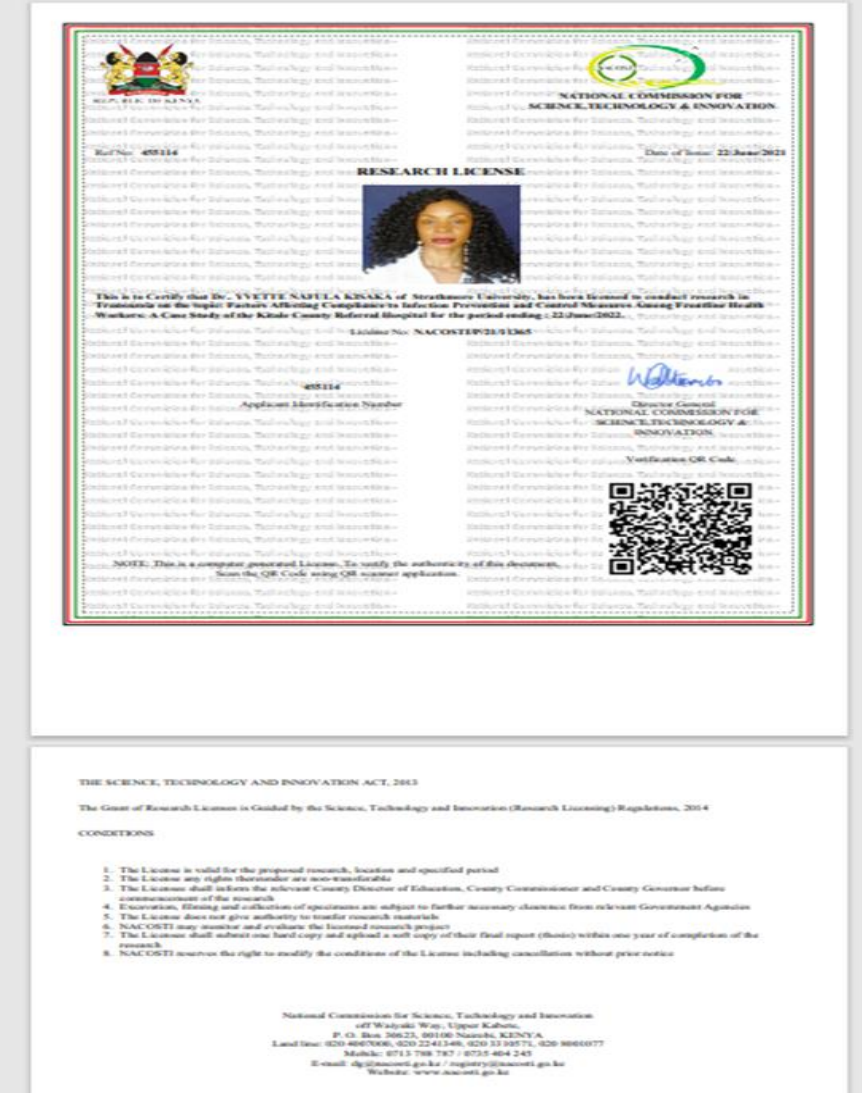
STRATHMORE UNIVERSITY INSTITUTIONAL ETHICS REVIEW COMMITTEE (SU-IERC)
09 Jun 2021
TEL: +254 (0)70303400
P.O BOX 59857-00200
NAIROBI-KENYA

Yours sincerely,

for: Dr Virginia Gichuru,
Secretary; SU-IERC
Cc: Prof Fred Were, **Chairperson; SU-IERC**

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
Email admissions@strathmore.edu www.strathmore.edu

APPENDIX B: NACOSTI RESEARCH PERMIT



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 455114 Date of Issue: 22/June/2021

RESEARCH LICENSE

This is to Certify that Dr.. YVETTE NAFULA KISAKA of Strathmore University, has been licensed to conduct research in Transnzoia on the topic: Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital for the period ending : 22/June/2022.

License No: NACOSTI/P/21/13365

455114

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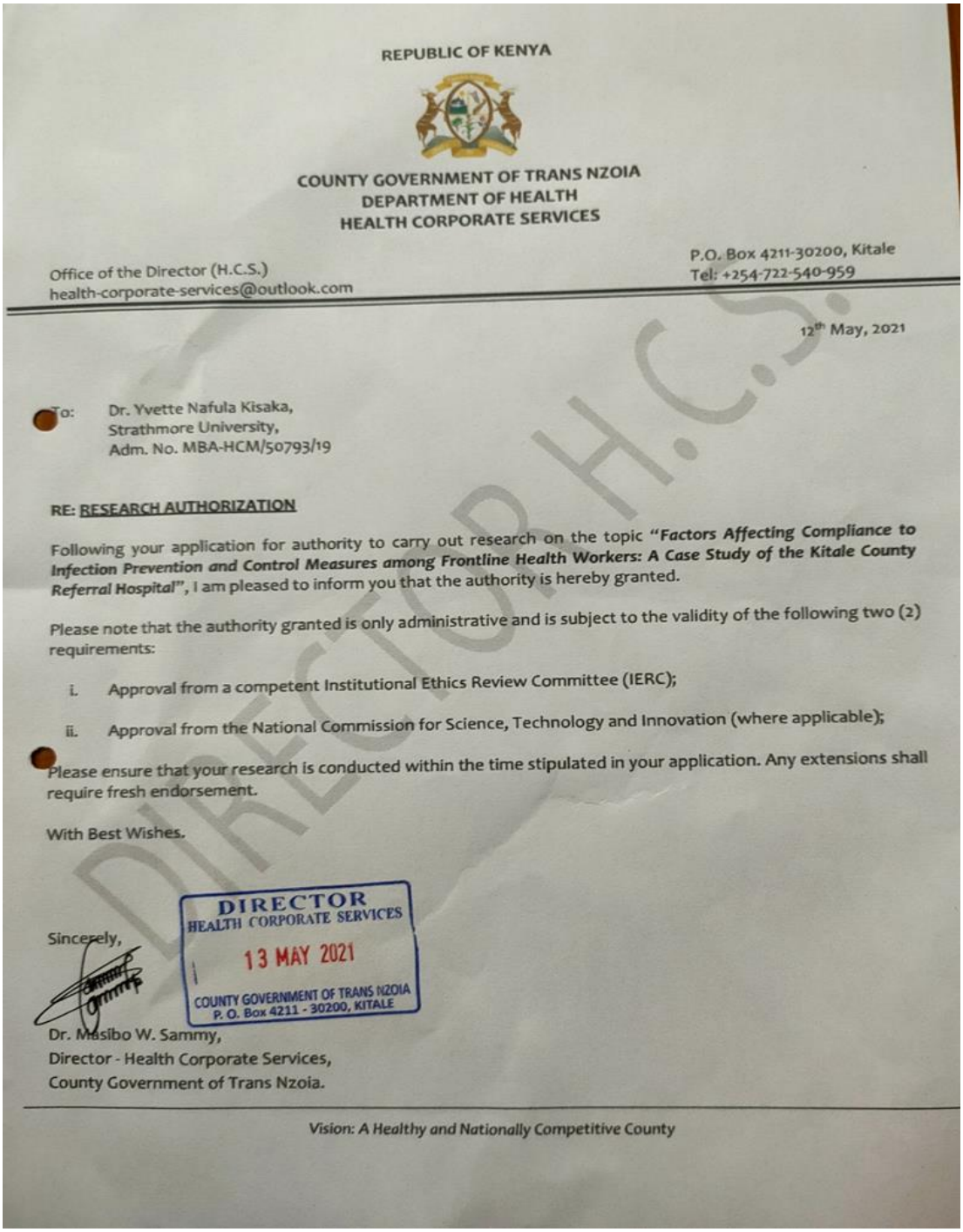
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

APPENDIX C: RESEARCH AUTHORIZATION



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF TRANS NZOIA
DEPARTMENT OF HEALTH
HEALTH CORPORATE SERVICES

Office of the Director (H.C.S.)
health-corporate-services@outlook.com

P.O. Box 4211-30200, Kitale
Tel: +254-722-540-959

12th May, 2021

To: Dr. Yvette Nafula Kisaka,
Strathmore University,
Adm. No. MBA-HCM/50793/19

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on the topic "***Factors Affecting Compliance to Infection Prevention and Control Measures among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital***", I am pleased to inform you that the authority is hereby granted.

Please note that the authority granted is only administrative and is subject to the validity of the following two (2) requirements:

i. Approval from a competent Institutional Ethics Review Committee (IERC);

ii. Approval from the National Commission for Science, Technology and Innovation (where applicable);

Please ensure that your research is conducted within the time stipulated in your application. Any extensions shall require fresh endorsement.

With Best Wishes.

DIRECTOR
HEALTH CORPORATE SERVICES
13 MAY 2021
COUNTY GOVERNMENT OF TRANS NZOIA
P. O. Box 4211 - 30200, KITALE

Sincerely,

Dr. Masibo W. Sammy,
Director - Health Corporate Services,
County Government of Trans Nzoia.

Vision: A Healthy and Nationally Competitive County

APPENDIX D: LETTER OF INTRODUCTION

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

Friday, June 17th, 2021

To whom it may concern.

RE: FACILITATION OF RESEARCH – YVETTE NAFULA KISAKA ADM. NO. MBA-HCM/50793/19

This is to introduce Yvette Nafula Kisaka who is an MBA-HCM student at Strathmore University Business School. As part of our MBA in Healthcare Management Program, she is expected to do applied research and to undertake a project. This is in partial fulfilment of the requirements of the course. To this effect, she would like to request for appropriate data from your organization.

Yvette is undertaking a research paper on " ***Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital.***" The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MBA in Healthcare Management course seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share the findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and we shall be willing to provide any further information if required.

Yours sincerely,

Caroline Tiara,
Manager – Graduate Programs.

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APPENDIX E : RESEARCH BUDGET

Strathmore University
School of Graduate Studies

Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital

ITEM	UNIT PRICE	QUANTITY	TOTAL (Ksh.)
Questionnaires,consent Interview guides	100	150	15,000
Printing and binding of the proposal	1,000	3	3,000
Data Analysis	15,000	1	15,000
Printing and binding of Dissertation	2,000	3	6000
Miscellaneous	10,000	1	10,000
TOTAL			49,000

APPENDIX F: STUDY QUESTIONNAIRE

Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital.

Participant's Identification Code …… Date……

Instructions

This questionnaire has been divided into three 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 avail truthful information that would enable the right generalizations.

Kindly use a pen in filling the questionnaire.

Your participation is highly appreciated

SECTION 1: INDIVIDUAL DETERMINANTS OF INFECTION PREVENTION AND CONTROL (IPC)

1.1 Socio-demographic characteristics

1.1.1 How old are you?

……Years

1.1.2 Gender (tick one)

- Male
- Female
- Others (specify)…….

1.1.3 Marital status (tick one)

- Single
- married
- Divorced
- Separated
- Widowed
- Cohabiting

1.1.4 Religion

…….

1.1.5 Cadre (tick one)

- Nurse
- Doctor

1.1.6 Highest Qualification (Tick one)

- Certificate
- Diploma
- Higher Diploma
- Degree
- Post-graduate qualification

1.1.7 Have you had a training on IPC? (tick one)

- Yes
- no

1.1.8 Length of clinical experience

……..

1.1.9 How long have you been working at Kitale County Referral Hospital (KCRH)?

……..

SECTION 2: INSTITUTIONAL DETERMINANTS OF IPC (Tick one response- yes, know or I don't know)

Statement	yes	no	I don't know
There is an IPC committee in the facility			
Management conducts trainings on IPC			
Management provides adequate hand hygiene supplies			
Management provides adequate PPE			
Management provides adequate injection safety boxes			
The hospital has written policies and guidelines on IPC			
Policies and guidelines are easily accessed			
There is adequate support from management on IPC matters			

SECTION 3: IMPLEMENTATION OF STANDARD IPC MEASURES

3.1.1 When do you perform hand hygiene? (Tick one response)

Statement	Always	Sometimes	Rarely	Never
Before touching a patient				
After touching a patient				
After performing a clean or aseptic procedure				
After touching patient's surrounding				
After fluid body fluid exposure risk				

3.1.2 What do you mostly use to perform Hand hygiene (tick one)

- Soap and water
- Alcohol hand rub
- Others (Specify)……
  ……

3.2.1 When do you use the Following PPE? (Tick one response)

	Always	Sometimes	Never	Depends on patients diagnosis/condition
Use of gloves when performing procedures				
Use of gowns when performing procedures likely to generate splashes				

Use of face masks/ googles performing procedures likely to generate splashes				

3.3.1 Regarding injection safety, when do you do the following? (Tick one response)

	Always	sometimes	Rarely	Never
Recapping of needles				
Reusing of syringes Reusing of needles				
Disposing of needles in safety boxes immediately after use				
Disposing needles in safety box and syringes in dustbins				

3.3.2 Apart from the use of safety boxes, do you have other ways of disposing of used needles and syringes?

- Yes
- No

3.3.3 If yes, which one? (Tick one)

- Burying
- Disposing in dustbins
- Burning
- Others (Specify) ……

APPENDIX G: INTERVIEW GUIDE

Factors Affecting Compliance to Infection Prevention and Control Measures Among Frontline Health Workers: A Case Study of the Kitale County Referral Hospital.

Participant's Identification Code …… Date……

1. In your opinion, why do you think adhering to IPC is important in healthcare practice?

2. What are the factors that hinder you from adhering to IPC standards?

3. What are the factors that motivate you to adhere to IPC standards?

4. What recommendations would you give to improve IPC practices at KCRH?

APPENDIX H: PARTICIPANT INFORMATION AND CONSENT FORM

SECTION 1: INFORMATION SHEET

Investigator: Dr. Yvette Nafula Kisaka

Institutional affiliation: Strathmore Business School (SBS)

SECTION 2: INFORMATION SHEET–THE STUDY

2.1: Why is this study being carried out?

To describe factors affecting compliance to infection prevention and control practices at the Kitale County Referral Hospital (KCRH) and subsequently inform policies and practices aimed at improving infection prevention practices and the quality of services provided at the facility.

2.2: Do I have to take part?

No. Taking part in this study is entirely optional and the decision rests only with you. If you decide to take part, you will be asked to complete a questionnaire to get information on infection prevention practices at KCRH or participate in the interview. If you are not able to answer all the questions successfully the first time, you may be asked to sit through another informational session after which you may be asked to answer the questions a second time. You are free to decline to take part in the study from this study at any time without giving any reasons.

2.3: Who is eligible to take part in this study?

- Nurses and doctors who have been working at KCRH for at least six months.
- Nurses and doctors working at the pediatric, maternity, medical, surgical as well as the accident and emergency departments
- **2.4: Who is not eligible to take part in this study?**

- Other cadres of healthcare workers other than nurses and doctors
- Those working in other departments other than the ones mentioned above
- Nurses and doctors who have been working at the hospital for less than six month

2.5: What will taking part in this study involve for me?

You will be approached **Dr. Yvette Kisaka** and requested to take part in the study. If you are satisfied that you fully understand the goals behind this study, you will be asked to sign the informed consent form (this form) and then taken through a questionnaire to complete

2.6: Are there any risks or dangers in taking part in this study?

There are no risks in taking part in this study. All the information you provide will be treated as confidential and will not be used in any way without your express permission.

2.7: Are there any benefits of taking part in this study?

No monetary benefits will be awarded to the study participants.

The information obtained will be used to improve infection prevention practices at the hospital, reduce transmission of nosocomial infections and improve quality of health services provided.

2.8: What will happen to me if I refuse to take part in this study?

Participation in this study is entirely voluntary. Even if you decide to take part at first but later change your mind, you are free to withdraw at any time without explanation.

2.9: Who will have access to my information during this research?

All research records will be stored in securely locked cabinets. That information may be transcribed into our database but this will be sufficiently encrypted and password protected. Only the people who are closely concerned with this study will have access to your information. All your information will be kept confidential.

2.10: Who can I contact in case I have further questions?

You can contact me, **Dr. Yvette Nafula Kisaka**, at SBS, or by e-mail kisaka.yvette@strathmore.edu , or by phone 0705009881. You can also contact my supervisor**, Dr. Francis Wafula**, at the Strathmore Business School, Nairobi, or by e-mail fwafula@strathmore.edu or by phone 0722679467

If you want to ask someone independent anything about this research, please contact:

The Secretary–Strathmore University Institutional Ethics Review Board, P. O. BOX 59857, 00200, Nairobi, email ethicsreview@strathmore.edu Tel number: +254 703 034 375

I, _____, have had the study explained to me. I have understood all that I have read and have had explained to me and had my questions answered satisfactorily. I understand that I can change my mind at any stage.

Please tick the boxes that apply to you.

Participation in the research study

I AGREE to take part in the research ☐ I DO NOT AGREE to take part in this research ☐

Participant's signature …… Date…….

Storage of information on the completed questionnaire

I AGREE to have my completed questionnaire stored for future data analysis ☐

I DO NOT AGREE to have my completed questionnaire stored for future data analysis ☐

Participant's signature …… Date…….

I, **Yvette Nafula Kisaka** certify that I have followed the SOP for this study and have explained the study information to the study participant named above, and that s/he has understood the nature and the purpose of the study and consents to the participation in the study. S/he has been allowed to ask questions which have been answered satisfactorily.

Investigator's Signature:

Date:
_____/_____/_____

_____

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