COMPLIANCE WITH CDC GUIDELINES FOR CATHETER ASSOCIATED URINARY TRACT INFECTION PREVENTION AMONG NURSES AT EMBU LEVEL 5 HOSPITAL

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DECLARATION

I, hereby declare that the work herein, is my own. It is being submitted in partial fulfillment for the Degree of Master in Medical-Surgical Nursing, in the School of Nursing at Mount Kenya University, and has not been submitted to any other university.

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DEDICATION

I would like to dedicate this research work to my wonderful parents, Mr.& Mrs. James Methu and my Heavenly Father. They have been my rock.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABUTI	Asymptomatic bacteremic urinary tract infection
CAUTI	Catheter associated urinary tract infection
CDC	Centers for Disease Control
CME	Continuous Medical Education
HAI	Hospital acquired infection
IP	Infection prevention
IUC	Indwelling urinary catheter
MoH	Ministry of Health
RN	Registered nurse
SUTI	Symptomatic urinary tract infection
UTI	Urinary tract infection
WHO	World Health Organization

ABSTRACT

Urinary tract infections directly related to catheterization account for approximately 40% of all healthcare related infections worldwide. Capping the utilization of urinary catheters and duration of placement, adherence to proper catheter care, and using aseptic technique have been identified as key interventions in the fight against CAUTI. Nurses thus play a huge role in preventing CAUTI since they are the primary care givers. In line with this, the Centers for Disease Control (CDC) developed recommendations to guide prevention strategies for CAUTI in healthcare facilities worldwide. However, despite demonstration of the effectiveness of these guidelines in averting CAUTI, uptake of these recommendations hasn't been investigated in health care institutions locally. This study was aimed at assessing compliance with CDC guidelines for prevention of CAUTI among nurses at Embu Level 5 Hospital in Embu County. Both quantitative and qualitative data were collected with the use of a descriptive cross-sectional study that employed the use of a concurrent mixed method design. The study was conducted at Embu Level 5 hospital in the surgical, medical and gynecological/obstetric wards. The total population of nursing staff in the hospital is 217 nurses and 130 nurses were sampled from this population. Systematic random sampling was employed to choose subjects to be included in the study, where every 2nd nurse was selected. A structured questionnaire was utilized to collect quantitative data from the nurses and an observation check list for selected participants to assess catheter insertion technique. Qualitative data was collected through a key informant interview guide for ward in-charges and their deputies. In order to safeguard reliability and validity of the research tools a pilot study was carried out at Thika Level 5 hospital. Thematic analysis was utilized to analyze qualitative data which was submitted by way of narration. The statistical package SPSS version 21 was utilized to perform quantitative data analysis. Descriptive statistics that is, frequencies and mean together with inferential statistics that is, Chi-square test and independent t-test were utilized for exploration of data and a p-value of < 0.05 was deemed significant. Tables and charts were then employed to proffer the data. A total of 93 nurses were involved in the study with an 86% response rate. The study findings revealed that the nurses' level of compliance of the CDC guidelines for CAUTI prevention was low (46.7%). There were no significant associations established between nurse related factors and compliance with CDC guidelines for CAUTI prevention ($p > 0.05$). Statistically significant relationships were however found between institution-related factors that is, regular training on CAUTI prevention, having adequate staffing and support from ward in charges and hospital administration and compliance with specific guideline statements for prevention of CAUTI ($p < 0.05$). In line with the study's findings, it is thus proposed that the hospital management organize regular training for nurses on CAUTI prevention and provide adequate staffing to improve compliance with guidelines for CAUTI prevention. Similar studies in other county and sub-county hospitals are recommended.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Healthcare - associated infections (HAIs) are the most commonly occurring injurious event in the healthcare setting worldwide. These infections present in 7 out of 100 and 10 out of 100 hospitalized patients in developed and developing countries respectively at any given time. Urinary tract infections (UTI) have been noted to be the most frequently occurring HAIs (CDC, 2019). These infections constitute 34% of all health care-related infections. What's more, approximately 75% of these UTIs are linked with utilization of a urinary catheter (*National Health Statistics Network*, 2018.). Catheter associated urinary tract infection (CAUTI) has been described as a urinary tract infection occurring in an individual having a urinary catheter in-situ or that develops within 48 hours of catheter removal (Saint et al., 2008). It is considered that about 15-25% of hospitalized patients are catheterized at any given time (CDC, 2019).

Several studies have shown catheterization period to be the most significant risk factor. According to (Prasanna & M, 2015) bacteremia (bacterial colonization) is said to be expected and occurs in half of the patients catheterized within 2 weeks and within 4 - 5 weeks after catheter insertion all patients develop bacteremia. It has further been approximated that the CAUTI risk goes up by 5 – 10% each day the catheter remains in-situ (Nicolle, 2014). CAUTI arises because these catheters hamper the urinary tract's natural defenses. This results from obstruction of the per urethral ducts, bladder mucosa irritation, and entry of bacteria into bladder through formation of a faux route. Based on a report released by the Centres for Disease Control the pooled means for CAUTI for intensive care units (ICUs) varied from 1.2 per 1,000 urinary catheter days in medical surgical ICUs to 4.1 in burn ICUs. Non-ICU rates ranged from 1.3 to 1.5 per 1,000 urinary catheter days in medical, surgical, or medical surgical unit (CDC, 2019). A CAUTI incidence rate of 4.8 per 1000 device days in low and middle income countries was obtained from a surveillance study carried out in 703 intensive care units (Rosenthal et al., 2016)

Increased mortality rates and financial costs have been linked with CAUTI incidence. Roughly 10% - 15% of hospitalized convalescents with indwelling urinary catheters perish each year (Darbyshire et al., 2016). Mortality rate attributable to urinary catheterization has been reported to 36 deaths per 1000 CAUTI (Douglas Scott II, 2009). Additionally, Nicolle, (2014) found that CAUTI is culpable for 13,000 fatalities yearly

in the United States and increases hospital stay by 2 – 4 days as well. Saint et al. (2008) found that each incidence of CAUTI and bacteremia associated with the urinary tract cost $600 and $800 respectively. Further, The CDC estimates a national economic burden of $340 million annually in the United States with the average cost associated with CAUTI being $1000 (Douglas Scott II, 2009). According to a 2018 study in the US the national cost was put closer to $1.7 billion (Hollenbeak & Schilling, 2018).

Like all other hospital acquired infections CAUTIs are preventable. It is has been demonstrated that 40% of CAUTI cases can be avoided through utilization of evidence based practices (Rebmann & Greene, 2010). It is in this regard that in 1981 the Centers for Disease Control (CDC) published guidelines for the prevention of urinary tract infections related to catheterization that were later revised in 2009. The guidelines have also been updated over the years with the last update done in 2017. These guidelines address the best practices for preventing CAUTI. They focus on appropriate urinary catheter use, catheter insertion technique, managing catheter blockage, collection of specimen, education and instruction, documentation and surveillance (Gould et al., 2010).

In regards to catheter use, it is recommended that catheters be placed only for appropriate indications which include; acute retention of urine or obstruction of the bladder outlet, input/output monitoring in gravely ill patients, intra-operative use for specific surgical procedures, incontinent patients with open perineal or sacral wounds, patients requiring extended immobilization, palliative care. Urinary catheter use also ought to be limited in each and every patient, particularly in high-risk patients. Utilization of urinary catheters ought to be avoided for the management of incontinence in patients and nursing home residents. In operative patients, use urinary catheters only as necessary, not routinely and remove catheter as soon as possible postoperatively for patients requiring an IUC. Lastly, other options to IUCs should be considered in specified patients when applicable.

When it comes to performing urinary catheter insertion aseptic technique should be observed. Hand hygiene preceding and subsequent to insertion or handling of the catheter should be done. Utilize aseptic equipment (sponges, antiseptic solution, sterile gloves, drapes, & k-y jelly) for perineal area cleaning and catheter insertion. Make use of the smallest bore catheter feasible compatible with good drainage to minimize bladder neck and urethral damage except when indicated clinically. The IUC should then be correctly

fastened to avoid movement and urethral traction. Only trained personnel in aseptic catheter insertion and maintenance should perform the procedure.

Following the aseptic placement of an IUC a closed drainage system ought to be preserved always and if there's break or leakage arises the catheter and collecting system ought to be substituted via sterile means with sterile equipment. Keep an unimpeded urine flow by ensuring the catheter and collecting tube are kink-free, maintain the collecting bag beneath the bladder level continually but away from the floor and empty the collecting bag periodically. Employ standard precautions while handling the catheter collecting system and changing IUCs at regular, fixed intervals is not advised. In patients requiring either long or short-term catheterization use of systemic antibiotic medication routinely is discouraged unless clinical indications exist. Bladder irrigation is not recommended as well and cleaning the periurethral area with antiseptic solutions to avoid CAUTI is discouraged; perform only standard hygiene. Closed continuous irrigation is suggested if obstruction is anticipated and if obstruction occurs as a result of the catheter material a catheter change is suggested. Lastly, urine samples should be obtained aseptically.

The guidelines also recommend that healthcare personnel receive regular in-service instruction with respect to procedures and techniques for urinary catheter placement, preservation and extraction. Supplies required for aseptic catheter placement should be easily obtainable and surveillance for CAUTI should be performed. A system which allows for documentation of indications for catheter placement, date and time of insertion, HCW responsible for inserting the catheter, and date and time of catheter removal should be employed.

Studies however, have shown inconsistent application of these guidelines for CAUTI prevention by healthcare workers with widespread inappropriate use of urinary catheters. These studies have reported that numerous catheterizations were found to be needless. Tambyah & Oon, (2012) found that 14% to 38% of catheterizations were unnecessary. It has also been observed that because of poor documentation, healthcare personnel are many a time oblivious of the placement and on-going care of urinary catheters. The outcome is that catheters are left in position for long durations until catheter associated complications arise (Dailly, 2012; Rhodes et al., 2009) In Nigerian study (Kh et al., 2010) it was found that there was poor documentation of urethral catheterization at a tertiary hospital. Labib and Spasojevic (2013) also reported that in Sub-Saharan countries

catheters are replaced monthly and catheterizations are performed in an unsterile environment. Clean technique is used rather than aseptic technique which likely results in CAUTI. This is mainly due to inadequate supplies (Labib & Spasojevic, 2013). Additionally, a study in Benin found that proper hygiene pre and post catheter placement is observed by only a limited number health workers (Dougnon et al., 2016).

1.2 Statement of the problem

Infections of the urinary tract related to catheterization account for about 30 to 40 percent of all nosocomial infections worldwide (Gould et al., 2010). In the United States it is estimated that approximately 1 million patients managed in acute care settings and long-term care facilities develop UTIs annually. Indwelling catheterization is linked to a bacteriuria incidence of 3-8% per day. In hospitalized patients with IUCs for 2-10 days are predicted to develop bacteriuria, 24% patients with bacteriuria develop UTIs and 3.6% of patients will get bacteremia from a urinary tract source (Saint S, 2008).

According to the World Health Organization (WHO) (2011), the pooled cumulative incidence density of urinary catheter related UTI among adult ICU patients in developed countries and developing countries were 4.1 per 1000 urinary catheter days and 8.8 per 1000 urinary catheter days respectively. It was also noted that in low- and middle-income countries the use of indwelling catheters was three times higher. In Australia the overall HAUTI and CAUTI prevalence was shown to be 1.4% and 0.9% respectively (Gardner et al., 2014). Among African countries, Senegal was found to have a prevalence rate of 4.5 per 1000 catheter days, South Africa had 4.8 per 1000 catheter days, Nigeria had 12.3 per 1000 catheter days with Kenya found to have 30.5 per 1000 catheter days (Assanga, 2016; Mukhit Kazi, 2015; Raji et al., 2013; Tillekeratne et al., 2014). At a hospital in Zinvie, Benin the prevalence rate for CAUTI was found to be 23.33% (Dougnon et al., 2016). In addition, at the Kenyatta National Hospital, CAUTI incidence was determined to be at 32% in the wards and 18% in the ICU setting (Mwamba, 2005; Revathi et al., 2011). At Embu Level 5 Hospital about 24% of hospitalized patients are catheterized monthly and almost 50% of these patients develop symptoms of urinary tract infection (Health Records Department).

These urinary infections often result in escalated morbidity, duration of hospital stay, mortality, and highly influence the cost of healthcare (Mody et al., 2010). According to a prospective, observational and laboratory study in the USA the average cost per CAUTI was calculated to be 589 US dollars. In a study carried out in 29 ICUs from 10 countries

it was shown that on average CAUTIs increased length of stay in ICU buy 1.59 days and mortality risk by 15%. Duration of catheterization has been demonstrated as the chief risk factor for CAUTI occurrence (Rosenthal et al., 2016).

It is documented that approximately 40% of CAUTI cases are avoidable using evidence-based practices. However, despite the proven efficacy of the guidelines in reducing CAUTI occurrence, there has been inconsistent application of the recommended guidelines by healthcare personnel. It is estimated that 12% to 16% of admitted patients will at some point have a urinary catheter and that 50% of these catheterizations may be unnecessary (Haworth, 2018; Mody et al., 2010). Chen et al., (2013) found out from their study that physicians and nurses too, fail to comply with CDC recommendations to assess the need for catheter removal. Additionally, as a result of the poor documentation, nursing staff are often unknowing of the placement and continuing care of urinary catheters. This results in catheters remaining in place for prolonged periods, such that complications occur (Nelius, 2013). A review of hospital records at Embu Level 5 Hospital also showed poor documentation of catheter insertion dates and on-going catheter management. Thus, this researcher sought to determine the level of compliance with the CDC guidelines for CAUTI prevention among nurses at Embu Level 5 hospital and any factors that might influence adherence with these guidelines.

1.3 Justification of the problem

It has been widely documented that the majority of urinary tract infections result from instrumentation of the urinary tract. These HAIs not only increase the length of hospital stay but also sometimes result in complications that are life threatening. A number of studies have indicated that catheters are placed indiscriminately and remain in place even when there is no longer need for catheterization (Chen et al., 2013; Mody et al., 2010; Nelius, 2013).

Embu Level 5 Hospital was chosen for the study because approximately 24% of the hospitalized patients are catheterized in a month, and of these nearly 50% develop catheter associated urinary tract infection (Health records department). With the CDC recommendations it is possible to reduce CAUTI rates as has been demonstrated by various studies (Marra et al., 2011). Hence there is need for adoption of these guidelines

by all healthcare providers to ensure CAUTI prevention. However, there is very little regarding studies carried out in Kenya on compliance with CDC guidelines for CAUTI prevention, hence the need to carry out a scientific study in this particular area. Information obtained from this study will be useful in identifying gaps in knowledge and current practice among nurses at Embu level 5 hospital. This will help the hospital administration develop effective policies and training programs for CAUTI prevention in the hospital. Further, better training of health personnel will result in enhanced quality of care and thus benefit the patients. The researcher will benefit by adding to the field's existing body of knowledge.

1.4 Objectives

1.4.1 General objective

To assess factors influencing compliance with CDC guidelines for catheter-related urinary tract infection prevention among nurses at Embu Level 5 Hospital.

1.4.2 Specific Objectives:

1. To assess the level of compliance with CDC guidelines for prevention of catheter related urinary tract infection among nurses at Embu level 5 Hospital.
2. To determine nurse-related factors influencing compliance with CDC guidelines for prevention for catheter-related urinary tract infections among nurses at Embu Level 5 hospital.
3. To determine institution-related factors influencing compliance with CDC guidelines for prevention of catheter-related urinary tract infections among nurses at Embu Level 5 hospital.

1.5 Research Questions

a) What is the level of compliance with CDC guidelines for the prevention of catheter related urinary tract infection among nurses at Embu Level 5 Hospital?

b) What are the nurse-related factors influencing compliance with CDC guidelines for prevention of catheter-related urinary tract infection among nurses at Embu Level 5 hospital?

c) What are the institution-related factors influencing compliance with CDC guidelines for the prevention of catheter-related urinary tract infection among nurses at Embu Level 5 hospital?

1.6 Null Hypothesis:

1. Nurse-related factors do not significantly influence compliance with the CDC guidelines for CAUTI prevention.
2. Institution-related factors do not significantly influence compliance with the CDC guidelines for CAUTI prevention.

1.7 Assumptions

It is assumed that the research participants will answer truthfully. With the guarantee of confidentiality and anonymity the research participants will be free to answer truthfully. Secondly, it is assumed that having selected an appropriate sample size the sample will be representative of the larger population. Finally, it is assumed that the discoveries from the present study are generalizable to other healthcare facilities in Kenya.

1.8 Operational Definition of Key Terms

Bacteremia : Presence of viable bacteria in the blood.

Biofilm : A structured community which is comprised of an accumulation of micro-organisms and their nuclei acid fragments contained within a mucopolysaccharide medium on a solid surface.

Catheter associated urinary tract infection: A urinary tract infection that arises in persons with an indwelling urinary catheter or that is acquired within 48 hours of catheter removal.

CAUTI Bundle : A grouping of evidence-based interventions that have been demonstrated to lessen catheter associated urinary tract infections and boost patient outcomes.

Hospital acquired infection/nosocomial infection: An infection acquired in hospital or any other healthcare facility. One must have been admitted for reasons other than the infection.

Incidence rate : The number of new cases of an event in a given population over a particular period of time.

Indwelling urinary catheter: A flexible plastic tube inserted into the urinary bladder that remains (dwells) there to provide continuous urinary drainage.

Intraluminal route: A route that goes through the cavity or channel of a tubular structure or organ.

Neurogenic bladder dysfunction: A bladder dysfunction (flaccid or spastic) due to neurologic damage.

Peri-urethral route: A route that begins within or around the tissues surrounding the urethra.

Prevalence rate: The total number of cases of an event in a given population at a particular time.

Suprapubic catheterization: A connection between the urinary bladder and the skin created surgically to drain urine from the bladder in individuals with obstruction of normal urinary flow.

Urinary tract infection: The presence of pathogenic microorganisms in any part of the urinary tract.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Healthcare associated infections (HAIs) also alluded to as nosocomial infections persist as the most commonly occurring injurious event in any healthcare setting. These infections affect millions every year and result in marked morbidity and mortality (Zingg et al., 2015). Studies carried out in American hospitals have shown that HAIs alone make up about 1.7 million of all infections and 99,000 fatalities annually. All hospitalized patients are prone to acquiring HAIs though some are at a higher risk than others. The risk factors that predispose one to developing these infections include age (children and the elderly), weakened immune system, prolonged hospitalization, utilization of invasive devises such as IUCs, poor hand hygiene among healthcare personnel and overuse of antibiotics. Literature has shown that the most commonly occurring HAIs are urinary tract infections (*National Health Statistics Network (2018)*). Catheter associated urinary infections comprise infections wherein a patient had an indwelling urinary catheter at the time or within 48 hours before symptom onset. This is regardless of the duration the catheter stays in position (Gould et al, 2010). The risks linked with catheter placement include introduction of bacteria into the urinary system leading to UTIs, trauma to the urethra or bladder, dislodgement of the catheter and formation of urinary stones.

The clinical diagnosis of CAUTI includes such symptoms as fever, flank pain or costo vertebral angle (CVA) tenderness, nausea with vomiting, pain on micturition, pelvic pain, urinary frequency and urgency and hematuria (Hooton et al., 2010). The CDC further sub-divides CAUTI into symptomatic urinary tract infection (SUTI) and asymptomatic bacteremic urinary tract infection (ABUTI). The bacteria responsible for CAUTI are able to enter the bladder via one of two ways: the periurethral route and the intraluminal route. Using the periurethral route bacteria enter the bladder through the space created by the outer surface of the catheter and the inside surface of the urethral wall. More commonly after drainage bag contamination bacteria ascend within the catheter drainage system via the intraluminal route (Vyawahare et al., 2015). The bacteria then form a biofilm on the catheter surface which makes them problematic (Feneley et al., 2015).

The probability of contracting a urinary tract infection related to catheterization varies between 3% and 7% per day and cumulatively rises each day a catheter remains in-situ. As a result, bacteriuria will be present in almost 100% of the patients post 7 to 10 days

of catheterization (Labib & Spasojevic, 2013). In addition, it is approximated that 17% of bacteremia cases identified originate from a urinary source and of these 71% are device related (Andrade & Veludo, 2016). The complications that arise from CAUTI include secondary blood stream infections, local and systemic morbidity, extended hospital stay, escalated costs and mortality (Nicolle, 2014).

The most important intervention identified in literature as being most effective in preventing development and consequently reducing CAUTI rates is avoidance of use of indwelling urinary catheters. Inappropriate catheterization unduly makes the patients susceptible to acquiring CAUTI, and there is likelihood of impairment from complications. The basis for urinary catheter insertion should be an appropriate clinical indication (Bruminhent et al., 2010). As stated in the CDC guidelines, the correct indications for indwelling catheter placement are bladder outlet occlusion, urinary retention, monitoring of urinary output in gravely ill persons, surgical cases involving the urinary system, monitoring of intra-operative urine output, for patients with open perineal or sacral lesions and are incontinent, for comfort improvement in terminal illness care and for patients with extended immobilization due to trauma or surgery (Gould et al, 2010). Catheters should not be placed for nursing convenience, as an alternative to providing nursing care in incontinent patients, for purposes of collecting of urine samples in patients who can void voluntarily and post-operatively for extended periods without clinical indication (Buckley et al., 2015).

The utilization of evidence-based interventions has been reported to prevent roughly 17% to 69% of CAUTI cases (APIC, 2008). Nurses, play a huge part in mitigating the development and risk of CAUTI as they are at the forefront of catheter care (Gray et al., 2016). They are culpable for urinary catheter placement (50% of urinary catheters placed), day to day catheter care and removal of catheters (Yoon et al., 2013). In this regard several studies have demonstrated the use of specific nursing interventions in decreasing CAUTI occurrence rates. Gokula et al., (2007) examined the effect of employing an indication sheet for urinary catheterization in the emergency unit of a U.S hospital. The study's outcome indicated a striking surge in the appropriate management of indwelling urinary catheters. Although CAUTI incidence was not an aspect evaluated in this particular study, other evidence supports the relationship between the scaling down of inept placement of catheters and CAUTI occurrence in hospitals (Gokula et al., 2007).

Studies point to the link between accurate recording of catheter placement and the corresponding reduction in unnecessarily placed catheters, and subsequent reduction of CAUTI incidence (Meddings et al., 2019). Documentation enables evaluation of the continued need for urinary catheterization. In a study carried out by Parry et al., (2013) it was offered that proper documentation and tracking by nurses was convincingly linked with a decline in the number of catheterized patients, and in addition CAUTIs.

Thirdly, prompt removal of indwelling urinary catheters has also been shown to mitigate CAUTI incidence. A decline in CAUTI occurrence was observed post the application of a reminder system in a study carried out in a hospital in the United Kingdom. The system was added to the patients' existing medical documents. It comprised of a catheter documentation form that alerted the nurse to perform catheter re-evaluation subsequent to 2 days of IUC use (Buckley et al., 2015).

Clinical evidence offers that stop orders that are nurse-initiated may prove useful in preventing extended, needless catheterization (Buckley et al., 2015). Substitutions to indwelling urinary catheters are linked with a reduced likelihood of CAUTI, and are proposed in plenty of cases (Agency for Healthcare Research and Quality, 2015). Incontinent patients could have condom catheters placed or use diapers. In the event of bladder voiding problems, spinal trauma or neurologic bladder, the utilization of periodic straight catheterization is deemed most appropriate (Herter & Kazer, 2010).

An estimated 10-20% of all CAUTIs are contracted during the insertion process due to inadvertent introduction of bacteria (*APIC*, 2008). Correct catheter insertion techniques have been proven to reduce CAUTI incidence (Loveday et al., 2014). Performing hand-washing with soap and water or applying hand rub(alcohol-based) effectively removes soiling and spores (Infection Control Nurses Association, 2003). The use of antiseptic solutions for cleaning the meatal area instead of routine personal hygiene has not been shown to offer any added advantage (SHEA, 2014).

Responsibility for the wellbeing, safety, interests and rights of patients falls on nurses. Thus, nurse practice has to be based on appropriate and evidence based guidelines (Martin, 2012).In 2009, the CDC went on to update their evidence-based guidelines which they had published in 1981 for the diagnosis, aversion, and management of CAUTI. The guidelines were revised to accommodate new research and technological advancements in CAUTI prevention, to cater for non-acute hospitalized patients and those in palliative care facilities and to further place emphasis on prevention strategies.

The CDC CAUTI prevention guidelines were updated from a meta-review of evidence-based studies from July 2007. The recommendations made in the document address CAUTI prevention measures that are relevant in nursing practice, such as catheter insertion indications, insertion methods, catheter materials, managing catheter blockage, collection of specimen, training, documentation and surveillance (Gould et al., 2010).

2.2 Nurses' Compliance with CDC Guidelines for CAUTI Prevention

Several studies were found on nurse or healthcare worker compliance to CDC guidelines for CAUTI prevention. A study was carried out in an Iranian teaching hospital. It sought to assess the nurses' compliance to CDC guideline statements for urethral catheterization. It showed that nursing staff adhered to most of the guidelines. Staff from surgical units reported better adherence to catheter care recommendations. Washing of hands while changing the urine bags however, was carried out infrequently. The actual proportion of patients who were ailing from CAUTI was approximated to be larger than what was announced (Taleschian-Tabrizi et al., 2015). In addition, (Johnston, 2015) conducted a study to evaluate observance of practice guidelines of the UK's CAUTI bundle guidelines. The study results showed a general lack of consistent catheter care over a 5 day duration. They also revealed that compliance with each specific CAUTI bundle criteria decreased with each passing day. A similar study evaluating utility of a CAUTI bundle amongst critical care nurses in Kenyatta hospital was conducted in Kenya (Assanga, 2016). It was observed that adherence to CAUTI bundle was 49.5% with reported utilization being higher than observed bundle utilization. In another study conducted by (Nofal et al., 2017) that evaluated the factors affecting adherence to infection control precautions among nurses and physicians in Jordan found high compliance levels among the health professionals. However, the nurses' compliance scores were higher than those for the physicians ($p = 0.04$).

A gap in the investigation of whether statistical relationships exist between nurse-related factors versus nurse' adherence with CAUTI guidelines was noted. Similarly, inquiry into a statistical association between institutional factors and nurse' adherence to CAUTI guidelines is lacking.

2.3 Nurse-related Factors Influencing Compliance with CDC Guidelines for CAUTI Prevention

2.3.1 Demographic Characteristics

An investigation into an exploration of a relationship between nurse demographic factors and compliance with CAUTI prevention guidelines revealed limited studies. Most studies have focused on compliance with infection prevention control and standard precautions. In an investigation performed by Aung et al. (2017) in Myanmar it was observed that no significant associations were found between nurse characteristics, that is, age, gender, religion, education, work experience and adherence to standard precautions. Similar findings were found by Mukakamanzi (2017) in Rwanda where no significant relationship was observed between education level, years of experience, training and practice of CAUTI prevention. In a study conducted at Abdulaziz University hospital in Egypt it was found that a significant association existed between nurses' practice and the current unit they worked in. In contrast, Karahan et al (2019) in their study conducted in Turkey found a weak and negatively significant link between age, years of experience and compliance with isolation precautions. However, no significant association was found between gender and education level versus compliance. Additionally, in a study carried out in Kenya, no significant relationship was observed between age, gender, nurse specialization, years of experience and cadre and adherence to a CAUTI bundle (Assanga, 2016).

2.3.2 Knowledge of CDC Guidelines for CAUTI Prevention

An exploration of existing literature did not reveal any studies focusing specifically on the knowledge of nurses regarding CDC guidelines for CAUTI prevention. Several studies though have been done regarding knowledge of individual CDC guideline statements such as appropriate indications for catheterization, catheter care and training of health personnel. Jain et al., (2015) conducted a study in an Indian tertiary health institution. The results showed that doctors as compared to nurses had significantly better awareness as regards indications for catheterization and CAUTI preventive measures. This was however abysmal as there was room for improvement. It was further noted that the health professionals did not think of CAUTI as a serious problem. Additionally, nearly 10% of the healthcare professionals opined that it was almost impossible to prevent CAUTI. Overall, in distinguishing the indications for catheterization doctors

ranked higher than nurses. Utilization of IUCs in the care of incontinent patients was justified by most nurses and a few doctors. Notably the healthcare providers were unable to determine the measures that are less efficacious in preventing CAUTI.

In another study Mody et al., (2010) found out that over 90% of the respondents were aware of measures such as meatal cleansing, use of gloves, and hand washing while handling catheters. They were however less knowledgeable on research-proven practices such as not routinely irrigating the catheter (8% aides vs 48% nurses), disengaging the catheter from its bag (59% nurses vs. 30% aides) and washing of hands even after brief contact (69% aides vs. 60% nurses). It was also determined that the healthcare workers were incognizant of recommendations as regards alcohol-based hand rub (27% nurses and 32% aides). The researchers surmised that there are wide disparities that remain between research proven recommendations and healthcare workers' knowledge pertaining to urinary catheter care.

Drekonja et al., (2010) carried out an internet survey in Minnesota on nurses' foley catheter use and knowledge. In the study nurses reported prompt catheter removal as the most useful intervention in preventing CAUTI. Registered nurses (RNs) who reported additional catheter education rated interventions to prevent CAUTI as more effective as compared to other RNs. A lack of institutional guidance as regards catheterization was reported by a majority of the nurses. It was surmised that the Minnesota RNs exhibited high level of appreciation of the utility of expeditious catheter removal for averting CAUTI. Lastly, Mukakamanzi, (2017) conducted a study in selected Rwandan referral hospitals. The study findings indicated that the nurses had inadequate knowledge regarding CAUTI prevention. 47.2% of the nurses were not aware of the inappropriate indications for urethral catheterization and only 43.4% knew that urinary catheters are not to be changed routinely or at fixed intervals. Most of the nurses (50.9%) did not know that the CDC guidelines for CAUTI prevention recommended removal of urinary catheters within 24 hours post operatively.

2.3.3 Nurses' Attitude towards CDC Guidelines for CAUTI Prevention

Several studies have been done but none that focus specifically on nurses' attitudes towards the CDC guidelines for CAUTI prevention. Jain et al., (2015) conducted a study in an Indian tertiary hospital. They noted that most of the health care professionals (HCP) maintained that incorporating CAUTI prevention as a high priority in the hospitals and utilization of review reminders would be helpful in abating CAUTI. Being educated

about basic catheter care was also considered to assist in averting CAUTI by majority of the HCPs (90%). The insertion of catheters for nursing convenience regarded as appropriate by almost 40% of the nurses and 25% of doctors. A few of the respondents (10%) exhibited hopelessness concerning prevention of CAUTI. In similar study Kim et al., (2015) observed that 85% of nurses as compared to 52% of physicians reported being aware of the novel nurse driven urinary catheter extraction protocol. Additionally, a majority of the nurses and physicians reported recognizing the probable efficacy of the protocol. A study carried out in specific referral hospitals in Rwanda by Mukakamanzi, (2017) showed that most nurses had a positive attitude towards CAUTI prevention. 86.8% considered CAUTI a very serious disease and 81.1% felt that CAUTI can be prevented with 90.5% being of the opinion that CAUTI prevention should be regarded as a high priority in hospitals.

2.4 Institution-related factors influencing compliance with CDC guidelines on CAUTI prevention

2.4.1 Availability of resources

There is existing research globally that has been carried out to investigate whether availability of resources influences the implementation of CAUTI guidelines but perhaps a dearth of it in the Kenyan context. A Scottish study investigated the use of nursing best practice statements and observed that most nurses cited unavailability of resources as one of the hinderances to guideline implementation (Ring et al., 2005). Labib and Spasojevic (2013) report that inadequate supplies and few health care providers often lead to non-compliance with CAUTI guidelines in Sub-Saharan countries. Additionally, Clark, (2017) conducted a review on articles touching on evidence-based practice(EBP) and found that among the key barriers to implementation of EBP identified was resource deficits.

2.4.2 Support

A study by Francke et al., (2008) that set out to investigate determinants that influence execution of clinical guidelines by healthcare personnel, reported that support by peers and/or superiors in applying the guidelines was important. In another study Abrahamson et al., (2012) which sought to find out the barriers and facilitators to clinical guideline implementation, it was observed that having administrative support was frequently mentioned as one of the facilitators for implementing the guidelines. In a similar study

by Goossens et al., (2008) it was noted that lack of adequate support from administration or peers can hinder guideline implementation. Further, a study performed in a District hospital in Kenya showed that while an Infection Prevention and Control Committee existed it was found to be inactive which potentially led to provision of inadequate support in carrying out clinical guidelines.

2.4.3 Staff Workload

In a study carried out by Abrahamson et al., (2012) that investigated facilitators and hindrances to implementation of clinical guidelines among nurses, it was observed that a greater of the nurses felt that their capacity to use the guidelines was aided by having adequate time and a workload that is manageable. In addition, yet another study done by Efstathiou et al., (2011) showed that a majority of the nurses felt that a huge workload due to poor staffing hindered their implementation of standard precaution guidelines. This finding was similar to that noted in a study carried out by Moyo, (2013) in Kenya, whereby nurses identified a heavy workload as one of the barriers to guideline implementation.

2.4.4 Staff Training

A study by Haile et al., (2017) that sought to determine adherence to standard precautions and related influences amongst healthcare personnel in a tertiary hospital in Ethiopia found that healthcare personnel that had not received training on infection prevention were 2.9 times less likely to always comply with standard precautions when compared to their colleagues who had received any training on the same. In a similar study that explored the determinatives of healthcare staff' compliance with infection control processes, training on infection control was found to be a significant factor influencing health workers' compliance (Yassi et al., 2007).

2.4.5 Summary of literature review

Table 2.4.5 1: Literature review summary

Author	Topic	Summary	Gaps
Saint et al, 2008	A multicenter qualitative study on preventing Hospital Acquired UTI in the United States Hospitals	Nurses' function in avoidance of CAUTI	The bundle not used by nurses.
Meddings et al., 2014	Reducing unnecessary urinary catheter use and strategies to prevent CAUTIs: An integrative review	CAUTI bundle as the yardstick in patient care	Regularity in the application of the CAUTI bundle lacking
Drenkoja et al., 2010	Internet survey of foley catheter practices and knowledge among Minnesota nurses	Nurses' CAUTI bundle knowledge	A lack in the translation of knowledge into practice.
Amine et al., 2014	Evaluation of an intervention program to prevent Hospital Acquired CAUTIs in acute care hospitals: The bundle approach	Employment of CAUTI bundle resulted in reduced CAUTI cases	Nil
Assanga, 2016	Utilization of catheter associated urinary tract infection bundle among critical care nurses - Kenyatta national hospital	Nurses generally employed the bundle.	Nurses employed some elements of the bundle more than others.
Jain et al., 2015	Knowledge and attitude of doctors and	Knowledge regarding	The insertion of catheters for nursing

	nurses regarding indication for catheterization and prevention of CAUTI in a tertiary care hospital.	indication and preventive measures was substandard	convenience regarded as appropriate by almost 40% of the nurses.
Clark, 2017	What are the barriers and facilitators to Nurses' utilization of a Nurse Driven Protocol (NDP) for Indwelling Urinary Catheter (IUC) removal?	Application of EPB and use of NDP for IUC extraction linked to less IUCs and CAUTI rates.	Resource deficits and workload some of the barriers to EPB.
Moyo, 2016	Factors influencing compliance with infection prevention standard precautions among nurses working at mbagathi district hospital, nairobi, Kenya	Unavailability of IP supplies and a deficiency of periodic training on IP found to be main drivers of non-compliance with standard precautions.	Most nurses had insufficient knowledge on the basics for IP standard precautions and their compliance less than optimal.

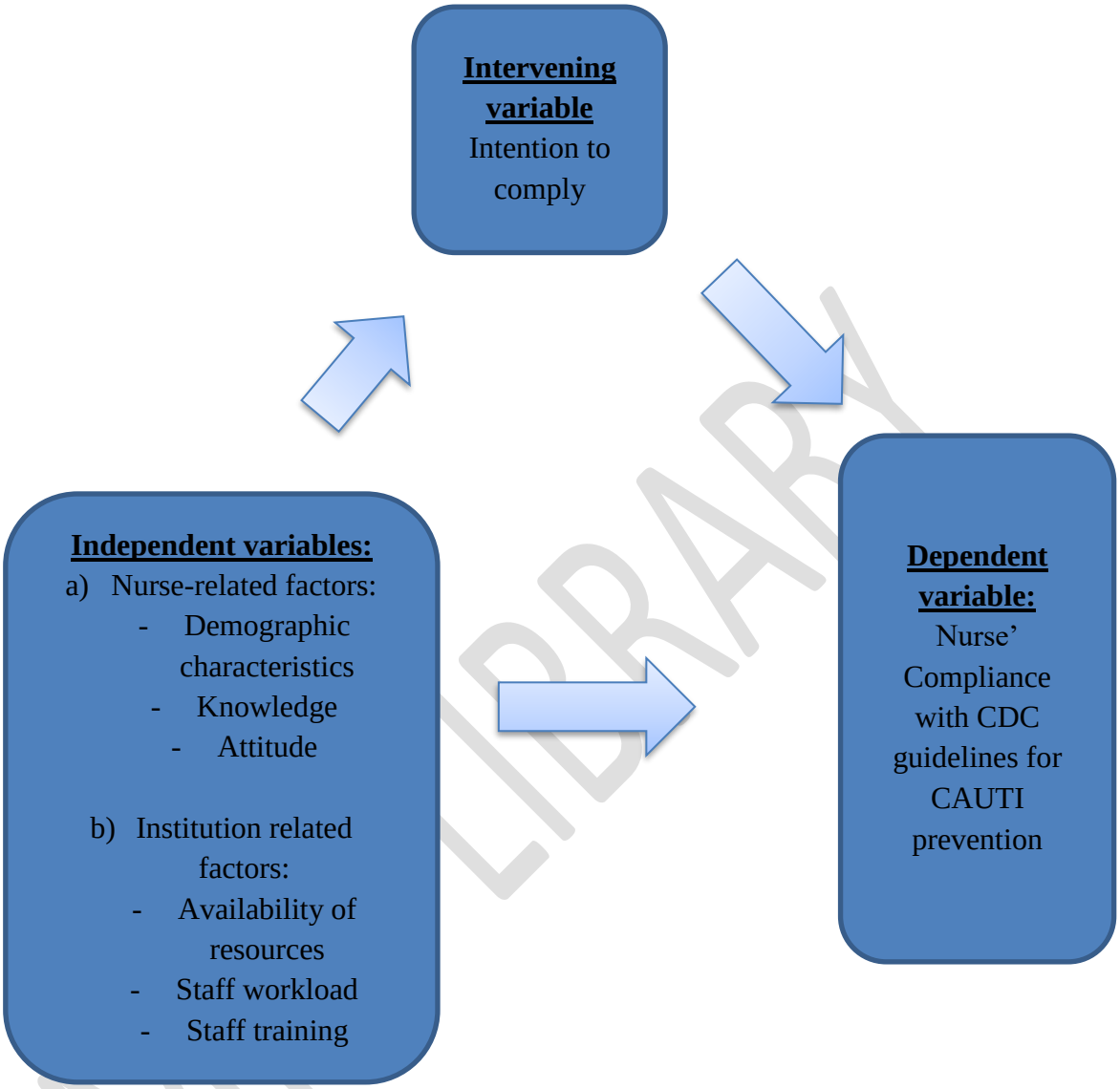
2.5 Theoretical Framework

The theory of Reasoned Action or Theory of Planned Behavior has principles applicable to this area of study. It was developed in 1980 by Ajzen and Fishbein who were social psychologists. The theory elucidates how attitude prompts human behavior (Ajzen, 1991). According to the theory a person's 'intention' determines his/her behavior (strong predictor). They define intention as one's cognitive readiness to perform a behavior and it represents his/her motivation. Further, an individual's 'attitude' toward performance of a particular behavior underlines his/her intention to execute the behavior (Ajzen, 1991). The theory also asserts that the individual's motivation to execute a certain behavior is also governed by perceived behavioral control and subjective norm.

Subjective norm refers to the belief one has regarding how people close to him/her will view performance of a certain behavior, while perceived behavioral control is an individual's perceived ability to execute a specific behavior (Ajzen, 1991). Perceived behavioral control increases when one feels that he/she has more resources and confidence. It is thus presumed that the stronger an individual's intentionality to carry out a given behavior, the more likely he/she will perform it (Ajzen, 2005).The theory also proposes that human beings are rational, that is, they utilize available information and consider what will result from their actions (outcome) prior to resolving to perform or not perform specific tasks (behaviors) (Ajzen, 2005).

Some studies have demonstrated that particular behaviors by nurses may decrease the development of hospital acquired infection (Sobeih & Nasr, 2015). For instance, if a nurse believes that prevention of catheter associated urinary infection is pertinent, he/she will take necessary measures in order to better the outcomes of urinary catheterization, thus improve the delivery of quality care. In the context of the current study, it is thus conceivable to theorize that the nurses would be prompted by cognitive elements such as knowledge. Inadequate knowledge of the CDC guidelines on CAUTI prevention might result in nurses' non-conformity to the guidelines while carrying out catheter care. Additionally, a negative attitude by the nurses might lead to their non-compliance with the guidelines. Further, having the required resources (adequate staff and supplies) and support would motivate the nurses to comply with the CDC guidelines. Non-compliance with guidelines for CAUTI prevention has been shown to result in increased CAUTI rates.

2.6 Conceptual Framework



(Source: Literature review)

Figure 1: Conceptual Framework

CHAPTER THREE: RESEARCH MATERIALS AND METHODS

3.1 Research Design

A descriptive cross-sectional design was used for the current study. This design was selected since it is useful in describing characteristics that exist in a group. It also helps in gathering information which may then be used to develop methods to investigate observed relationships. Presumably interrelated factors are studied at a specific point in time in a determinate population. Furthermore, it is a simple design and is carried out over a limited period of time.

3.2. Research Approach

The current study used a convergent mixed-method approach where both qualitative and quantitative data are collected concurrently. By mixing both quantitative and qualitative approaches the researcher gains more in-depth understanding of the phenomenon. This is because he/she examines one phenomenon from different vantage points using different methods and techniques (Creswell, 2009).

3.3 Study Area

The study was carried out at the Embu Level 5 Hospital. The hospital is situated in Embu town which is the capital of Embu County. The county has a population of 543,221 persons and occupies an area of 2,818$km^{2.}$ The hospital is a government run facility and has a total bed capacity of 618 beds and 12 departments; Outpatient, Imaging, Laboratory, Dental, Surgical, Medical, Theatre, Maternity (Obstetrics/Gynecology), CCC, Psychiatric, MCH, Ophthalmology. It has a total of 217 nursing personnel.

The hospital was chosen because it serves a wide catchment area and because it has several wards where catheterization procedures are common; medical, surgical, obstetrics and gynecology wards. (Map of Embu County in appendix).

3.4 Target Population

The target populace was the nurses working at Embu Level 5 hospital, who numbered 217 at the time of the study.

3.5 Study Population

The study's populace comprised of nurses from the surgical, medical and obstetrics/gynecology units at Embu Level 5 hospital.

3.6 Selection Criteria

3.6.1 Inclusion Criteria

Qualified nurses practicing in the surgical, medical and obstetrics/gynecology wards.

Qualified nurses that gave consent to take part in the study.

Eligible nurses who were at hand to take part in the study.

3.6.2 Exclusion criteria

Student nurses.

Qualified nurses on leave.

3.7 Sampling technique

3.7.1 Sampling procedure

The researcher utilized the stratified random sampling procedure where the respondents were divided into 3 populations as per the department, those working in the medical, surgical and obstetrics/gynecology departments. This helped in ensuring that the researcher captures everyone in the population. At the department level systematic random sampling was utilized to pick the nurses that made up the sample. A sampling frame for each department was made. Then the first nurse was selected at random from the list and then every 2^{nd} nurse thereafter. See proportionate sampling distribution table:

Table 3.7. 1 : Proportional sample size per department

Unit	Population in category(N)	Proportionate %	Sample size of category(n) n_h= N/100*n	Kth Element N/n_h
Medical	30	23.1	24	2^{nd}
Surgical	52	40	43	2^{nd}
Obstetric/Gynecologic	48	36.9	40	2^{nd}
TOTAL	130	100	107	

3.7.2 Sample Size Determination

Respondents in the current study were chosen by employing stratified proportionate quota random sampling of subgroups. Yamane formula (Yamane, 1967) was used to come up with a sufficient sample size. The formula is appropriate when determining an ideal sample size given the population size is known and based on a preferred confidence

interval. The formula below was employed to realize the required sample size for the present study from the defined population. The sample population is less than 10,000 hence the formula below was employed.

$n = N/1+N(e)^2$

Where: n is the required sample size, N is the known population size and e is the error limit at 5% assuming a confidence interval of 95%

The total number of nurses in the study population is 130 that is the total number of nurses working in the 3 departments (medical, surgical and obstetrics/gynecology). The specific number of nurses working in the 3 departments is as follows: 30 nurses in the medical department, 48 in the obstetric/gynecology department and 52 in the surgical department. Using the Yamane formula the sample size was determined as follows;

$n = 130/1+ 130(0.05)^2$

$n = 130/1.325$

$n = 98$

n= approximately 98 subjects + 10% for none respondents = 107 subjects

The study participants to be interviewed comprised of the ward in-charges and their deputies from the medical wards (male & female), surgical ward (male & female), obstetric ward and maternity ward. Data saturation was utilized to achieve an adequate sample size. Only when no new information on the subject of interest can be gleaned from a subset of the population can data saturation be said to have been achieved (Grove et al., 2012). In the present study, saturation was realized when there was no new data, that is, additional data was not sufficient to generate any new codes. The point of data saturation was arrived at after the sixth key informant interview. This finding is supported by Creswell (1998) who recommends 5-25 interviews for phenomenological studies while Morse (1994) suggests at least 6 interviews to achieve data saturation ("Qualitative Sample Size," n.d.).

3.8 Research Instruments

In order to collect quantitative data from the respondents a structured self-administered questionnaire was utilized. The questionnaire was separated into four sections: Section 1 captured the respondents' demographic information. Section 2 captured information regarding the respondents' knowledge and attitude toward CDC guidelines for CAUTI prevention: Section 3 captured information regarding institution related factors influencing compliance with CDC guidelines for CAUTI prevention. Lastly Section 4

captured information regarding the respondents' compliance with CDC guidelines for CAUTI prevention. Quantitative data was also collected using an observation checklist whereby selected nurses were observed as they performed catheter insertion. Qualitative data was compiled by way of key informant interviews. The key informants were the ward in-charges and deputy ward in-charges in the medical, surgical and obstetrics/gynecology units. The researcher made use of literature review and the research questions to come up with questions for the interviews. These questions were then reviewed and discussed with the research supervisor. Data was collected through both tools concurrently as they were developed at the same time.

3.9 Pretesting of Instruments

A pilot study on 12 nurses was conducted at Thika Level 5 Hospital prior to carrying out the actual study so as to test the study questionnaire. The nurses were drawn from the medical, surgical and gynecology wards. This provided an opportunity to check, revise and finalize the questionnaire by enhancing the clarity and sequencing of questions and withdrawing ambiguous and irrelevant questions. This helped to improve the final questionnaire that was used in the study. Additionally, in order to determine the comprehensibility and relevance of the questions in the interview guide and to inform any revisions to the questions a pilot interview was carried out. This was in order to ensure that data collected was based on the study's research questions.

3.10 Validity

Validity of a research tool is the capacity of an instrument to evaluate what it is intended to evaluate. The face validity of the questionnaire used in this study was determined by constructing an appropriate and comprehensive questionnaire having acquired a thorough understanding of the research problem through literature review. Validity was also ensured by consulting expert opinion in coming up with appropriate items for the research instrument. A pilot study was carried out at Thika Level 5 Hospital and necessary revisions made to the research tools to establish validity. To guarantee accurate information nurses were guaranteed confidentiality and notified that the findings were to be employed for research functions only. The researcher and her assistant also checked the filled-out questionnaires for completeness after data collection. Validity of the interviews was ensured by the researcher appointing an impartial moderator (clinical officer) to conduct the interviews with the key informants to eliminate bias.

3.11 Reliability

Reliability of the research instrument is the instrument's ability to yield the same results on repeated trials. Reliability of this study's research tools was ensured by giving clear instructions for the respondents and making sure the questions were not ambiguous and were easy to score. Further, reliability was determined by designing tools that took a relatively short time to administer. Training of the research assistants to make certain that they understood the research tools was also done to ensure consistency in administration of the data collection tools. Lastly, in order to safeguard reliability of the questionnaire the Cronbach's alpha was utilized to calculate internal consistency.

3.12 Data collection procedures

A structured questionnaire (Appendix 3) and an observation checklist (Appendix 4) were utilized to collect quantitative data. It contained 4 sections. Section one dealt with the participants' demographic characteristics and section two focused on nurse-related factors influencing compliance with CAUTI prevention guidelines and contained 13 items related to catheter indication, care and maintenance and duration of catheterization, and 6 items evaluating nurses' attitude towards CAUTI prevention. The third section comprised 6 items evaluating institution-related factors influencing compliance with CAUTI guidelines. Finally, the fourth section was made up of 11 items measuring compliance with CAUTI prevention guidelines; in the knowledge sub-section every right answer was scored 1 and every incorrect answer was scored 0. The items on the attitude sub-section were rated on a Likert scale from 1 to 3 (Disagree =1, neither agree nor disagree=2, Agree = 3). The aggregate score varied from 1 to 18 and the separate scores were calculated into percentages. Finally, in the implementation section, the items were also ranked on a Likert scale from 0 to 3 (Not at all = 0, Very little = 1, somewhat = 2, to a great extent = 3). The categories were further collapsed into 'Yes' and 'No' categories with Yes = 1 and No = 0. The total score ranged from 0 to 33 and the individual scores were calculated into percentages. In regards to the checklist, the investigator observed selected participants for each executed action and the participants got 1 (yes) if the action was carried out or 0 (No) if not done. Qualitative data was obtained through interviewing each of the key informants separately. There were four open-ended questions to which interviewees were given time to reflect on and respond. Clarifications were then sought if a response was not clear or needed elaborating. Each interview lasted about 30 minutes.

3.13 Data management

3.13.1 Data cleaning

Typing and spelling errors were rectified, mislabeled data appropriately labeled and filed, and incomplete or missing entries were omitted.

3.13.2 Quantitative data analysis

Quantitative data collected from the study was coded, entered and analyzed using the statistical package SPSS version 21. Exploratory analysis using descriptive and inferential statistics was carried out. Descriptive statistics utilized in the study include frequencies and means. Any significant relationships between the study variables were determined using the Chi-square test and independent t test, with a p-value of <0.05 being regarded statistically significant.

3.13.3 Qualitative data analysis

Thematic analysis used to interpret data collected from qualitative means in this study. Below are steps followed in carrying out thematic inquiry as highlighted by Boyatzis (1998):

Step 1: Familiarization

First, transcription of the audio data was done verbatim into a Microsoft word document. The researcher then listened to the audio recordings and read through the transcriptions regularly reflecting on what was said and the meaning and relationships in the data. The focus being to answer the research question. To become familiar with the data, the researcher went over the transcripts several times, jotting down notes on the first impressions of the data (See Table; example of notes from interviews).

Table 3.13.3 1: Example of notes

Excerpts from the interviews	**Notes produced from the excerpts**
I: In your own opinion, what challenges do nurses face while trying to comply with the CDC guidelines for CAUTI prevention?	
R1: One challenge in implementing those guidelines most probably is shortage…you are supposed to have a ratio of 1:6, now you are alone, a ratio of 1:50.	Inadequate staffing Poor staffing ratios
R2: We might not be able to replace those catheters after every 2 weeks, to be sincere you can forget you inserted the catheter, although the date is in the file. Due to workload you might tend to forget.	Overwhelming workload – catheter care not done
R3: …and sometimes you maybe you may miss the resources like catheters, antiseptic lotions.	supplies unavailable
R4: Some nurses it's attitude,some say it's a doctor's procedure. I would say shortage…she's for example alone, her shift and it's our admission day and receives many patients who need catheterization…she might not be able to achieve that because she will do the emergencies first.	shortage - staffing ratio attitude
R5: And the issue of the technique, actually it's supposed to be a sterile procedure, the only challenge we have is possibly when we have students but we guide them before we have them insert a catheter..we have to demonstrate how it's done.	supervise students
R6: The problem I know within the hospital is shortage of nursing staff…you want to do treatment, you want to do dressing, you want to catheterize…the work is overwhelming and one may forget.	staff shortage- overwhelming workload

Step 2: Generating a codebook

The researcher invented codes from wordings, sentences or portions of data compatible with the research question. As the investigator further absorbed the data codes were created and reworked (Open coding). This task was performed in a Word document and highlighting was utilized to relate the data to the codes as shown below.

Table 3.13.3 2: Code framework

Quote	→	**Quote description**	→	**Code Label**
Yea..Like if you use aseptic technique of course you prevent infection, you don't reinfect the patient and yourself.	→	Nurses protect themselves and patients from infection	→	Prevent spread of infection
One challenge in implementing those guidelines most probably is shortage…you are supposed to have a ratio of 1:6, now you are alone, a ratio of 1:50. Then we have a challenge of supplies, sometimes you want a particular catheter and that catheter is not available, yea shortage of supplies. Sometimes you don't have urine bags and the exact size of the catheter you want.	→	Staffing ratios Unavailable of needed supplies	→	Staff shortage Availability of supplies
). So I have not had any issues with sterility because we have sterile gloves, we are able to get a VE pack for us to be able to insert in a sterile way so we don't have issues on that. So, the nurses I have here actually I have very	→	Nurses have needed supplies for sterile technique.	→	Availability of supplies

senior midwives here, I'm lucky so I don't have any issues in carrying out that procedure.		Nurses are experienced		Experienced staff
One thing I would say is let us get enough staffs. the first thing is a CME if not a seminar or a training on insertion, the practices, how often that catheter should be changed, such a CME.	→	Need for enough staff Need for training	→	Adequate staffing Training on proper catheter practices

Step 3: Code validation

Validation of the codes was done by reviewing the codes and ensuring that they were anchored in the data and not influenced by researcher bias. To confirm consistency of the codes with the data sets the researcher reviewed the data frequently. It was via this undertaking that the investigator confirmed that data saturation had been achieved via interviews with six participants. After reviewing codes within each key informant interview and over the six interviews, it was evident that by the end of the sixth interview no additional codes were materializing from the data. In order to have the codes verified for consistency, the investigator had her research supervisor look them over. Upon successful deliberation on the data excerpts and code clusters a code book was developed (See table 3.13.3 ©)

Table 3.13.3 3: Code validation

Codes Label	**Extract/Quote from Data**	**Description**
Prevent spread of infection	Yea..Like if you use aseptic technique of course you prevent infection, you don't reinfect the patient and yourself.	This code refers to a benefit of using aseptic technique.
Staff shortage	…. you report on duty alone so maybe sometimes you find that becomes a hinderance…staff shortage.	This code refers to a problem of staffing which makes it hard for nurses to comply with guidelines
Experienced staff	….actually I have very senior midwives here, I'm lucky so I don't have any issues in carrying out that procedure.	This code refers to a factor that facilitates nurse compliance with guidelines.
Unavailable supplies	Then we have a challenge of supplies, sometimes you want a particular catheter and that catheter is not available, yea shortage of supplies. Sometimes you don't have urine bags and the exact size of the catheter you want.	This code refers to a problem of availability of needed supplies.
Adequate staffing	One thing I would say is let us get enough staffs.	This code refers to a recommendation to hire more nursing staff.

Step 4: Identifying themes

To develop themes affiliated codes were clustered, producing sub-themes. Based on similitudes in the implications of the codes and/or associations in the codes sub-themes were then collapsed into themes.

Table 3.13.3 4: Identifying themes

Codes	**Codes**	**Codes**	**Codes**
- Prevent spread of infection - Appropriate indications for catheterization - Catheter insertion techniques - Nursing convenience	- Distracted due to time pressure - Staff shortages/increased workload - Urgency interferes with correct practice - Inappropriate attitude - Unavailable supplies	- Availability of needed supplies - Having experienced staff - Regular training on proper catheter practices	- Catheter insertion technique and documentation audits
↓	↓	↓	↓
Sub-theme - Being familiar with CAUTI prevention guidelines.	Sub-theme: - Inadequate staffing/staff workload - Personal factors - Unavailability of supplies	Sub-theme - Availability and access to supplies - Experienced staff - Support from IPC nurse	Sub-theme - Unexpected audits
↓	↓	↓	↓
First emergent theme: Knowledge on CAUTI prevention guidelines	Second emergent theme: Barriers to compliance with CAUTI guidelines	Third emergent theme: Facilitators of compliance with CAUTI guidelines	Fourth emergent theme: Reinforcing behavior change

3.13.4 Data Presentation

Quantitative data was displayed by way of tables and charts, whereas qualitative data was integrated into the discussion of quantitative findings in the form of narratives to further support or explain findings.

3.14 Limitations/Delimitations

Although data from this study is derived through a mixed methodology approach there were a few limitations. First the study was carried out in only one Level 5 hospital due to financial and time constraints. Thus, the results cannot be generalized to the whole country. However, the results obtained from the sample can be generalized to the nurse population at Embu level 5 hospital due to the representativeness of the sample. Clinical data such as CAUTI infection rate was also not collected. The study however, was based on information obtained from the hospital's health records department regarding UTI incidence that could be linked to presence of indwelling catheters. Thus, giving a picture of CAUTI occurrence at the facility. Another limitation was that during the data collection period some nursing staff went on retirement and thus the study sample was reduced. However, the representativeness of the sample was ensured by getting proportional sample sizes for each department. Lastly one of the study tools relied on self-reporting. There could be proclivity to over-reporting compliance with advocated practices. However, an observation checklist was also utilized in order to compare reported versus observed adherence with the guidelines.

3.15 Ethical Considerations

Ethical clearance to carry out the investigation was acquired from the ethical review committee at Mount Kenya University and a permit to perform the study obtained from National Commission for Science Technology and Innovation (NACOSTI). Permission to gather data was requested from the hospital's medical superintendent and from the ward in charges of the units to be involved in the study. The research participants were also given information sheets citing who the researcher is, reason for the research and what it would involve. The research participants were also requested to sign a consent form which contained a brief outline of the study project and its expected gains to the study participants and the general population. The consent form expressly stated the voluntary nature of the study indicating that participants were free to decline participation

or stop their involvement at any time without retribution. The researcher explained the concept of informed concept before giving the research participants the consent form.

Throughout the study period confidentiality and anonymity was upheld. Codes were used instead on subjects' names in the questionnaires and observation checklists. The questionnaires and observation checklists were saved under lock and key and in password and firewall protected computers. The researcher was the only person privy to the information collected in the course of the research period and the information will only be utilized for scholarly and policy functions.

CHAPTER FOUR: RESEARCH RESULTS AND DISCUSSIONS

4.1 Introduction

The study collected and analyzed data that aimed at investigating knowledge, attitudes and level of compliance with CDC guidelines for CAUTI prevention among nurses. The main target population was the nurses at Embu Level 5 Hospital in Embu County, Kenya. The respondents were requested to complete a questionnaire divided into 4 sections focusing on demographics, nurse – related factors, institution – related factors and compliance with CDC guidelines for CAUTI prevention respectively. The study also sought the views of a number of Key Informants on the compliance with CDC Guidelines for CAUTI among nurses at Embu Level 5 Hospital.

A total of 107 questionnaires were distributed among the study participants. 98 questionnaires were returned however 5 of these were spoilt. 8 of the 93 questionnaires accepted had some missing responses which were omitted during data analysis.

4.2 Participants' demographic characteristics

Table 4.2 1: Participants' demographic characteristics

Variable	**N%**
Gender	
Male	29(31.2)
Female	64(68.8)
Years of nursing experience	8.25
Education level	
Certificate	14(15.2)
Diploma	42(45.7)
Bachelor degree	36(39.1)
Ward working in	
Medical	23(24.7)
Maternity	23(24.7)
Gynecology	18(19.4)
Surgical	29(31.2)
Duration of work	1.91
Age	
Age Category	
< 30 years	25(26.9)
30-39 years	49(52.7)
40-49 years	14(15.1)
>49 years	5(5.4)

The calculated sample size for the study was 107 nurses. However, 86% (93) respondents were interviewed with a large proportion (68.8%) being female while the average years of nursing experience being 8.25±5.2. Almost half 45.7% of nurses had a diploma and were working in surgical ward 31.2%. The mean duration of work and age was 1.91±1.18 and 34.38±6.97 years respectively with more than half 52.7% (n=93) being between 30-39 years old.

4.3 Nurses-related Factors Influencing Compliance with CDC guidelines for CAUTI Prevention

4.3.1 Awareness of CDC Guidelines on CAUTI prevention

From Table 4.3.1 it is observed that 66.7% (62) respondents had heard of CDC guidelines but only 16.1% (15) had received training on the same. Though univariate analysis did not show much difference, t test analysis showed a (p=0.018) with the participants who had heard of the CDC guidelines having a greater mean score in comparison to those who had not heard of the same.

Table 4.3 1: Awareness of CDC guidelines on CAUTI prevention (N=93)

Variable	**N%**	**Knowledge Scores**	**t/F Value**	**Statistical Significance**
Ever heard CDC Guidelines			2.4	0.018
Yes	62(66.7)	2.71±0.15		
No	31(33.3)	2.62±0.2		
Ever received training on CDC Guidelines	15(16.1)	2.6±0.18	0.26	0.498
Yes	78(83.9)	2.6±0.17		
No				

4.3.2 Respondents' Knowledge of CDC guidelines on CAUTI prevention

The study also assessed the nurse's knowledge on CDC guidelines for CAUTI prevention (See Table 4.3.2 (a)). The overall knowledge score of the participants was 71% indicating that the participants' knowledge regarding CAUTI prevention was moderate. This aggregate score was derived by totaling all the appropriate responses percentages (total percentage sum = 922.9) which were then divided by the total number of items (13). The

MacDonald's standards of learning outcome measuring criteria was then used to rate the respondent's level of knowledge (See Table 4.3.3) The key informants also opined that the nurses at the facility had the knowledge and skills regarding CAUTI prevention as reported by R1 "*Most of the nurses are knowledgeable regarding catheter care and infection prevention though they need regular CMEs*". 72% (67) of the nurses responded correctly that indwelling catheter use and duration should be minimized in all patients. 71% (66) of the participants also correctly identified documentation of catheter insertion date and expected date of removal as being key in preventing development of CAUTI. Use of aseptic technique for catheter insertion to prevent CAUTI occurrence was also correctly identified by 89.2% (83) of the nurses while 93.5% (87) indicated that hand hygiene should be carried out pre and post catheter placement or manipulation. However, only 43% (40) of the participants correctly responded that urinary catheters should be changed only as necessary rather than routinely. This data coincides with that from the key informants who reported that urinary catheters should be changed routinely that is after every 2 weeks. R3 reported "*In our facility we change urinary catheters after every 2 weeks*…" Also, 48.9% (46) of the nurses were not aware that patients with positive urine cultures need to be examined for presence of an indwelling catheter and a CAUTI.

Table 4.3.2 1: Nurses' Knowledge on CDC guidelines for CAUTI prevention (percentage of correct answers) (N=93)

	Questions	**Correct Answers**
.i	Use and duration of indwelling catheters should be minimized in all patients.	67(72%)
.ii	Documentation of catheter insertion date and expected date of removal is important.	66(71%)
.iii	Urinary catheters in catheterized patients should be changed only as necessary, rather than routinely	40(43%)
.iv	Alternatives to indwelling urinary catheters should be used depending when appropriate.	79(84.9)
.v	Strict aseptic technique should be used when inserting indwelling urinary catheters.	83(89.2%)
.vi	Hand hygiene should be done immediately before and after catheter insertion or manipulation.	87(93.5%)

.vii	Indwelling catheters should be secured properly after insertion.	84(90.3%)
.viii	Not unless otherwise indicated, the smallest bore size catheter should be used.	71(76.3%)
.ix	If the drainage system is compromised replace the catheter and collecting system aseptically.	57(61.3%)
.x	The urine drainage bag should be emptied when ¾ full.	52(55.9%)
.xi	Standard Precautions should be observed when handling the catheter or collecting system.	64(68.8%)
.xii	Surveillance on catheter associated urinary tract infection prevention is necessary	61(65.6%)
.xiii	Patients with positive urine cultures should be examined for the presence of an indwelling catheter	47(51.1%)
		71.01%
Average Knowledge		

Table 4.3.2 2: McDonald's standard for learning outcomes

MacDonald's Standard for Learning outcomes	**Percentage**
Very Low	< 60%
Low	60-69.9%
Moderate	70-79.9%
High	80-89.9%
Very High	> 90%

Table 4.3.2 3: Overall knowledge scores (N=93)

Knowledge Score	**Frequency**	**Percentage**
Poor	2	2.2
Moderate	74	79.6
Good	17	18.3

4.3.3 Respondents' Attitude towards CDC Guidelines for CAUTI Prevention

According to the study results, 48.4% (45) of the respondents felt that it was difficult to keep track of catheters placed. This was supported from information collected from the key informants. The ratio of nurses to patients is a hindrance to keeping track of catheters placed in patients as reported by one of the informants, "*To be sincere one can forget that you inserted a catheter even though the date is in the file. Due to the workload one tends to forget*".

Only 45.7% (43) of the respondents were of the opinion that development of CAUTI cannot be avoided while opinions were divided on whether it is unrealistic to clean hands after every contact with patient. Insertion of catheters as a nursing convenience was agreed upon by 46.2% (43) while 35.5% (33) of the nurses felt that they did not have time to follow the guidelines, (see Table 4.3.6). According to data from the key informants urinary catheterization is done mainly for nursing convenience as reported by R4, *"So what we do basically in the wards for all bed ridden patients is we catheterize them to avoid them getting bed sores and also this helps to conserve linens which might not be enough for other patients if we keep changing linens.*

Table 4.3.3 1: Nurse' Attitude towards CDC guidelines for CAUTI prevention (N=93)

Assessing the attitude toward CAUTI prevention			
Using 1= Disagree, 2= Neither agree nor disagree 3 = Agree, tick as per your opinion on the following	Disagree	Neutral	Agree
.i It is difficult to keep track of catheters placed	26.9%	24.7%	48.4%
.ii Development of CAUTI cannot be avoided	45.7%	21.7%	32.6%
.iii It is unrealistic to clean hands after every contact with patient	46.2%	12.9%	40.9%
.iv Insertion of catheters should be for nursing convenience	39.8%	14%	46.2%
.v I do not like taking care of patients in need of catheters	68.8%	25.8%	5.4%
.vi I do not have time to follow the guidelines	43%	21.5%	35.5%

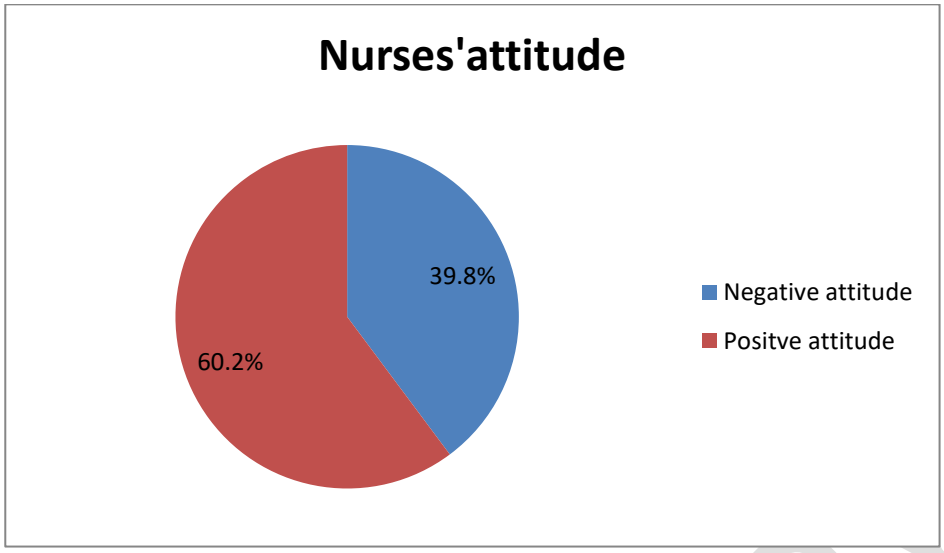


Figure 4.3 1: Nurses' overall attitude towards guidelines for CAUTI prevention

As seen in the figure above, the study results indicate that 60.2% nurses working at the facility had a positive attitude towards prevention of CAUTI. First all negatively formed questions (4) were reversed. Then the aggregate score was worked out and then used to obtain the mean. Categorization of the respondents' attitude as either positive or negative was based on the mean score (39.1%) selected as the cut-off point. Therefore, the resulting categories were as follows; 39.8% were graded as possessing negative attitude since they scored below the mean and 60.2% of the nurses who were graded as having a positive attitude had a score above the mean.

4.4 Respondents' Compliance with CDC Guidelines for CAUTI Prevention

Table 4.4 1: Adherence with CDC guidelines for CAUTI prevention (N=93)

Compliance with CDC Guidelines			
		Yes	**No**
.i	I usually minimize use and duration of indwelling urinary catheters in all patients.	22.8%	77.2%
.ii	I normally document catheter insertion date and expected date of removal.	25.8%	74.3%
.iii	I change urinary catheters only as necessary and not routinely.	39.8%	60.2%
.iv	I use external urinary catheters as an alternative to indwelling urethral depending on individual care needs.	70.7%	29.3%
.v	I use strict aseptic technique for catheter insertion.	58.9%	41.2%

.vi	I wash my hands before and after catheter insertion or manipulation.	69.6%	30.5%
.vii	I secure indwelling catheters after placement to prevent urethral traction.	73.1%	26.9%
.viii	Unless contrary indicated, I normally use the smallest bore catheter size possible.	38.7%	61.3%
.ix	I change the catheter and collecting system aseptically whenever there's a compromised drainage system.	45.2%	54.9%
.x	I use Standard Precautions when handling the catheter or collecting system.	55.9%	44.2%
.xi	I normally examine patients with positive urine cultures for the presence of an indwelling catheter.	12.9%	87.2%
Overall Compliance Level			***46.7%***

Information regarding the level of compliance with the guidelines for CAUTI prevention was obtained from the questionnaires and from observation of 10 of the study participants as they performed indwelling catheter insertion. The overall level of compliance was low (46.7%). First, the responses 'Not at all' and 'Very little' were collapsed into one group 'No' and the responses 'Somewhat' and 'To a great extent' collapsed into one group 'Yes'. The practice score was then attained by adding up all the practice score percentages (total percentage sum = 889) then dividing by the number of practice items (no. of items = 11). As can be seen from Table 4.6, implementation of the CDC guidelines varied with only 22.8% minimizing urinary catheter use in patients while 25.8% reported documenting catheter insertion date and expected date of removal. This is consistent with data obtained from observation where only 30% (3) respondents observed inserted IUCs in patients with appropriate indications and half of the participants 50% (5) remembered to document the catheter insertion date and time. Nearly 40% of the respondents reported changing urinary catheters only as necessary and not routinely while 70.7% used external catheters as an alternative to IUCs depending on individual care needs. Most of the respondents, 58.9% reported using aseptic technique for catheter insertion, 69.6 % performed hand hygiene while 73.1% properly secured indwelling catheters after placement to prevent urethral traction. Data from observed adherence using the checklist (See Table 4.7), showed that 60% (6) washed their hands before IUC insertion and 100%

(10) washed hands after insertion. However, only 20% (2) were seen to observe strict aseptic technique as most could not obtain sterile equipment and some sterile gloves while only 30% (3) secured the IUC to prevent movement and irritation. Only 38.7% of the nurses reported using the smallest bore catheter size possible. 45.2% replaced the catheter and collecting system aseptically while, 55.9% used Standard Precautions with only 12.9% of the respondents reported examining patients with positive urine cultures for the presence of an indwelling catheter.

Table 4.4 2: Distribution of respondents according to observation of performed tasks (N=10)

Task	**Yes**	**No**
Patient meets one of the criteria for catheterization.	3	7
Perform hand hygiene before insertion	6	4
Perform perineal preparation before catheter insertion.	8	2
Maintain strict aseptic technique throughout insertion procedure.	2	8
Properly secure the catheter.	3	7
Place the drainage bag below level of the bladder.	6	4
Inspect the system for any kinks and closed connections.	10	0
Perform hand hygiene post insertion.	10	0
Record catheter insertion date and time.	5	5

4.5 Relationship between Nurse- related factors and Compliance with CDC guidelines for CAUTI prevention

4.5.1 Nurse Demographic characteristics vs Compliance with CDC guidelines

There was no statistical relationship amid compliance and nurse' demographic characteristics. However, female seem to comply more than male, those with diploma

were likely to comply while the health workers working in surgical wards were likely not to comply compared with their counterparts from medical, maternity and gynecology.

Compliance was poor among those aged below 40 years with those who had never heard of the CDC guidelines having the lowest compliance with our study showing that those that hard been trained on CDC guidelines having the poorest compliance.

Overall, 75(80.6%) showed poor compliance, 16(17.2%) moderate while only 2(2.2%) showed good compliance.

Table 4.5 1: Relationship between nurses' demographic characteristics and compliance (N=93)

Variable	**Frequency (Percentage)**			**Statistical Significance**
	Poor	**Moderate**	**Good**	
Gender				0.37
Male	25(33.3)	3(18.8)	1(50)	
Female	50(66.7)	13(81.3)	16(50)	
Education Level				
Certificate	11(14.9)	3(56.3)	0	
Diploma	31(41.9)	9(21.4)	2(100)	0.590
Bachelor Degree	32(43.2)	4(9.8)	0	
Ward working in				
Medical	17(22.7)	5(21.7)	1(50)	
Maternity	18(24)	4(25)	1(50)	0.29
Gynecology	18(24)	0	0	
Surgical	22(29.3)	7(43.8)	0	
Age Category				
< 30 years	20(26.7)	4(25)	1(50)	
30-39 years	41(54.7)	7(43.8)	1(50)	
40-49 years	12(16)	2(12.5)	0	0.27
>49 years	2(2.7)	3(18.8)	0	
Ever heard of CDC guidelines				
Yes	12(16)	3(18.8)	0	0.27
No	63(80.8)	13(81.3)	2(100)	
Ever been trained on CDC guidelines				
Yes	50(66.7)	12(75)	0	0.79
No	25(33.3)	4(25)	2(100)	

4.5.2 Nurses' Knowledge vs Compliance with CDC Guidelines

As can be observed from table 4.6 no significant relationships were observed between the nurses' knowledge and implementation of the CDC guidelines on CAUTI prevention (p value > 0.05). Thus, the null hypothesis stating that nurse-related factors do not significantly influence compliance with the CDC guidelines for CAUTI prevention was accepted.

Table 4.5 2: Relationship between nurse knowledge and implementation of CDC guidelines for CAUTI prevention (N=93

Variable	**Knowledge of CDC Guidelines on CAUTI prevention Frequency (Percentage)**			**Statistical Significance**
	Poor	**Moderate**	**Good**	
I usually minimize use and duration of indwelling catheters in all patients.	2(2.2)	71(78.9)	17(18.9)	0.766
I document catheter insertion date and expected date of removal.	1(1.3)	57(76)	17(22.7)	0.052
I change urinary catheters only as needed and not routinely.	2(2.3)	68(79.1)	16(18.6)	0.876
I use external urinary catheters as an alternative to indwelling catheters depending on individual care needs.	2(2.4)	66(79.5)	15(18.1)	0.767
I use sterile technique for catheter insertion.	2(2.2)	73(81.1)	15(16.7)	No statistic
I wash my hands always before and after catheter insertion or manipulation.	2(2.2)	72(79.1)	17(18.7)	0.877
I secure urinary catheters after placement to prevent urethral traction.	2(2.2)	73(79.3)	17(18.5)	0.878

Unless contrary indicated, I use the smallest bore catheter size possible.	1(1.5)	52(76.5)	15(22.1)	0.243
I replace the catheter and collecting system aseptically when the drainage system is compromised.	2(2.3)	69(79.3)	16(18.4)	0.924
I use Standard precautions when handling the catheter or collecting system.	2(2.2)	73(79.3)	17(18.5)	0.878
I normally examine patients with positive urine cultures for the presence of an indwelling catheter	0	28(80)	7(20)	0.522

4.5.3 Relationship between Nurses' Attitude and Compliance with CDC guidelines

According to the study results no significant associations were observed between the nurses' attitude towards the CDC guidelines for prevention of CAUTI and their implementation of the same (p value >0.05). Thus, the null hypothesis stating that nurse-related factors do not significantly influence compliance with the CDC guidelines for CAUTI prevention was accepted.

Table 4.5 3: Relationship between nurses' attitudes and adherence with CDC guidelines for CAUTI prevention (N=93)

Variable	**Respondents' Attitude towards CAUTI prevention Frequency (%)**		
Practice	**Positive**	**Negative**	**Statistical significance**
1. I usually minimize use and duration of indwelling catheters in all patients.	29.3	70.7	$\chi^2 = 1.19$, df = 1, P= 0.276

2.	I document catheter insertion date and expected date of removal	29.3	70.7	χ^2 = 1.18, df = 1, P= 0.276
3.	I change urinary catheters only as necessary and not routinely.	27.9	72.1	χ^2 = 1.19, df = 1, P= 0.276
4.	I use external urinary catheters as an alternative to indwelling urethral depending on individual care needs	26.5	73.5	χ^2 = 0.119, df = 1, P= 0.662
5.	I use strict aseptic technique for catheter insertion.	24.4	75.6	No Statistic
6.	I wash my hands before and after catheter insertion or manipulation.	27.5	72.5	χ^2 = 0.38, df = 1, P= 0.539
7.	I secure urinary catheters after placement to prevent urethral traction.	26.1	73.9	χ^2 = 2.75, df = 1, P= 0.097
8.	Not unless indicated, I use the smallest bore catheter size possible.	26.5	73.5	χ^2 = 0.022, df = 1, P= 0.883
9.	I change the catheter and collecting system aseptically when the drainage system is compromised.	25.3	74.7	χ^2 = 1.74, df = 1, P= 0.187
10.	I use Standard Precautions when handling the catheter or collecting system.	27.2	72.8	χ^2 = 0.372, df = 1, P= 0.542
11.	I normally examine patients with positive urine cultures for the presence of an indwelling catheter.	31.4	68.6	χ^2 = 0.59, df = 1, P= 0.442

4.6 Institution-related Factors Influencing Compliance with CDC Guidelines for CAUTI Prevention

According to 71% (66) of the nurses, there is no regular training on updates regarding catheter care/management. This coincides with qualitative data obtained from the key informants. *"Another challenge is knowledge deficit regarding prevention of infections associated with catheterization…the hospital needs to take us for a CME, we keep forgetting these things. Supplies are there but the knowledge is a bit lacking".* 86% (80) indicated that there are no protocol/guidelines on CAUTI prevention at Embu Level 5 hospital. However, 75.3% (70) of the nurses said that the hospital has standard clinical procedures for catheter insertion and maintenance, and only 43% (40) said that there is adequate staff to care for patients.

This is supported by qualitative data collected where the key informants opined that there is lack of human resource leading to nurses being overworked,

"As nurses we are willing to work but we are overwhelmed by the work due to low numbers in relation to the patients we receive. When nurses come in the morning we offer nursing care to the bedridden that includes bathing them and changing linen before treatment that starts at 9 am. Imagine doing this with only 2 of you in a ward that has 50 patients."

Only 50.5% (47) of the respondents said that there are readily available supplies and commodities necessary for aseptic urinary catheter insertion. This information coincides with the qualitative data from the key informants where having inadequate supplies like urine bags, exact size of the catheter, sterile gloves and antiseptic lotions was cited as a major challenge. *"The main challenge in implementing the CDC guidelines is shortage of supplies because sometimes you want a particular catheter and that catheter is not available. Sometimes you don't have urine bags and the exact size of the catheter you want. Especially when dealing with male patients since most require size 18 and 20 and you find we have size 14 and 16 and so when you insert these sizes the catheter leaks. Sometimes we do not have urine bags hence we use syringes to close the catheter whereby the patient can take off the syringe whenever he feels like passing urine."*

Support from ward in charges and hospital administration in implementing the CDC guidelines for CAUTI prevention was said to be present by 68.8% (64) of the nurses (See Table 4.6)

Table 4.6 1: Institution-related factors influencing adherence with CDC guidelines for CAUTI prevention (N=93)

Institution related factors	Yes	No
.i There is regular training and mentorship for nurses on catheter care/management	29%	71%
.ii The hospital has a protocol and guidelines on CAUTI prevention	14%	86%
.iii The hospital has standard clinical procedure of maintaining catheters	75.3%	24.7%
.iv There is adequate staff to deal with patients on catheters	43%	57%
.v There are readily available supplies and commodities necessary for aseptic urinary catheter insertion	50.5%	49.5%
.vi There is support from ward in charges and hospital administration in implementing the CDC guidelines for CAUTI prevention	68.8%	31.2%

4.7 Relationship between Institution Related Factors and Compliance with CDC Guidelines for CAUTI Prevention

As seen in Table 4.5, institution related factors, that is, regular training, adequate staffing and support from ward in charges were found to have an effect on compliance with some of the CDC guidelines statements. There were significant associations noted between having regular training/mentorship and having adequate staff and the guideline statements of documenting catheter insertion date and date of removal ($p = 0.006$, $p = 0.000$) and use of the smallest bore catheter size possible ($p = 0.003$, $p = 0.003$). A relationship was also observed between having support from ward in-charges and administration and documenting catheter insertion date and date of removal and examining patients with positive urine cultures for a catheter and a CAUTI ($p = 0.001$, $p = 0.019$).

Thus, the null hypothesis stating institution-related factors do not significantly influence nurse' compliance with CDC guidelines for CAUTI prevention was rejected.

Table 4.7 1: Relationship between institution-related factors and adherence of CDC guidelines for CAUTI prevention

Variable	Regular training and mentorship Yes n (%)	No n (%)	Statistical Significance
.i I document catheter insertion date and expected date of removal.	10(37)	8(12.1)	$\chi^2 = 7.62$, df = 1, P= 0.006*
.ii Unless contrary indicated, I normally use the smallest bore catheter size possible.	13(48.1)	12(18.2)	$\chi^2 = 8.75$ df = 1, P= 0.003*

Variable	There is adequate staff to deal with patients on catheters Yes	No	Statistical Significance
.i I document catheter insertion date and expected date of removal	12(18.3)	1(1.1)	$\chi^2 = 24.1$, df = 1, P= 0.000*
.ii Unless contrary indicated, I normally use the smallest bore catheter size possible.	19(20.4)	6(6.5)	$\chi^2 = 15.1$, df = 1, P= 0.000*

Variable	There is support from ward in charges and hospital administration in implementing the CDC guidelines for CAUTI prevention Yes	No	Statistical Significance
.i I document catheter insertion date and expected date of removal	18(19.4)	0	$\chi^2 = 10.1$, df = 1, P= 0.001*
.ii I normally examine patients with positive urine cultures for the presence of an indwelling catheter	19(20.4)	16(17.2)	$\chi^2 = 5.52$, df = 1, P= 0.019

4.8 Discussion

This section offers an examination of the study's results based on the study objectives as well as the conceptual framework outlined in preceding chapters of this study in the following sub-sections. The focus is on the participants' demographic characteristics, implementation of CDC guidelines for CAUTI prevention and both nurse related and institution related factors influencing compliance with CDC guidelines for CAUTI prevention by nurses.

4.8.1 Respondents' Compliance with CDC Guidelines for CAUTI Prevention

The current study results indicate that nurses' level of implementation of the CDC guidelines for CAUTI prevention is low (40.6%) despite most participants being knowledgeable regarding the guidelines. Only a small proportion of the respondents indicated that they minimized use and duration of urinary catheters in all patients (22.8%). Documentation of catheter insertion date and expected date of removal was carried out only by a few of the respondents (25.8%). It was also reported by the key informants that indwelling catheters were routinely changed after every 2 weeks which tallied with quantitative data from the participants where only 39.8% reported changing urinary catheters as necessary and not routinely. Strict aseptic technique during catheter placement was reported by most of the participants however only 20% of those observed performing catheter insertion were seen to observe strict aseptic technique. Further, only 45.2% of the respondents reported using the smallest bore catheter size possible whilst a majority of the respondents did not examine patients with positive urine cultures for the presence of an indwelling catheter and a CAUTI.

The results from this study coincide with those from a study by Johnston (2015) that sought to evaluate adherence to practice guidelines of the UK's CAUTI bundle. The study results showed a general lack of consistent catheter care over a 5-day duration and also revealed that compliance with each specific CAUTI bundle criteria decreased with each passing day. Another study by Assanga, (2016) showed the nurse' adherence level to a CAUTI bundle at Kenyatta national hospital was 49.5%. However, results from an investigation conducted by Taleschian-T, Frahadi et. al (2015) which sought to assess the nurses' compliance to CDC guideline statements for urethral catheterization in an Iranian Hospital showed that nursing staff adhered to most of the guidelines. These findings relate to those from an investigation conducted in Rwanda by Mukakamanzi, (2015) which sought to evaluate nurses' practices, attitude and knowledge regarding

CAUTI prevention. The investigator reported that despite the nurses having insufficient knowledge the level of implementation was moderate (79.9%). The difference in findings may be due to the different methods employed to determine adherence levels. It is worth noting however, that reported adherence was higher than observed adherence in the current study. Similar findings were observed in a study by Assanga, (2016).

4.8.2 Nurse-Related Factors Influencing Implementation of CDC Guidelines for CAUTI Prevention

4.8.2.1 Respondents' Knowledge Regarding CDC guidelines for CAUTI prevention

Results from the current study revealed that a large proportion of the nurses were knowledgeable (overall knowledge score - 71.1%) regarding most of the CDC guidelines statements. The major risk factor for CAUTI development has been identified as duration of catheterization. It is recommended that HCWs minimize the use and duration of catheters and a majority of the study participants (72%) agreed with this guideline statement. Documentation of the date of catheter insertion and expected date of removal is also important in order to ensure that catheters are not left in place for extended periods of time. Most of the nurses (71%) rightly agreed with this statement. Additionally, to reduce the chances of CAUTI development alternatives to indwelling urinary catheters should be used in all patients when appropriate and 84.9% of the study participants agreed with this statement. Use of strict aseptic technique when inserting IUCs and performing hand hygiene prior to and post catheter insertion or manipulation are important interventions in preventing the occurrence of CAUTI. A majority of the nurses (89.2% and 93.5% respectively) agreed with these statements. Some gaps in knowledge were identified in the current study however. Most nurses were not aware that IUCs should be changed only as necessary and not routinely, patients with positive urine cultures should be examined for presence of an IUC and CAUTI and that surveillance of CAUTI is important. The key informants reported that IUCs are changed every 2 weeks as opposed to only when necessary. The findings also indicated that most (66.7%) of the participants had heard of the CDC guidelines for CAUTI prevention however only a few (16.1%) had received specific training on the guidelines.

In another study, Assanga, (2016) evaluated the use of a CAUTI bundle amongst critical care nurses at Kenyatta national hospital. It was observed that the nurses were

knowledgeable regarding the CAUTI bundle. A similar study that sought to evaluate the knowledge, attitude and practice among nurses on CAUTI prevention in selected hospitals in Rwanda however indicated that a majority of ICU nurses had inadequate knowledge (Mukakamanzi, 2017). Additionally, a study by Mody et al., (2010) set out to evaluate the knowledge of research proven urinary catheter interventions among healthcare professionals working in nursing homes. The researchers surmised that there are wide disparities that remain between research proven recommendations and healthcare workers' knowledge pertaining to urinary catheter care.

A statistically significant difference in knowledge between those that were aware of the CDC guidelines for CAUTI prevention and those that weren't was noted ($p = 0.018$). However no statistically significant relationship was observed between the nurses' knowledge of the CDC guidelines for CAUTI prevention and having specific training on the guidelines. This is contrary to findings from a study carried out by Moyo, (2013) which sought to determine the factors affecting nurses' compliance with infection prevention standard precautions at Mbagathi District Hospital, Kenya. The study revealed a statistically significant contrast in knowledge amid those nurses formally trained on infection prevention and those without training ($p = 0.027$). It is worth noting however, that the lion's share (83.9%) of the participants in the current study had reported having not received any training on the CDC guidelines for CAUTI prevention, whereas most (60%) of the study participants in the study at Mbagathi had reported having been trained on infection prevention.

4.8.2.2 Respondents' Attitude towards CDC Guidelines for CAUTI Prevention

In this study a large proportion (60.2%) of the participants were found to have a positive attitude towards CAUTI prevention. Only a few of the respondents felt that it was difficult to keep track of catheters placed and also most of the respondents felt that development of CAUTI could be avoided. In regards to adhering to the guidelines, less than half of the participants felt that they had the time to follow the guidelines. It was also noted that nurses considered that catheters should be placed for nursing convenience. Some of the key informants stated that all bed ridden patients are catheterized to prevent them from developing bed sores and in order to conserve linens.

These results are not unique to this study as another study by Mukakamanzi, (2017) showed that in regards to CAUTI prevention indications for catheterization most nurses had a progressive attitude. However, a study carried out by Manisha et. al, (2015) had

contrary findings. The study was performed to explore the attitude and knowledge of nurses and doctors concerning indications for catheter placement and CAUTI preventive measures. It was found that the health professionals did not think of CAUTI as a serious problem and a majority of them felt that catheters should be placed for nursing convenience.

4.8.2.3 Relationship Between Nurse-related Factors and Implementation of CDC guidelines for CAUTI Prevention

It was hypothesized that nurse-related factors, that is, demographic characteristics, knowledge, attitude and towards the CDC guidelines for CAUTI prevention did not influence their compliance with the guidelines. Analysis of these variables showed no statistically significant relationships between nurse related factors (demographic characteristics, knowledge and attitude) and implementation of the CDC guidelines among the nurses. Hence, the null hypothesis was accepted. The results from this study contradict findings from some studies. One such study is by Gerrish and Clayton (2004) that sought to investigate nurses' perceived barriers to implementing of evidence-based practices (EBP) found that a limited knowledge of EBP was one of the barriers to implementation identified. The results were consistent with findings obtained from an investigation carried out by Koehn & Lehman, (2008) that sought to determine nurses' perceptions of nursing practice based on scientific evidence. Time and knowledge were largely cited as the most common barriers to implementing evidence-based practice. In addition, a systematic meta-review of factors influencing the implementation of clinical guidelines for healthcare professionals also revealed that characters of health professionals such as awareness of the existence of the guidelines and knowledge of their contents affect implementation (Francke et al., 2008). However, a study by Assanga (2016) at Kenyatta national hospital in Kenya found no significant association between nurses' demographic characteristics (age, gender, years of experience, specialty and cadre) and utilization of a CAUTI bundle. An explanation for these contradictory findings may be that these studies used qualitative means to determine personal factors that influence adherence whereas the current study and that in Kenyatta hospital used quantitative means to establish whether a statistical relationship truly exists between these variables.

4.8.3 Institution-related Factors Influencing Implementation of CDC Guidelines for CAUTI Prevention.

This study revealed a majority of participants reported that the hospital did not have a laid-out protocol for CAUTI prevention and that there was no regular training for nurses on catheter care and management. Most of the respondents also reported that the hospital does not have adequate staff and only half of the participants felt that the hospital provided necessary supplies for catheter care and maintenance. A Scottish study investigating the use of nursing best practice statements noted that one barrier to implementation as cited by the nurses was lack of resources (Ring et al., 2005).

In another study that sought to investigate barriers and facilitators to clinical guideline implementation Abrahamson et al., (2012) found that having administrative support was considered as one of the facilitators to implementing the clinical guidelines. They also discovered that a large proportion of the nurses concluded that their capability to utilize the guidelines was aided by having adequate time and a workload that is manageable. Efstathiou et al., (2011) also found out from their study that a majority of the nurses felt that a huge workload due to poor staffing hindered their implementation of standard precaution guidelines.

It was hypothesized that institutional factors such as availability of needed supplies, staff shortage, support from ward in charges/hospital administration and staff training on CAUTI prevention do not influence the implementation of CDC guidelines by the nurses. The current study revealed that statistically significant relationships exist between staff training on CAUTI prevention and performance of documentation of catheter insertion date and planned date of removal and use appropriate size of catheter consistent with good drainage ($p = 0.006$, $p= 0.003$). A strong statically significant relationship was also noted between availability of adequate staff and documentation of catheter insertion date and date of removal and use of appropriate catheter size consistent with good drainage ($p= 0.000$, $p= 0.000$). Further, a statistically significant relationship was observed between support from ward in charges/hospital administration and documentation of catheter insertion date and date of removal and examination of patients with positive urine cultures for presence of an indwelling catheter ($p= 0.001$, $p= 0,019$). Thus, the null hypothesis was rejected.

These results are consistent with findings from other studies. For example, a study by Francke et al (2008) that set out to determine factors influencing implementation of

clinical guidelines by healthcare professionals, reported that support from peers and/or superiors in following the guidelines was important. In yet another investigation by Abrahamson et al., (2012) which set out to determine the barriers and facilitators to clinical guideline implementation, it was noted that having administrative support was frequently mentioned as one of the facilitators for implementing the guidelines. Efstathiou et al., (2011) also did a study that revealed that a large proportion of the nurses felt that a huge workload due to poor staffing hindered their implementation of standard precaution guidelines. In addition, Amine et al., (2014) in their assessment of an intervention program to avert hospital related CAUTI in an intensive care setting found that adherence improved after educating the nurses on the CAUTI bundle.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study's findings indicate that a majority of the nurses are females and most are aged between the ages of 30 to 39 years. Most of the respondents were familiar with the CDC guidelines for CAUTI prevention and a statistical association was noted between an awareness of the guidelines and knowledge of the same. The nurses were knowledgeable regarding the CDC guidelines for CAUTI guidelines with an overall knowledge score of 71.1%. In regards to the nurses' attitude towards CAUTI prevention a large proportion of the nurses (60.2%) had a positive attitude. The nurses' level of compliance with CDC guidelines for CAUTI was low at 46.7% despite having adequate knowledge of the guidelines. Significant associations were noted between specific institution-related factors and nurses' compliance with certain guideline statements and thus the null hypothesis was rejected. However, the second null hypothesis was accepted since no statistical relationship was seen between nurse-related factors and nurse compliance with CDC guidelines for CAUTI prevention.

5.2 Conclusion

There were no significant associations observed between nurse related factors and nurse' compliance with the guidelines. Thus, according to the study nurse related factors do not influence their compliance with CDC guidelines for CAUTI prevention. However, significant associations were noted between institution-related factors (training, adequate staffing and support from wards in charges and hospital administration) and specific guideline statements; documentation of date of catheter insertion and removal, use of appropriate catheter size and examining patients with positive urine cultures for a catheter and CAUTI. This suggests that institutional factors influence nurse' compliance with guidelines for CAUTI prevention.

The study findings also showed that the nurses' level of compliance with CDC guidelines for CAUTI prevention was low which may be attributed to the challenges in staffing, availability of resources and training as indicated by the respondents. The key informants also highlighted inadequate staffing with increased workload, personal factors and inconsistent availability of resources as the main barriers to adherence with the CDC guidelines for CAUTI prevention.

5.3 Recommendations

Based upon the findings from the current investigation the researcher's propositions are as follows:

1. There is need to conduct periodic trainings on CAUTI prevention within the wards to ensure all the nurses are updated on the guidelines.
2. There is need to regularly monitor nurse' compliance with CAUTI guidelines to ensure quality care is being provided to catheterized patients.
3. There is need for hospital management to provide adequate personnel and supplies in order to facilitate increased compliance with CDC guidelines for CAUTI prevention.
4. There is need for clinical audits to enable healthcare managers and policy makers draft evidence-based policies on CAUTI prevention.
5. Similar studies should be conducted in other County and sub-county hospitals in order to facilitate CAUTI surveillance and inform CAUTI prevention strategies in Kenya.

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APPENDICES

APPENDIX 1: CONSENT FORM

Name of researcher: **Catherine Wambui Methu**

Research Title:

An Assessment of Compliance with CDC guidelines on Catheter Associated Urinary Tract Infection Prevention by Nurses at Embu Level 5 Hospital.

Purpose of the study

This study aims to assess compliance with CDC guidelines by nurses at Embu Level 5 Hospital in Kenya. The expected results will be on the level of knowledge and compliance with CDC recommendations for the prevention of catheter associated urinary tract infection among nurses. It will also determine attitudes towards the said guidelines. Any association which may exist between knowledge, attitude and implementation among nurses at Embu Level 5 Hospital will also be explored.

Procedure for Participation

Should you consent to be part of this study, you are requested to finish a 44-item survey. The questionnaire is split into 4 sections touching on knowledge, attitude and implementation of CDC guidelines for prevention of CAUTI. Approximately 5 to 10 minutes are adequate to fill out the survey.

Risks and Benefits of being in the Study

No physical risks are anticipated in taking part in the investigation since it is not experimental in design. Any social risk will be mitigated by ensuring your responses remain confidential. This will be made possible by maintaining your anonymity. The expected benefit for participation in this inquiry is that you will play a role in identifying gaps in knowledge and current practice regarding CAUTI prevention. Furthermore the hospital can gain from future changes in policy that ought to translate into improved hospital operations and patient safety where catherization is necessary. Areas in need of improvement through training may be identified.

Costs to Subjects and Compensation

Participation in the study will be at no financial cost and there is no compensation available to the study participants.

Voluntary Nature of the Study

Voluntary participation is a requirement for the present study. The decision to participate or not participate in the study will be respected. You are at liberty to opt out of the study at any time during the course of the study.

Confidentiality

Anonymity of the responses will be safeguarded and the information obtained will not be used for any purpose beyond this study. Further, neither your name nor any other unique identifier will be used in any report from the research study.

Contacts and Questions:

Researcher contacts: 0722668864

Please feel free to contact me on my mobile number indicated above in case of any queries.

Agreement

Respondent: I have read and understood the purpose of this study and I'm fully aware that participation is voluntary and that results from this study will be used for academic purposes. I therefore consent to take part in this study.

Researcher: I have provided all the necessary information regarding the study and agree to answer any future questions and follow the stipulated procedure.

....……

Signature Date Ward

....……

Name of Researcher Signature Date

APPENDIX 2: KEY INFORMANT INTERVIEW GUIDE

Compliance with CDC Guidelines for Catheter Associated Urinary Tract Infection Prevention among Nurses Working at Embu Level 5 Hospital

1. In your own opinion, what do you think are the benefits of using the CDC guidelines for CAUTI prevention?

2. In your own opinion, what challenges do nurses face while trying to comply with the CDC guidelines for CAUTI prevention?

3. What do you think might aid the nurses in your department to comply with the CDC guidelines for CAUTI prevention?

4. Finally, in your opinion, what measures do you think can be taken to promote and sustain compliance with the CDC guidelines for CAUTI prevention?

APPENDIX 3: QUESTIONNAIRE

An Assessment of Compliance with CDC Guidelines for Catheter Associated Urinary Tract Infection Prevention by Nurses at Embu Level 5 Hospital

Objective:

To assess compliance with CDC guidelines for catheter related urinary tract infection prevention by nurses at Embu Level 5 hospital.

Section 1: General Characteristics

1. Gender Male ( ) Female ( )

2. Years of nursing experience _____

3. Education Level Certificate ( ) Diploma (KRN/KRCHN) ( ) Bachelor Degree ( )

Others (Specify)_____

1. What department are you currently working on?
   - .i Medical ( )
   - .ii Maternal (Labour & Delivery, Post-natal) ( )
   - .iii Gynecology/Obstetric ( )
   - .iv Surgical ( )
2. How long in years have you worked in the above department? _____
3. How old are you (years)? _____

Section 2: Assessment of Nurses' Knowledge regarding CDC guidelines on CAUTI prevention

1. Have you ever heard of the CDC guidelines for Catheter related Urinary Tract infection?
   - .i Yes ( )
   - .ii No ( )

2. Did you receive training on the CDC guidelines for Catheter related Urinary Tract infection?

.i Yes ( )

.ii No ( )

3. **Assessment of individual knowledge in the prevention of CAUTI**			
Using 1= Disagree, 2= Neither agree nor disagree 3 = Agree, tick as per your opinion on the following	1	2	3
.xiv Use and duration of indwelling catheters should be minimized in all patients.			
.xv Documentation of catheter insertion date and expected date of removal is important.			
.xvi Urinary catheters in catheterized patients should be changed only as necessary, rather than routinely			
.xvii Alternatives to indwelling urinary catheters should be used when appropriate.			
.xviii Strict aseptic technique should be used when inserting indwelling urinary catheters			
.xix Hand hygiene should be done before and after catheter insertion or manipulation.			
.xx Indwelling catheters should be secured properly after insertion.			
.xxi , Unless otherwise indicated the smallest bore size catheter possible should be used.			
.xxii If the drainage system is compromised replace the catheter and collecting system aseptically.			
.xxiii The urine drainage bag should emptied when ¾ full.			
.xxiv Standard precautions should be used when handling the catheter or collection system.			

.xxv Surveillance on catheter associated urinary tract infection is necessary.			
.xxvi Patients with positive urine cultures should be examined for the presence of an indwelling catheter and a CAUTI			

Assessing the Nurses' Attitude towards CDC Guidelines for CAUTI prevention

4. **Assessing the attitude on CAUTI Prevention**			
Using +1= Disagree, 0= Neither agree nor disagree -1 = Agree, tick as per your opinion on the following	**+1**	**0**	**-1**
.vii It is difficult to keep track of catheters placed			
.viii Development of CAUTI cannot be avoided			
.ix It is unrealistic to clean hands after every contact with patient			
.x Insertion of catheters should be for nursing convenience			
.xi I do not like taking care of patients in need of catheters			
.xii I do not have time to follow the guidelines			

Section 3: Institution-related Factors Influencing implementation of CDC Guidelines for CAUTI Prevention

5. **Institution related factors**	Yes	No
.vii There is regular training and mentorship for nurses on catheter care/management		
.viii The hospital has a protocol and guidelines on CAUTI prevention		
.ix The hospital has standard clinical procedure of maintaining catheters		

.x There is adequate staff to deal with patients on catheters		
.xi There are readily available supplies and commodities necessary for aseptic urinary catheter insertion		
.xii There is support from ward in charges and hospital administration in implementing the CDC guidelines for CAUTI prevention		

Section 4: Compliance with CDC Guidelines for CAUTI Prevention

6. **Compliance with CDC Guidelines for CAUTI prevention**				
Use 0=Not at all 1=Very little 2=Somewhat 3=To a great extent to indicate your implementation of the following	**0**	**1**	**2**	**3**
.xii I usually minimize use and duration of indwelling catheters in all patients.				
.xiii I document catheter insertion date and expected date of removal.				
.xiv I only change urinary catheters as needed and not routinely.				
.xv I use external urinary catheters as an alternative to indwelling catheters depending on individual care needs.				
.xvi I use sterile technique for catheter insertion.				
.xvii I wash my hands always before and after catheter insertion or manipulation.				
.xviii I secure urinary catheters after placement to prevent urethral traction.				
.xix Unless contrary indicated, I use the smallest bore catheter size possible.				
.xx I replace the catheter and collecting system aseptically whenever there is a compromised drainage system.				
.xxi I use Standard Precautions when handling the catheter or collecting system.				
.xxii I normally examine patients with positive urine cultures for the presence of an indwelling catheter.				

THANK YOU FOR YOUR TIME

APPENDIX 4: OBSERVATION CHECKLIST

Compliance with CDC Guidelines for Catheter Associated Urinary Tract Infection Prevention among Nurses Working at Embu Level 5 Hospital

INTERVENTIONS	YES	NO	COMMENT
Before IUC Insertion			
Patient meets at least one of the appropriate indications as per CDC guidelines.			
Selects the smallest appropriate catheter.			
Get help as required to facilitate proper insertion technique.			
Carry out hand washing.			
Patient Preparation/IUC Insertion			
Conduct perineal care, then re-perform hand washing			
Continue strict asepsis all through the actual IUC insertion procedure, repeat hand hygiene upon completion: - Use sterile gloves/equipment and set up and keep a sterile field.			
Place catheter to suitable length and inspect flow of urine before balloon inflation to avert urethral trauma (In males, insert completely to the catheter "y" connection; in females, advance about 1 inch/2.5cm past the point of urine flow).			
Inflate IUC balloon accurately: dilate to 10ml for catheters labelled 5ml or 10ml per manufacturer's instructions.			
After catheter placement completion:			
Fasten the catheter to prevent irritation of the urethra.			

Place the drainage bag below the bladder (but not resting on the floor).			
Inspect the system for any kinks and a closed system.			
Remove gloves and perform hand hygiene.			
Record catheter insertion date and time in the patient's nursing cardex.			

APPENDIX 5: TIME FRAME: 2015/2018

	2015 - 2016			2017 - 2018			
Activity	**September -March**	**April**	**May**	**November to February**	**March-August**	**September**	**November**
Proposal writing							
Proposal Presentation							
Ethics Approval							
Pre-testing & Collection of data							
Data analysis & Report Writing							
Project review & presentation							
Submission for examination							

APPENDIX 6: BUDGET

Item	**Unit**	**Cost Per Unit**	**Total Cost**
Labour:			
Research Assistants	2	1250	2,500
Travel:			
Fare to and from Embu	6	600	3600
Eldoret to Thika	10	1800	18000
Research Equipment:			
Digital Recorder	1	2000	2,000
Research Materials:			
Batteries for digital recorder	2	75	150
Refreshments for interviewees	6	100	600
Paper rims	3	300	600
Pens	120	10	1,200
Clip boards	10	150	1,500
Meals: 2 persons	20	100	2,000
Accommodation:	5	8000	4000
Institutional Fee	1	4,000	4,000
NACOSTI	1	1,000	1,000
Data Analysis	1	30,000	30,000
Printing and Binding:			
Printing document	7	400	2,800
Printing and binding of proposal	6	400	2,400
Printing and binding of research report	15	700	10,500
Subtotal			**85,050**
Contingencies (10%)			8,505
Grand Total			**93,555**

APPENDIX 7: ETHICAL CLEARANCE CERTIFICATE

Mount Kenya University

APRIL 3, 2017

Ref. No. MKU/ERC/0347

CERTIFICATE OF ETHICAL CLEARANCE

This is to certify that the proposal titled **"COMPLIANCE WITH CDC GUIDELINES FOR CATHETER ASSOCIATED URINARY TRACT INFECTION PREVENTION BY NURSES AT EMBU LEVEL 5 HOSPITAL",** whose Principal Investigator is Ms Catherine Wambui Methu (MScN/2014/67183) has been reviewed by Mount Kenya University Ethics Review Committee (ERC), and found to adequately address all ethical concerns.

Mr Francis W. Makokha
Secretary, Mount Kenya University ERC

Sign: _____ **Date:** 03/04/2017

Prof. Francis W. Muregi
Chairman, Mount Kenya University ERC

Sign: _____ **Date:** 03/04/2017

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

APPENDIX 8: INTRODUCTORY LETTER

Mount Kenya University

SCHOOL OF POSTGRADUATE STUDIES

REF: No. MSCN/2014/67183

10th April, 2017

The Director, Research Coordination Division
National Commission for Science, Technology & Innovation
Utalii House, 8th & 9th Floor
P.O Box 30623- 00100
Nairobi

Dear Sir/Madam,

RE: CATHERINE WAMBUI METHU – REGISTRATION NO. MSCN/2014/67183

The purpose of this letter is to introduce the above named student who is pursuing **Master of Science in Nursing** in the Department of **Medical Surgical Nursing,** School of **Nursing** in the **College of Health Sciences**.

The title of her thesis is ***"Compliance with CDC Guidelines for Catheter Related Urinary Tract Infection Prevention by Nurses at Embu Level 5 Hospital."***

She has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data for her research in the course of this semester **(April – June, 2017)**.

Any assistance accorded to her will be highly appreciated.

Thank you.

Mount Kenya University
Dean, School of Postgraduate Studies
P. O. Box 342 - 01000
Thika

Dr. Samuel Karenga
Dean, School of Postgraduate Studies

Enc

APPENDIX 9: PERMIT LETTER FROM NARCOSTI

THIS IS TO CERTIFY THAT:
MS. CATHERINE WAMBUI METHU
of MOUNT KENYA UNIVERSITY,
3170-1000 thika,has been permitted to
conduct research in *Embu County*

on the topic: *COMPLIANCE WITH CDC GUIDELINES FOR CATHETER RELATED URINARY TRACT INFECTION PREVENTION BY NURSES AT EMBU LEVEL 5 HOSPITAL*

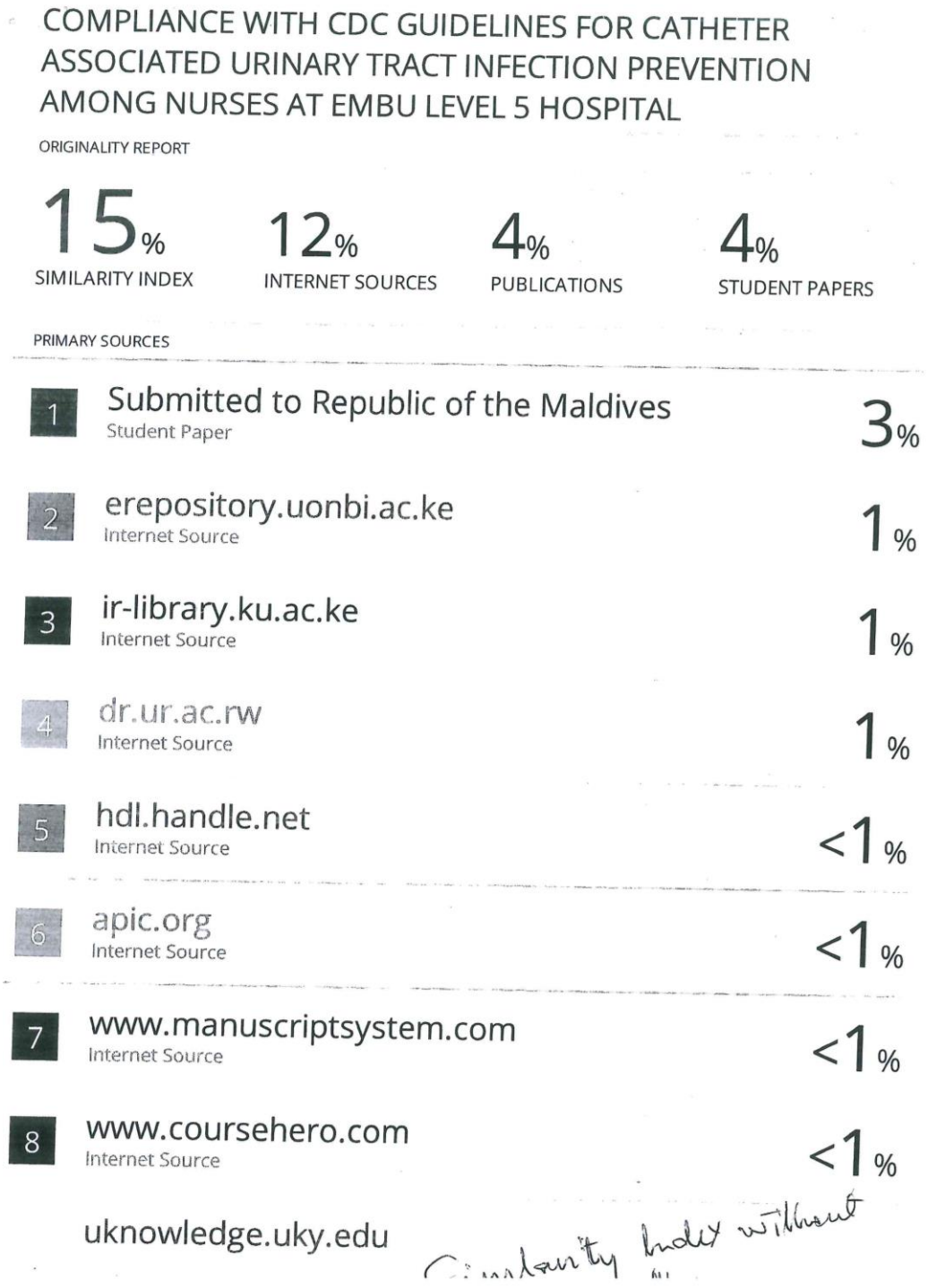
for the period ending:
5th May,2018

.....
Applicant's Signature

Permit No : NACOSTI/P/17/36802/16905
Date Of Issue : 8th May,2017
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

APPENDIX 10: SIMILARITY INDEX REPORT



COMPLIANCE WITH CDC GUIDELINES FOR CATHETER ASSOCIATED URINARY TRACT INFECTION PREVENTION AMONG NURSES AT EMBU LEVEL 5 HOSPITAL

ORIGINALITY REPORT

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APPENDIX 11: MAP OF EMBU COUNTY