



**KNOWLEDGE, ATTITUDE AND PRACTICE OF NURSES TOWARDS
THE PREVENTION OF CATHETER ASSOCIATED URINARY TRACT
INFECTION IN SELECTED REFERRAL HOSPITALS IN RWANDA.**

Jacqueline MUKAKAMANZI

College of Medicine and Health Sciences.

School of Nursing and Midwifery.

Master of Sciences in Nursing/Critical Care and Trauma.

2017



**KNOWLEDGE, ATTITUDE AND PRACTICES OF NURSES TOWARDS
THE PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT
INFECTION IN SELECTED REFERRAL HOSPITALS IN RWANDA.**

by

Jacqueline MUKAKAMANZI

216339952

A dissertation submitted in Partial Fulfilment of the Requirements for the degree of
MASTER OF SCIENCES IN NURSING/ CRITICAL CARE AND TRAUMA.

in the

College of Medicine and Health Sciences

Supervisor: Dr. Darius GISHOMA

Co-Supervisor: Prof. BUSISIWE Rosemary Bhengu.

July, 2017

DECLARATION AND AUTHORITY TO SUBMIT THE DISSERTATION

Surname and First Name of the Student:

Jacqueline MUKAKAMANZI

Title of the project:

Knowledge, attitude and practice of nurses towards the prevention of Catheter associated urinary tract infections in selected referral hospitals in Rwanda.

a. Declaration by the Student

I do hereby declare that this *dissertation* submitted in partial fulfilment of the requirements for the degree of **MASTERS OF SCIENCE in NURSING**, at the University of Rwanda/College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Date and Signature of the Student



Date: July 25, 2017

b. Authority to Submit the dissertation

Surname and First Name of the Supervisor:

Dr. Darius GISHOMA

In my capacity as a Supervisor, I do hereby authorize the student to submit his/her **dissertation**.

Date and Signature of the Supervisor/Co-Supervisor



Date: July 25, 2017

DECLARATION

I, Jacqueline MUKAKAMANZI, declare that this research project entitled “Nurses’ knowledge, attitude and practices toward the prevention of catheter associated urinary tract infections in selected referral hospitals in Rwanda is my unique work and has never been presented for a degree award or any other award in any University.

Signed

Date: August 1, 2017

Jacqueline MUKAKAMANZI

DEDICATION

I dedicate this work to the Almighty God, who gave me life and the chance to elaborate this work.

I also dedicate this work to my friends for the love and support that strengthened and encouraged me throughout this study process. This work is furthermore dedicated to my brothers and sister whose words of encouragement and push for tenacity ring in my ears.

A special feeling of gratitude to my family member and my loving parents especially my mother, who taught me that even the largest task can be accomplished if it is done one step at a time. All you have been my best cheerleaders.

A C K N O W L E D G E M E N T

First of all, I am thankful to the Almighty Heavenly Father for eternal love, care and blessing especially during the period of this study.

I would like to express my deepest gratitude to my supervisor Dr Darius GISHOMA and to my co-supervisor Prof. BUSISIWE Bhengu for their unlimited support and guidance. I consider myself extremely lucky to have been provided with such exceptional guidance and support throughout the Masters process.

I am appreciative of the College of Medicine and Health Sciences for daily support. Special thanks to the University of Rwanda for the sponsorship.

I am also grateful for the College of Medicine and Health Sciences staffs and Human Resource for Health staffs responsible for their unreserved help during my studies and clinical placement.

I express my gratitude to all the nurses who participated in the study and gave so charitably of their time; their continuous interest, participation and support for the project demonstrating their guarantee to refining practices outcomes.

My parents, brothers and sisters have been constantly caring for and inquiring about me, my well-being. I am grateful to them as without their driving force throughout my study time would be a burden.

Last but not least; my unforgettable thanks go to everybody who, especially my colleagues in Master in Nursing, have helped me intellectually during the research fulfillment and my studies.

ABSTRACT

Catheter-associated urinary tract infection (CAUTI) is the most common health care-associated infection accounting for 80% of all hospital acquired infection and is mostly related to the use of urinary catheter frequently found in severely ill patients. Although, many preventive measures and guidelines to prevent CAUTI exist in different healthcare settings, the prevalence of CAUTI and urinary catheter (UC) use is still a major issue as 25 % of hospitalized patients receive urinary catheters, sometimes unnecessarily.

Aim: The aim of this study was to assess the level of knowledge, attitudes, and skills of nurses regarding CAUTI prevention in selected referral hospitals in Rwanda.

Method: A descriptive quantitative approach and a cross-sectional design was used for the data collection. The research survey builds on the World Health Organization (WHO) defined standards for precautions of infection control and the Center for Disease Control (CDC) 2009 guidelines for indication of catheterization, and measures for CAUTI prevention. The research study included all registered nurses working in ICU of two referral hospitals in Kigali who were fulfilling the inclusion criteria. Total population purposeful sampling method was used as the population to be studied was small and needed to be used as whole without selecting some units. The final collected data was coded and analyzed using SPSS. Frequency, Mean and other statistics were calculated. Only P-value less than 0.05 were set as statistically significant.

Results and discussion: A total of 53 nurses working in intensive care unit were included in the study with 86.8% of response rate. Based on the results of the present study, a high percentage has shown a good implementation of different practices (79.9%) towards catheter indications and CAUTI prevention. However respondents' knowledge (64.52%) was not satisfactory and among respondents, 52.83% show a positive attitude. Lastly, there were no influence of demographics characteristics on knowledge, attitudes and practice in this study ($p > 0.05$).

Conclusion: The findings of the study show a low level of knowledge among nurses but no demographic factor was seen as a barrier to nurses' KAP towards the prevention of CAUTI. Therefore there is a need for further study to establish factors contributing to low level of knowledge, attitude and practice, perhaps using a qualitative study. Nurses should be empowered by in service training towards infection control especially CAUTI.

KEY WORDS.

Catheter-associated Urinary Tract Infection: it is an infections of the urinary tract resulting from the presence of an indwelling urinary catheter.

Knowledge: understanding measures used to prevent CAUTI in theory by providing the correct responses on structured questionnaires. In this case it is the knowledge of nurses towards the appropriate indications of urinary catheter, catheter care, timely removal and risk factors. It was assessed by a self-reported questionnaire where the high score indicated the high level of knowledge. It was measured by the score they obtained in knowledge related questions and they were categorized based on the marks they obtained.

Attitude: personal opinions or views of nurses regarding prevention of CAUTI in their wards. These are beliefs of ICU nurses with regards to catheter insertion, maintenance and removal as well as CAUTI prevention is concerned. This reflects the way nurses received, responded and valued CAUTI prevention in terms of risk factors, seriousness, catheter care and maintenance, education program for nurses and the involvement of health facilities. It was assessed by a self-reported questionnaire developed by the researcher. The total attitude score was calculated and the high scores indicate positive attitude.

Practice: putting into action all measures aimed at preventing CAUTI. In this study the practice represent nurses' performance with regards to catheter insertion, maintenance and manipulation as far as CAUTI prevention is alarmed. It was assessed using a self-reported practice and an observational checklist. The high scores indicate the high category of practice.

Nurse: A person who is formally licensed, educated and trained in the care of the sick especially in a hospital. For this study, it is any person deployed in the hospital to provide nursing services to patients hospitalized in intensive care unit.

Intensive care unit: also known as critical care unit, intensive therapy unit or intensive treatment unit, is a special department of a hospital that provide intensive care medicine. It is a particular unit where critically ill patients can be observed and cared for by qualified and trained healthcare staff working under best possible conditions (Said, 2012, p. 0)

LIST OF SYMBOLS AND ACRONYMS.

#: percentage

ABUTI: asymptomatic bacteriuria urinary tract infection

AHA: American Hospital Association

AHRQ: Agency for Healthcare Research and Quality.

AIDS: acquired immunodeficiency syndrome

APIC: Association for Professionals in Infection Control and Epidemiology

BSI: Blood stream infection.

CAUTI: catheter associated urinary tract infection

CDC: Center for diseases control

CLABI: central line associated blood stream infections

CMHS: College of Medicine and Health Sciences

CPD: Continuous Professional Development

CVA: costo vertebral angle

GIT: gastrointestinal tract infection

HAI: Healthcare associated infections

HAUTI: healthcare-associated urinary tract infection

HBM: Health belief model

HCAI/HAI: Healthcare associated infections

HIPAC: Healthcare infection control practices advisory committee

HRET: Health Research and Education Trust

ICU: intensive care unit

IHI: Institute of Healthcare Improvement

IRB: Institutional Review Board

IUC: indwelling urinary catheter

KAP: Knowledge, attitude and practice

KFH: King Faisal Hospital

MOH: Ministry of health

n: frequency of respondents

N: total number of all respondents

NHSN: National Healthcare Safety Network

NHSN: National Healthcare Safety Network

NIPC: National Infection Prevention and Control committee

PNEU: Pneumonia

SPSS: Software Package for Statistical Analysis.

SSI: surgical site infections

SUTI: symptomatic urinary tract infection

UC: urinary catheter

UR: University of Rwanda

UTHB: University teaching hospital of Butare

UTHK: University teaching hospital of Kigali

UTI: urinary tract infection

VAP: ventilator associated pneumonia

WHO: World health organization

TABLE OF CONTENTS

DECLARATION AND AUTHORITY TO SUBMIT THE DISSERTATION.....	i
DEDICATION.....	iii
ACKNOWLEDGEMENT	iv
KEY WORDS.....	iv
LIST OF SYMBOLS AND ACRONYMS.....	v
LIST OF TABLES	xi
LIST OF FIGURES.....	xii
CHAPTER 1: INTRODUCTION.....	1
1.1. Introduction.....	1
1.2. Background of the study.	1
1.3. Problem statement.....	4
1.4. Objectives of the research.....	4
1.4.1. The general objective	4
1.4.2. Specific objectives.....	5
1.5. Research questions	5
1.6. Significance of the study.	5
1.7. Structure of the study.....	6
CHAPTER 2. LITERATURE REVIEW.....	7
2.1. Introduction.....	7
2.2. Theoretical literature	7
2.2.1. Catheter associated urinary tract infections.....	7

2.2.2. Urinary catheterization.....	10
2.2.3. Appropriate and inappropriate indications of urinary catheter.....	11
2.2.4. Complications of urinary catheterization.....	13
2.3. Empirical literature.....	13
2.3.1. Knowledge of nurses regarding catheter indications, insertion, maintenance, and removal.....	13
2.3.2. Attitude of nurses towards CAUTI prevention during catheter insertion, maintenance, and removal.....	15
2.3.4. The practice of nurses towards the use of urinary catheter insertion, maintenance and removal 2009 CDC guidelines.....	16
2.3.5. Factors and barriers influencing nurses' KAP towards the prevention of CAUTI.....	17
2.4. Theoretical/conceptual framework.....	19
2.4.1. Constructs of the model.....	20
2.4.2. Adaptation of the HBM to CAUTI prevention.....	22
CHAPTER 3. METHODOLOGY.....	24
3.1. Introduction.....	24
3.2. Research design.....	24
3.3. Research approach.....	24
3.4. Research setting.....	24
3.5. Study population.....	25
3.5.1. Inclusion criteria.....	25
3.5.2. Exclusion criteria.....	25

3.6. Sampling methods	25
3.6.1. Sampling procedure or strategy.....	25
3.6.2. Sample size.....	26
3.7. Data collection.....	26
3.7.1. Data collection tool	26
3.7.2. Validity and Reliability of the tool.....	27
3.7.3. Data collection procedure.....	28
3.8. Data analysis.....	29
3.9. Data management and storage.....	29
3.10 .Ethical consideration	30
3.11. Data dissemination	30
3.12. Limitations and challenges	30
CHAP 4. RESULTS PRESENTATIONS AND THEIR INTERPRETATIONS.	32
4.1. Introduction	32
4.2. Demographic data of participants.....	32
4.3. Knowledge of ICU nurses towards catheter indications and CAUTI prevention (N=53)	34
4.4. Attitude of ICU nurses towards catheter use and CAUTI prevention N=53	37
4.5. Practice of ICU nurses towards Catheter indication and the prevention of CAUTI. N=53.....	40
4.6. Factors influencing nurses' KAP towards the prevention of CAUTI.	42
4.6.1. Demographic characteristics and nurses' knowledge towards CAUTI prevention.....	42

4.6.2. Demographic characteristics and nurses’ attitude towards CAUTI prevention.	43
4.6.3. Demographic characteristics and respondents’ practice towards the prevention of CAUTI.....	44
CHAP 5: RESULTS DISCUSSION.....	46
5.0. Demographic characteristics of participants.	46
5.1. Level of knowledge of nurses regarding catheter indications and CAUTI prevention.	47
5.2. Nurses attitude towards catheter indications and CAUTI prevention.....	48
5.3. Nurses practice towards catheter indications and CAUTI prevention.....	49
5.4. Demographic factors ‘influence on nurses KAP towards catheter indications and CAUTI prevention.	50
CHAP 6: CONCLUSIONS AND RECOMMENDATIONS.....	51
Conclusions	51
Recommendations.	51
REFERENCES.....	53
Appendice A: Information document (English version)	A
Appendice B: Informed consent (English)	B
Appendice C: Questionnaire.....	C

LIST OF TABLES

Table 1: Content validity relating to study objectives, conceptual framework and items of the questionnaire.....	28
Table 2: Sociodemographic characteristics of participants (N=53).....	33
Table 3: Sociodemographic characteristics of participants (N=53).....	35
Table 4: Frequency distribution of nurses based on the way they answered correctly each knowledge question. N=53.....	36
Table 5: Distribution of ICU nurses ‘attitude based on Likert scales regarding CAUTI prevention in two Referral hospitals in Kigali. N=53.....	39
Table 6: Distribution of nurses according to their practice score. N=53.....	40
Table 7: Demographic characteristics of respondent and their knowledge level towards catheter indications and CAUTI prevention.....	43
Table 8: Demographic characteristics of respondent and their attitude category towards catheter indications and CAUTI prevention.....	44
Table 9: Demographic characteristics of respondent and their practice level towards catheter indications and CAUTI prevention.....	45

LIST OF FIGURES.

Figure 1: Types of infections most found in acute care hospitals (United State of America).	8
Figure 2: Route of entry of bacteria in urinary tract	10
Figure 3: Four stages of urinary catheter as far as CAUTI prevention is concerned.....	11
Figure 4: Health Belief Model	21
Figure 5: Adaptation of the HBM in this research study	23
Figure 6: Gender of participants (N=53)	33
Figure 7: Distribution of respondents according to their attitude category N=53	38

CHAPTER 1: INTRODUCTION.

1.1.Introduction

Healthcare associated infections (HCAI) or nosocomial infections constituting a major health problem worldwide; they are infections occurring in a patient hospitalized in a health-care facility and that was not present or incubating at the time of admission (Ramasubramanian *et al.*, 2014; Kaushal, 2015, pp. 282–283). World health organization (WHO) report 7.1 million cases of nosocomial infections occurring each year and that cause significant morbidity and mortality in hospitalized patients. Different factors have been associated with the occurrence of such kind of infections among many hospitalized patients including decreased immunity, increased number of medical invasive procedures and poor infection practices (Anupriya *et al.*, 2016, p. 399). The most frequent HCAI is catheter associated urinary tract infections (CAUTI) accounting for 34% followed by surgical site infections, central line associated blood stream infections and ventilator associated infections (Rife, 2012). Most of CAUTI cases are associated with the presence of urinary catheter even though many catheters are used unnecessarily and for prolonged periods of time. Guidelines have been designed with regard to the prevention of infections and nurses have to respect and put them into practice in order to decrease the incidence of this infection.

1.2.Background of the study.

The American National Healthcare Safety Network (NHSN) in collaboration with the Center for Disease Control (CDC), reported that a urinary tract infection (UTI) is an infection affecting any part of the urinary system, including urethra, bladder, ureters, and kidneys (NHSN, 2016). On the other hand, catheter-associated urinary tract infections (CAUTI) are a UTI related to the presence of a urinary catheter in the bladder for more than two days from the date of infection, and that was not present at the time of admission (Lo et al, 2014, p. 457).

While urinary catheters are used for the safety of the patients, complications can arise from their use and can be a source of morbidity for most of patients in hospital and nursing home residents (Ioannis and Kostadinov, 2013, p. 1). Approximately, 12% to 16% of all hospitalized patients are catheterized while up to 50% of those patients do not have an appropriate indication thus increasing the risk of catheter related infections (Gail, 2016, p. 2). Similarly to this urinary catheters are used frequently in hospitalized patients whereby 25% of them undergo urinary

catheterization during their hospital stay (Institute for Healthcare Improvement, 2011, p. 4; Lo et al, 2014, p. 15). Then, the frequency of urinary catheterization in Intensive Care Unit (ICU) can be as high as 100% due to high dependency of critically ill patients (Marra *et al.*, 2011, pp. 1–2; Jain *et al.*, 2015, p. 76) and utilization in the ICU (61%) was greater than in the non-ICU (20%) units (Marra *et al.*, 2011, p. 1; Greene *et al.*, 2014, p. 4).

NHSN also reported that among UTIs acquired in the hospital, almost 75% are associated with a urinary catheter and 15-25% of hospitalized patients obtain urinary catheter for urine drainage, and yet their extended use is the most important risk factor for developing CAUTI (NHSN, 2014). "They are the most common type of healthcare-associated infection (HCAI) with an estimated prevalence of 1%-10%, representing 30%-40% of all nosocomial infections accounting for approximately 13 000 deaths per year" (Marra *et al.*, 2011, p. 1).

The estimated risk of acquiring a urinary tract infection increases by five percent each day the catheter stays *in situ*. An average of 25% of hospitalized patients had a catheter inserted at some stage during their admission. Therefore, it is serious that practices and procedures must be considered to minimize the risk of infection (Yokoe, et al, 2014). Per the Institute for Healthcare Improvement (IHI); globally, urinary tract infections account for around 40 % of all infections acquired in hospital every year; 80 % of these hospital-acquired urinary tract infections are linked to indwelling urethral catheters. Literature review supports the concept that the length of catheterization is a significant risk of developing urinary tract infections (UTI) (Lewis *et al.*, 2013, p. 744). Even though CAUTI are the most frequent infections, they are preventable if the healthcare provider respects the recommended catheter placement indications and evidenced-based methods of catheter maintenance and care (Jain *et al.*, 2015; Gould *et al.*, 2017).

Although the indwelling catheter is used for therapeutic and diagnostic purposes, overuse has become common practice in healthcare settings which increases the risk for infection. As an example there is up to five million urinary catheters that are placed each year in the United States of America (USA). The estimated prevalence of HCAI in USA is 4.5% making 9.3 infections per 1000 patients per day while the same prevalence is 7.1% in Europe with 17 HCAI cases per 1000 patients every day and among the most frequent, urinary tract infections occupy 21% of infections mostly acquired during hospitalization (Ramasubramanian *et al.*, 2014, p. 47). In

addition to this, the amount of HCAs was in the millions and directly associated with ninety-nine thousand deaths in the United States per year that put HCAs at the fourth leading cause of mortality among the patient population (William B. Munier, 2010, p. 1).

The prevalence of HAUTI was 1.4% counting for 15 patients among 1109 included in the study conducted by Gardner and colleagues in Australia. Among them, CAUTI was occupying 0.9% (10/1109) where *S. aureus* (20%) and *C. species* (20%) were the most identified common pathogen (Gardner *et al.*, 2014, p. 3).

In Africa like other developing countries, the prevalence and extent of the problem remains unknown due to limited resources and deficiency in social health care system. Even though, studies about HCAI in Africa are limited; WHO conducted a systematic review on Health-care-associated infection in Africa. From different literature review; it was found that some studies were conducted in only 10 African countries and the overall prevalence of HAI ranged from 2.5% to 14.8% (Nejad *et al.*, 2011, p. 761).

As published in the MOH annual report July 2012, in Rwanda, UTI is among the top ten causes of morbidity in Health Centers (2.4%) and hospitals (4.6%), but there is no particular study done in the country concerning urinary tract infections and catheter use (MoH, 2012). In addition to that, the diseases of the urinary system have been the 5th leading cause of death in UTHK occupying 24.6% and the 3rd in UTHB, placing them at the 9th place among causes of extended hospitalization (0.81%) (MoH, 2014).

Considering the above study results, healthcare providers may be playing a role in transmitting UTI at any stage of patient care or urinary catheterization. Different authors revealed the same findings in their study where they found that many nurses did not know that the urine collecting bag should be lower than the level of the bladder and be emptied regularly to allow continuous urine flow (Jain *et al.*, 2015, p. 78; Kose *et al.*, 2016, p. 78).

However, according to CDC report 17% to 69% of CAUTI may be prevented using recommended infection control measures, resulting to 380, 000 infections and 9000 deaths related to CAUTI per year that could be prevented (Gould *et al.*, 2017)

1.3. Problem statement.

In Intensive Care Unit (ICU), exposure to multiple invasive devices and procedures, the high patient's contact with health-care personnel, the long ICU stay and space limitations increase the risk of HCAI contamination (Khadoura, 2013, p. 3). Catheter associated urinary tract infections is the most common HCAI related to prolonged use of urinary catheter and leading to increased length of hospital stay and morbidity. Surprisingly, in healthcare settings located in developing countries, urine bags are kept in the patient's trouser pockets or in their bed so blocking the drainage systems and increasing the risk of CAUTI. Another issues is that patients stay with the urinary catheter even when it is no longer needed and catheter care, maintenance and timely removal are very poor (Saint, 2014). Also, in some healthcare facility, nurses are not aware that the patients had a urinary catheter, or urine bags are on the floor or in the patient's bed or regular emptying is not done timely. This make the main risk factors for developing CAUTI among many hospitalized patients. Although this is the case, healthcare system have to provide reassurance that the care will be delivered safely and efficiently to prevent disease related vulnerability.

Even though many efforts have been made to prevention CAUTI, the infection continue to rise counting for 32% in USA and most of the time due to inadequate knowledge about basic catheter care practices especially among nurses (Weber *et al.*, 2011; Prasanna and M, 2015, p. 186).

Unfortunately, in Rwanda there is no study done regarding urinary tract infections or CAUTI prevention. Thus the researcher has an interest to conduct a study to assess the knowledge, attitude, and practices of nurses towards the prevention of those infections especially among patients with a urinary catheter in place hospitalized in ICU.

1.4. Objectives of the research.

1.4.1. The general objective

The primary drive of the study is to assess the knowledge, attitude, and practice of nurses towards the prevention of CAUTI among ICU patients in referral hospitals in Kigali, Rwanda.

1.4.2. Specific objectives

1. To assess the level of knowledge of nurses regarding catheter insertion, maintenance, and removal.
2. To evaluate the attitude of nurses towards CAUTI prevention during catheter insertion, maintenance, and removal.
3. To assess the practice level of nurses towards the use of urinary catheter insertion, maintenance and removal 2009 CDC guidelines.
4. To identify factors influencing nurses' KAP towards the prevention of CAUTI.

1.5. Research questions

1. What is the nurses' level of knowledge regarding urinary catheter insertion, maintenance, and removal?
2. What is the nurses' attitude category regarding CAUTI prevention during urinary catheter insertion, maintenance, and removal?
3. What is the level of practice of nurses in relation to CDC 2009 evidence-based guidelines for urinary catheter insertion, maintenance and removal or replacement?
4. What are the factors that influence the nurses' KAP towards the prevention of CAUTI?

1.6. Significance of the study.

The burden of CAUTI affect the individual patients and the health care system as a whole. Nurses are responsible for providing assessment and management of patients in ICU including the responsibility for sterile insertion of urinary catheters, needed daily maintenance, and timely catheter removal to prevent catheter associated UTI.

This research study assessed the nurses' KAP towards CAUTI prevention and the research results will contribute to nursing educational needs, practices, and further research contributing to an increase in the quality of care and improvement of the critical patient's outcomes via appropriate handling of IUC in Rwanda. Concerning management and administration, it is hoped that this study will serve to inform the development of context based and evidence based guidelines,

protocols and checklists for the prevention of CAUTI. A part from that in this research will play a role in education whereby the study hopes to inform context based content for nursing curriculum in the country especially clinical learning activities including continuing Professional Development (CPD).

1.7. Structure of the study.

The current study is subdivided into the following chapters namely: introduction, literature review, methodology, results presentation and their interpretation, result and discussion and finally conclusions and recommendation

Conclusion.

Catheter Associated Urinary Tract Infection is a serious problem in most hospitalized patients especially those in ICU who are critically ill or with life threatening diseases; as it may lead to different complications and morbidity. It is in this context that nurses have to minimize its occurrence using different preventive measures, especially by putting into respect the CDC guidelines for urinary catheterization and CAUTI prevention during insertion, maintenance and removal.

CHAPTER 2. LITERATURE REVIEW.

2.1. Introduction.

In this chapter different review of literature have been used to sort out nurses' knowledge towards the indications of urinary catheters, their management, maintenance and removal as well as the complications related to this device especially CAUTI. This literature review was implemented using current research from online search including Google Scholar, Hinari, Centre for Disease Control guidelines, World Health Organization report, American Intensive and Critical Medicine, Biomedical Journal of Clinical Research, Association of Professional and Infection Control Epidemiology and current textbook in general nursing within five years of publication. Online research terms included the urinary catheter, urinary catheter infection, nosocomial infections, health care associated infections, urinary tract infections, nurses 'knowledge towards infection prevention, infection control and prevention.

2.2. Theoretical literature

The following section is centred on 5 elements related to the study including catheter associated urinary tract infection, hand hygiene, urinary catheterization, risk factors for CAUTI and possible barriers to the prevention of CAUTI

2.2.1. Catheter associated urinary tract infections.

Catheter associated urinary tract infection is an infection (CAUTI) of the urinary tract that affects patients with an indwelling urinary catheter (Nicolle, 2014, p. 1), and the risk of infection varies from three percent to ten percent (Susan *et al.*, 2010, p. 2) each day the catheter is in place. Urinary tract infections are the most frequent hospital acquired infections representing 40% of all healthcare associated infections with 70 to 80% related to the use of a urinary catheter (Dougnon *et al.*, 2016, p. 1).

Catheter associated urinary tract infection may increase morbidity, may cause a delay in wound healing, delayed rehabilitation, increased exposure to antimicrobial therapy, and its potential adverse effects, and prolonged hospitalization therefore increasing the cost of care (Rajiv G., 2016). The Center for Disease Control (2013) reported that "each year there are about 2 million of preventable HCAI resulting in almost 40 billion dollars in excess health care costs and lead to

99,000 deaths, which is very high compared to AIDS, breast cancer and car accidents related deaths combined" (HRET & AHA 2013 p. 7).

Literature stated that among the infections related to imported pathogens, CAUTI is the most frequent and preventable type of infections by simple measures like handwashing (Hanan and Nasr, 2015, p. 7; Dougnon *et al.*, 2016, p. 1). In addition to this, different publication studying the estimation of healthcare-associated infections, found that urinary tract infections comprised 36% (Figure. 1) of the total HCAI in the United States of America (Greene, James and Oriola, 2008, p. 5; Meddings *et al.*, 2013)

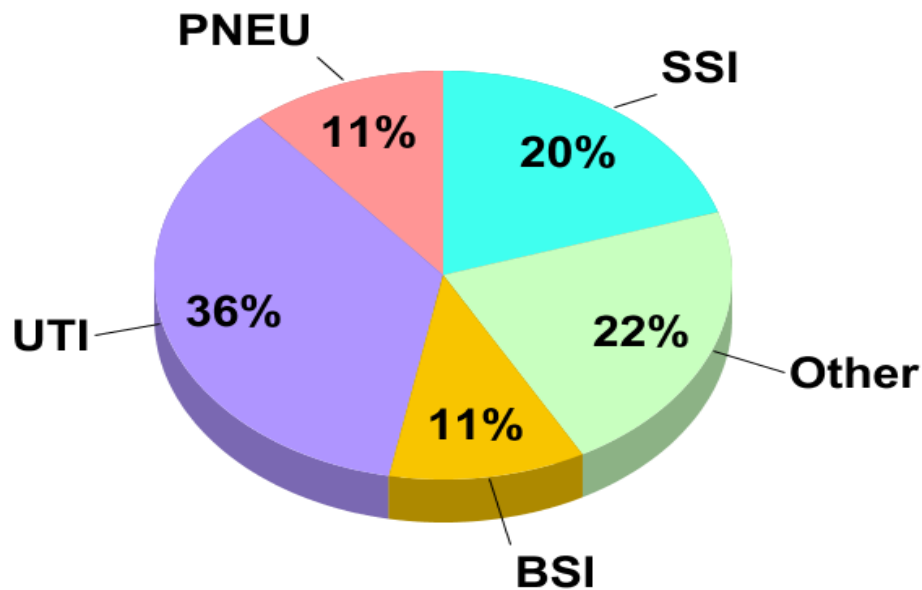


Figure 1: Types of infections most found in acute care hospitals (United State of America). Source: (Greene, James and Oriola, 2008)

The Center for Disease Control also reports that the most common pathogens causing CAUTI was "*Escherichia coli* (21.4%), *Candida* (21.0%), *Enterococcus* (14.9%), *Pseudomonas aeruginosa* (10.0%), *Klebsiella pneumoniae* (7.7%), and *Enterobacter* (4.1%) and *Staphylococcus spp*" (Gould *et al.*, 2010, p. 24; Lewis *et al.*, 2013, p. 744) . Some pathogens in UTI are contracted from the patient's healthy and perianal flora, as the use of a urinary catheter will allow pathogens to enter the urinary tract (Susan *et al.*, 2010, p. 3); then it is better to perform periurethral routine hygiene during daily bathing or showering (Gould *et al.*, 2010, p. 13).

The clinical diagnosis of CAUTI include symptoms such as fever, malaise, nausea and vomiting, pain in the flank area or cost vertebral angle (CVA) tenderness, hematuria, pain with urination or dysuria, pelvic pain and discomfort, frequent urination, and in severe cases an altered mental status, confusion (especially in elderly), and lethargy with no other cause (Hooton *et al.*, 2010). In one study conducted in Western Pennsylvania; fever was the most frequent signs (58.82%) followed by dysuria (4.90%), frequency (3.92%), urgency (3.92%), and burning (0.98%); but those signs were noted in a few of the patients that did not have even catheters at the time of urine collection (Bond, 2014, p. 25).

In health care facilities especially ICU, the patient has many invasive lines and tubes so that it may be difficult to determine which one is the source of infection without making the patient pay for swab screening. Then, note that those signs may be only attributed to CAUTI if they cannot be associated to other infections after analysis (Bond, 2014, p. 5).

The microorganisms that infect the UT in patients with an indwelling urinary catheter may be external, from contaminated hands of healthcare provider during catheter insertion, or manipulation of the collecting system, or internal from the urinary meatus, the rectum or vaginal infections (Nicolle, 2014, p. 4). Once asepsis is not respected, bacteria may enter the urinary tract by the external surface or internal lumen of the catheter where colonization of the catheter occurs, and a biofilm formation occurs (Figure 2). This biofilm consists of a complex structure comprised of bacteria, host cells, and cellular products. Bacteria in the biofilm may be resistant to antimicrobial treatment which in turn causes a more complicated or chronic (Kristi Felix, Mary Jo Bellush, 2014, p. 8).

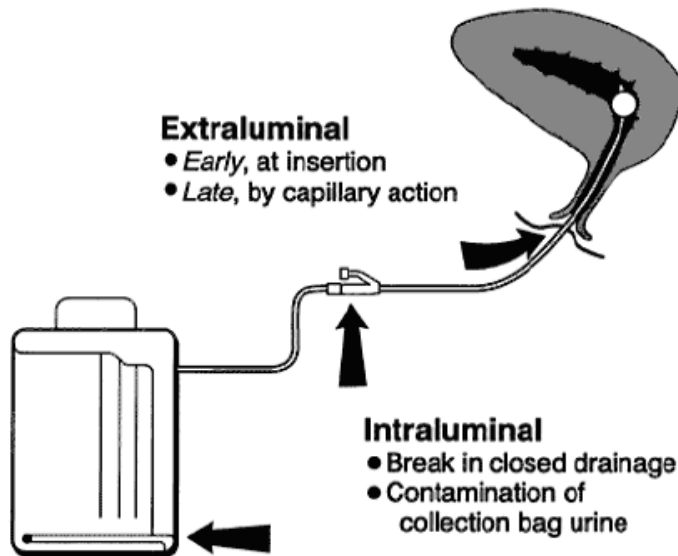


Figure 2: Route of entry of bacteria in urinary tract; Source: Greene, James and Oriola, (2008)

Many patients with a catheter inserted as part of their routine nursing or medical care are at high risk of acquiring a catheter associated urinary tract infection (CAUTI) and the risk is linked to the method and duration of catheterization, as well as the quality of catheter care and patient susceptibility (Bayliss and Houghton, 2014, p. 4).

2.2.2. Urinary catheterization.

The National Health Safety Network define the indwelling urinary catheter or Foley catheter as a hollow tube inserted in the urinary bladder via the urethra and connected to a drainage bag to drain urine (Jessica Lynn, 2015, p. 5). Urinary catheterization is a procedure that must be performed under aseptic technique with sterile equipment by qualified nursing staff otherwise it carries a risk of causing urinary tract infection. The procedure consist of inserting a catheter into the urinary bladder via the urethra or a suprapubic catheter through the fore abdominal wall into the bladder (Herter and Kazer, 2010, p. 342). The catheter is maintained in place by a retention balloon ensuring a closed drainage system which help in infection prevention.

Methods of CAUTI prevention have been researched with attention to three key components: catheter insertion, maintenance or care, and removal or prevention of introduction (Figure 3). The best way of CAUTIs prevention would be to avoid the use of a urinary catheter at all. Unfortunately, and at times impossible, attention should be focused on different issues to reduce

catheter-related urinary tract infections. Simple nursing procedures such as maintaining a closed catheter system, implementing evidenced based urinary catheter care, maintain unobstructed urine flow, and minimizing the duration of catheterization (Labib and Spasojevic, 2013, p. 2) are concerned.

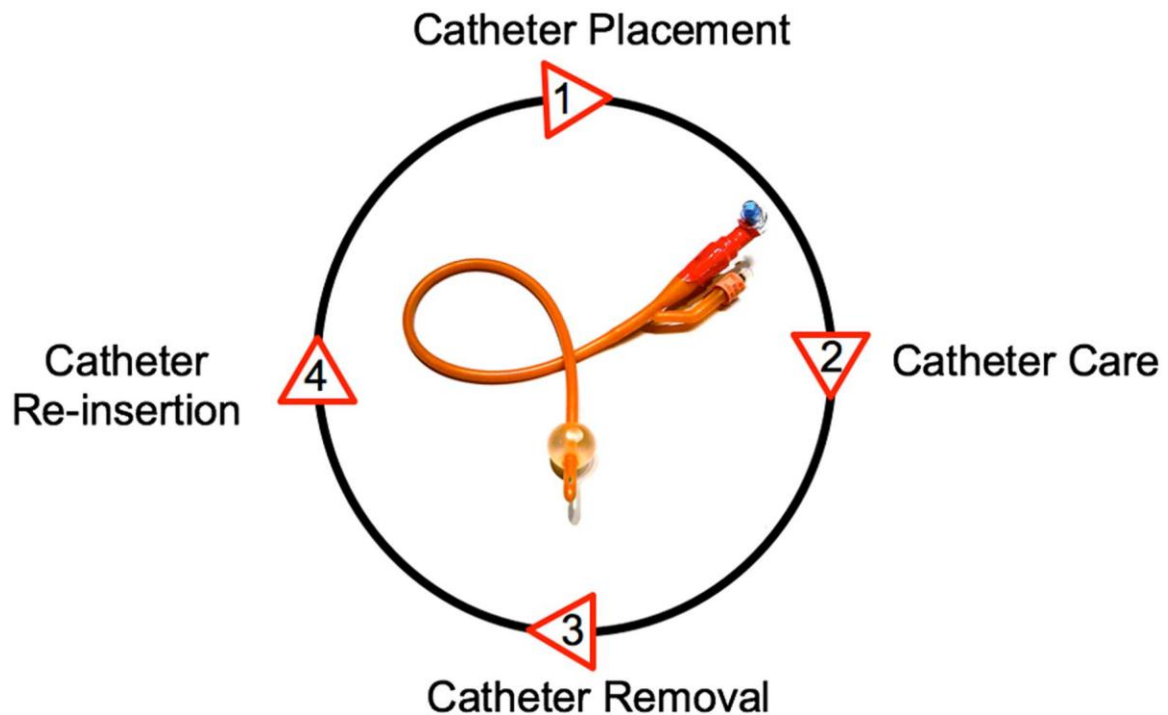


Figure 3: Four stages of urinary catheter as far as CAUTI prevention is concerned,

Source: (Meddings et al., 2013)

2.2.3. Appropriate and inappropriate indications of urinary catheter.

Healthcare institutions must integrate the evidenced based care regimes into the nurse's daily activities including the bedside care providers, nursing managers and even physicians to be able to manage and prevent CAUTI. Those steps are appropriate urinary catheter use, proper catheter insertion and maintenance and adequate catheter removal as soon as the indication end up (HRET & AHA 2013 p.7). In addition to those steps, some of the following appropriate indications or CDC criteria for indwelling urethral catheter must be considered before urinary catheter insertion:

When the patient has urinary retention or bladder opening blockade

If the healthcare need correct measurements of urinary output in critically ill patients

In perioperative use for selected surgical procedures such as: In case of extended duration of surgery (catheters inserted for this reason should be removed in post-anesthesia care unit) or patients expected to receive large-volume infusions or diuretics during surgery and so there is a need for intraoperative monitoring of urine output.

To help in the healing of open sacral or perianal wounds in incontinent patients to prevent worsening impairment of skin integrity.

When the patient requires prolonged immobilization (in case of thoracic or lumbar spine and multiple traumatic injuries such as pelvic fractures).

To ensure patient comfort for end-of-life care (Gould *et al.*, 2010)

Beside the appropriate indications for a urinary catheter, there are also some contraindications or inappropriate indications in which it is not necessary to use IUC to provide such kind of care:

Urine output monitoring that can be measured using other ways than indwelling urinary catheter like urinals or graduated bed pan.

Urinary incontinence without a sacral or perianal pressure sore is not necessarily controlled by IUC as the patient may be cooperative and able to eliminate using others materials like high-absorbency briefs or pads or if regular skin care can be provided to avoid its impairment.

Prolonged postoperative use: UC is usually removed as soon as possible after a surgical operation; except if there is essential repair of the urethra or neighboring structures or acute urinary retention per bladder scanner that require the catheter to stay in place. This is supported by CDC suggesting that every patient in post-operative with an indwelling catheter in place, is to be removed within 24 hours post-operative; unless if there is any other special indication to continue catheterization (Gould *et al.*, 2009, 2010, p. 321; Wald *et al.*, 2012).

2.2.4. Complications of urinary catheterization.

In different healthcare settings, it is common that the demand for urinary catheterization is to control urinary incontinence, avoiding the need to change bed linen, diapers, and reduce bedside work and care (Talaat *et al.*, 2010). Even though, catheterization is a common healthcare practice but it is associated to many risks including urethra or bladder trauma, catheter dislodgement, catheter blockage, urinary stones formation and bacterial introduction into the urinary system leading to urinary tract infections (Herter and Kazer, 2010, p. 344). Other complications encountered in the case of urinary catheterization are secondary nosocomial bloodstream infections, nosocomial bacteremia 17% originating from urinary system with an associated mortality of 10% (Lúcia *et al.*, 2016, p. 2). In Intensive Care Unit settings, urinary catheter was used at 79% and 74% in Istanbul during two consecutive years and then the higher the urinary catheter use the more increased the rate of UTI and it is the most common HCAI (30-40%) associated to catheter 80% of the cases (Kose *et al.*, 2016, p. 71).

2.3. Empirical literature.

The following section emphasized on the findings based on evidence concerning the elements of this study. This include research study on knowledge and attitude of nurses regarding catheter indications, insertion, maintenance, and removal, practice of nurses towards the prevention of CAUTI and factors influencing nurses' KAP towards CAUTI prevention.

2.3.1. Knowledge of nurses regarding catheter indications, insertion, maintenance, and removal.

A study was done by Jain, et al., (2015) to assess the knowledge and attitude of health care providers about catheter indications and CAUTI prevention methods in Indian. A prospective questionnaire-based survey was done in a period of 5 months. Among 180 health care personnel, only 154 (doctors = 49 and nurses = 105) participants completed a questionnaire and were included in the study. The study found that nursing staff had a low level of knowledge regarding catheter care, and issues regarding urinary catheter indications and the much needed preventive measures, but it is the healthcare providers' knowledge base which is lacking and needs improvement and education. This research by Jain also found a severe gap in the perception of the seriousness of CAUTI. Then, ongoing control of the incidence of CAUTI would also be

supportive to identify improvement witnessed as a result of educational and managerial interventions (Jain. et. al., 2015, p. 80). Similar results have been found by Oducado & Opina 2014 in another study conducted in Iloilo in Philippines that nurses had low level of knowledge and poor practices on infection control in the use of urethral catheters (Opina and Oducado, 2014, p. 99).

Urinary tract catheterization must be done only if there is a specific and adequate clinical indications, because it can lead to high risk of infection CAUTI included. This is so; nurses are required to have adequate knowledge regarding urinary catheter indications, maintenance and removal. The knowledge of using some basic preventive measures like hand hygiene, changing gloves before and after patient contact, adherence to a sterile and closed urinary drainage system has been shown to markedly reduce the risk of catheter associated infection acquisition (Jain *et al.*, 2015, p. 77). Although this may true, most nurses do not have a good knowledge and practice about infection control (Md. Shariful Islam, 2010, p. 69; Hamed Sarani and Nosratollah Masinaeinezhad, 2016, p. 196) and sometimes their practice is affected by the attitude and knowledge

Literature says that ICU nurse have the responsibility to avoid the insertion of unnecessary urinary catheter, manage and reduce the duration of catheterization, emptying the collecting bag regularly, maintaining a closed drainage system, ensure asepsis during urinary catheterization and always keeping the drainage bag below the level of the bladder. Hence, nurses are required to have knowledge about the prevention of urinary infections and continue to perform effective care for their patients using their knowledge (Weber *et al.*, 2011). Different studies have been done to assess the level of knowledge, included Kose and colleagues, who found that nurses have a low score concerning daily catheter care, cleaning the meatus, emptying the drainage bag before transfer or weekly changing of the drainage bag (Kose *et al.*, 2016).

However, a study conducted in Michigan revealed that nurses and healthcare workers possessed adequate knowledge of methods used to prevent CAUTI, such as hand washing before and after manipulating UC, as well as after patient contact, but they did not use universal precautions and hygiene in daily practice (Lona *et al.*, 2010).

In a descriptive cross sectional research study conducted in India the findings concluded that even though staff nurses possessed an adequate knowledge base regarding catheter care, there

still existed a significant gap in knowledge regarding nursing practices of infection control (Prasanna and M, 2015).

2.3.2. Attitude of nurses towards CAUTI prevention during catheter insertion, maintenance, and removal.

In different hospitals, many hospitalized patients receive urinary catheterization and nurses tend to forget the catheter in place even after the end of its proper indications and yet it is known that the incidence of CAUTI increase with the number of catheter days. Studies have shown that establishing single preventive measures such as catheter reminder for catheter removal after its indications to decrease the number of catheter days (Greene *et al.*, 2014, p. 2; Jain *et al.*, 2015, p. 76) can help in reducing CAUTI incidence. This infection is very frequent in non-ICU patients 78% as well as in ICU patients 28% (Lewis *et al.*, 2013, p. 746) while catheter utilization in the ICU 61% was greater than in the non-ICU 20% (Greene *et al.*, 2014). Be that as it may, Weber and colleagues find that more than 70% of urinary catheters are placed in the operating room (62%) or the emergency department (11%) of most healthcare institutions henceforth, they tend to remain in place for a long period therefore increasing the risk of developing CAUTI (Weber *et al.*, 2011, p. 1057).

Regarding the attitude of HCP towards CAUTI prevention; Jain et al, 2015 found that most of the HCP were suggesting the consideration of CAUTI as a high priority in hospitals and getting education regarding basic catheter care are all alternatives to help in preventing CAUTI (Jain *et al.*, 2015). However many healthcare professionals especially nurses are not aware of existing CDC guidelines for catheter indications and CAUTI prevention so that their interventions in reducing CAUTI is limited as they fail to make daily review of catheter indications and the argument they may give to the physicians to limit the use of IUC is not evidence based (Kaushal, 2015, p. 282).

2.3.4. The practice of nurses towards the use of urinary catheter insertion, maintenance and removal 2009 CDC guidelines.

Ensuring that nurses engage in safe practices with regards to catheter care and CAUTI prevention requires that they have appropriate knowledge, skills and practice to meet standards. In health care setting, the transmission of infectious agents requires the interaction of three agents; a reservoir, susceptible host including health care workers and visitors, and a mode of transmission (Fashafsheh *et al.*, 2015). Nosocomial infections including CAUTI are transmitted via the interrelationship of those agents even though using simple and basic preventive measures (Opina and Oducado, 2014, p. 93). Hand washing is one of the preventive measures for the decrease of different infections CAUTI included, however nurses are always accused to demonstrate a poor level of respect for hygiene rules during the catheterization of patients in the hospital in Zinvie (Dognon *et al.*, 2016, p. 7).

Patients in ICU tend to have extended time of hospitalization depending on their diseases state and they are always catheterized to allow close monitoring of fluids status, however; it is known that the urinary catheter duration is a main factor for CAUTI. The most common reasons for prolonged urinary catheterization include: poor patient mobility, urinary incontinence, or lack of prioritization due to nurse's workload and minimal understanding of the risks of indwelling urinary catheters (Oman *et al.*, 2011, p. 2).

Another key point illustrated by Jain, et al., (2015) was that nurses lacked knowledge regarding CAUTI including the practice of simple preventive measures like maintain the urinary drainage bag under the level of the bladder and emptying the drainage bag regularly. Among 154 nurses included in this 2015 study; 119 (77%) and 68 (45%) of them respectively, thought that regular bacteriological monitoring and prophylactic antimicrobials for three days was useful for prevention of CAUTI. However, bacterial surveillance and prophylactic antimicrobial caused increased treatment costs for the patients and overloaded the laboratories and increased the number of antibiotic resistance bacteria (Hanan and Nasr, 2015, p. 118; Jain *et al.*, 2015).

A comprehensive working knowledge regarding prioritizing the care of the urinary catheters in their daily practices is a foundational need for bedside nursing. Even though nurses lacked knowledge on CAUTI precautionary measures, nurses were found to have better overall care

practices compared physician, where hand washing was concerned (Opina and Oducado, 2014; Fashafsheh *et al.*, 2015, p. 88; Jain *et al.*, 2015, p. 79).

In sub-Saharan countries, catheters are changed every month and this in an unsterile environment with poor quality of catheters and lack of urine bag. On the other hand, note that the benefit of catheterization is considered to be greater than the risk of getting complications by some healthcare providers. Thus, one of the practice used for CAUTI prevention are advising patients to take care of perineal hygiene and bladder wash out (Labib and Spasojevic, 2013, p. 3). The most common practice measure done by nurses in different health care settings to prevent CAUTI are hand washing and wearing gloves before the insertion, during catheter care and removal. Although this may be true, Dougnon et al revealed that the hygiene practices observed during the operated patients are poor, and so bacteria can easily colonize the urinary tract via cross-contaminations from various sources, including non-washed hands, the non-disinfected surfaces of patients, and contaminated environment of the working place. Furthermore, the assessment of hygiene practices before patients' catheterization as well as the maintenance of catheters in the different concerned services revealed that most health workers do not observe good hygiene practices (Dougnon *et al.*, 2016, pp. 6–7). However a study which intended to assess the knowledge of recommended urinary catheter care practices among 356 healthcare workers (HCWs) in Southeast Michigan; conducted by Lona and colleagues in 2010, revealed that HCW knew that hand washing is among infection preventive measures and had to be performed after each catheter manipulation; unfortunately they were not aware that hand washing after each patient contact was necessary (Lona *et al.*, 2010).

2.3.5. Factors and barriers influencing nurses' KAP towards the prevention of CAUTI.

Anupriya et al 2016 stated that in ICU there are 20–25% of all reported HCAI and severely ill patients are the most exposed to nosocomial infections due to their weakened immune system, altered protective barriers and long stay in an environment with many opportunities for cross transmission. They added that most of infections acquired in ICU are due to the use of many invasive devices like central venous line, intubation tube in mechanical ventilation, nasogastric tube or urinary catheter. These leads to different infections that cause mortality and morbidity to patients such as catheter related blood stream infection, ventilator associated pneumonia, and

catheter associated urinary tract infection while 70% of them might be prevented if healthcare workers practicing simple preventives measures like asepsis (Anupriya *et al.*, 2016, pp. 400–401)

Literature review on the topic of CAUTI prevention; in a study titled Strategies to Prevent CAUTI in Acute Care Hospitals (Lynn, 2015) revealed that “the most important methods for preventing CAUTI were prevention of the random insertion of catheters and diminishing the duration of catheter use”. The risk of developing an infection related to catheter use increases by three to seven percent daily when the catheter remained in place (Jessica Lynn, 2015). Similarly the same results have been confirmed by Talaat et al, 2010; that the increased duration of catheterization for more than 6 days, has been associated to CAUTI infection (Talaat *et al.*, 2010, p. 226). However, even though many nurses report that patients had an indwelling urinary catheter (IUC) at every shift change, they are not aware of the cumulative number of days patients had catheters, thus increasing the number of days with a UC and risk for infection (Martin, 2012, p. 36). In addition to this, urinary catheterization is considered by some healthcare workers as having greater benefit to the patient than the risk of getting complications related to CAUTI (Labib and Spasojevic, 2013, p. 3)

Some of the risk factors associated with the occurrence of CAUTI mentioned in different literature are duration of catheterization, female gender, advanced age (Talaat *et al.*, 2010, p. 225), anatomical or functional abnormalities of the urinary tract, insertion of the catheter outside the operating theatre, diabetes mellitus and poor catheterization technique or breaks in aseptic technique (NIPC), 2016, p. 185). This is similar to the findings of CDC and HIPAC in their publications on Guideline for prevention of CAUTI 2009 (Gould *et al.*, 2009, p. 35, 2010)

In African health settings such as in Zambia factors other than duration of catheterization may be associated to CAUTI like performing catheterization in unsterile environment, use of unsuitable catheters for long term catheterization (Latex catheters changed on monthly basis), use of homemade drainage systems, immunocompromized (HIV, diabetes and malnutrition) patient catheterization is also of higher risk for CAUTI (Labib and Spasojevic, 2013, p. 2).

Research have proven that the use of some catheters especially inserting the smallest urinary catheter using aseptic techniques can reduce the incidence of CAUTI (Talaat *et al.*, 2010), unfortunately in developing countries the lack of appropriate catheters is more common (Labib

and Spasojevic, 2013, p. 3; Meddings *et al.*, 2013). In addition to that larger catheter also may be used for short term management of hematuria for example (Talaat *et al.*, 2010).

Literature says that the choice of catheter type and catheter material may be an important determinant in the development of subsequent catheter-related infection; then Polytetrauroethylene (Teflon) and polyurethane catheters have been associated with fewer infections than other catheters made of polyvinyl chloride or polyethylene. Multi-lumen catheters are good for simultaneous administration of parenteral nutrition, fluids and medications plus hemodynamic monitoring among critically ill patients; but they are associated with a high risk of infection (Loveday *et al.*, 2014, pp. S41-42) . Suprapubic catheter are alternative to the urethral catheter and is inserted into the bladder surgically (V.Geng, H.Cobussen-Boekhorst, J.Farrell, M.Gea-Sanchez, I. Pearce, T. Schwennesen, S. Vahr, 2012).

2.4. Theoretical/conceptual framework.

The theoretical framework is the united set of defined thoughts and interactive statements that can be used to describe, clarify, forecast or control phenomenon. It is the theoretical rationale needed for the development of a hypothesis. According to Rocco and colleague 2009, the "goal of a conceptual framework is to categorize and describe concepts relevant to the study and map relationships among them" (Rocco and Plakhotnik, 2009, p. 122).

Different literature review suggests the use of the Health Belief Model constructs to studies that explore health behaviors like health prevention and promotion, and agreement with recommended guidelines for infection control so that it provide the framework for this study. The focus of the HBM is that a health behavior may be determined by personal interpretations or opinions about a disease, its adverse outcomes and the strategies available to decrease its occurrence (Tarkang & Zotor 2015, p.2).

Taylor, et. al., 2007, explained that "the model tries to explain health actions through the interaction of three sets of beliefs: individual perceptions, modifying factors, and the likelihood of action." This means that based on knowledge, an individual knows that there is enough reason to make a health concern relevant (perceived susceptibility and severity), so that the person understands that he or she may be vulnerable to a disease or an adverse health outcome (Perceived

threat or seriousness). In addition to that individuals must realize that behavior changes can be beneficial and the advantages of those changes will compensate any costs of doing so (Perceived benefits and barriers) (Taylor *et al.*, 2007).

2.4.1. Constructs of the model.

The Health Belief Model incorporates a concept of perceived susceptibility; the subjective perception of the risk for an individual may be related to a state or a condition. Then if the person knows the dangers of developing a life-threatening condition, he/she may, in fact, take steps to prevent this condition from occurring. In the context of this study, if nurses knew the seriousness and the complications CAUTI they would take all possible measures to prevent its occurrence.

Perceived severity is the subjective evaluation of the seriousness of the consequences associated with a state or a condition. The disease severity is derived from knowledge, but it may also develop from personal beliefs about the difficulties that a disease may create or how the disease may effect on his or her life.

The perceived threat is the combination of the personally identified severity and susceptibility to an illness or disease. This perceived threat might become motivational for an individual to avoid a particular outcome such as an illness or disease.

Cues to action are reminders to take actions consistent with an intention. These activities can range from advertising to personal communications from health professionals, family members, and peers. These cues may encourage a person to change an ongoing or past negative behavior.

Modifying factors are age, race, ethnicity (cultural identity), religion, education and income.

Perceived benefits are subjectively understood as real assets when taking a health action to balance a health condition. A perceived belief will be a positive influence on the individual's overall 'health motivation.' This theory is based on people's judgment of the importance of the new behavior in reducing the risk of acquiring a disease or illness.

Perceived barriers will negatively influence interventions or present barriers to health promotion and change.

Self-efficacy added to the HBM in the 1970s is an act or task specific to building and supporting self-confidence, for example, believing in someone's capacity to implement a given behavior.

Expectations are the result of perceived benefits or barriers, and self-efficacy. Expectations are indicative of the extent to which the individual will try to take a given action (Taylor *et al.*, 2007).

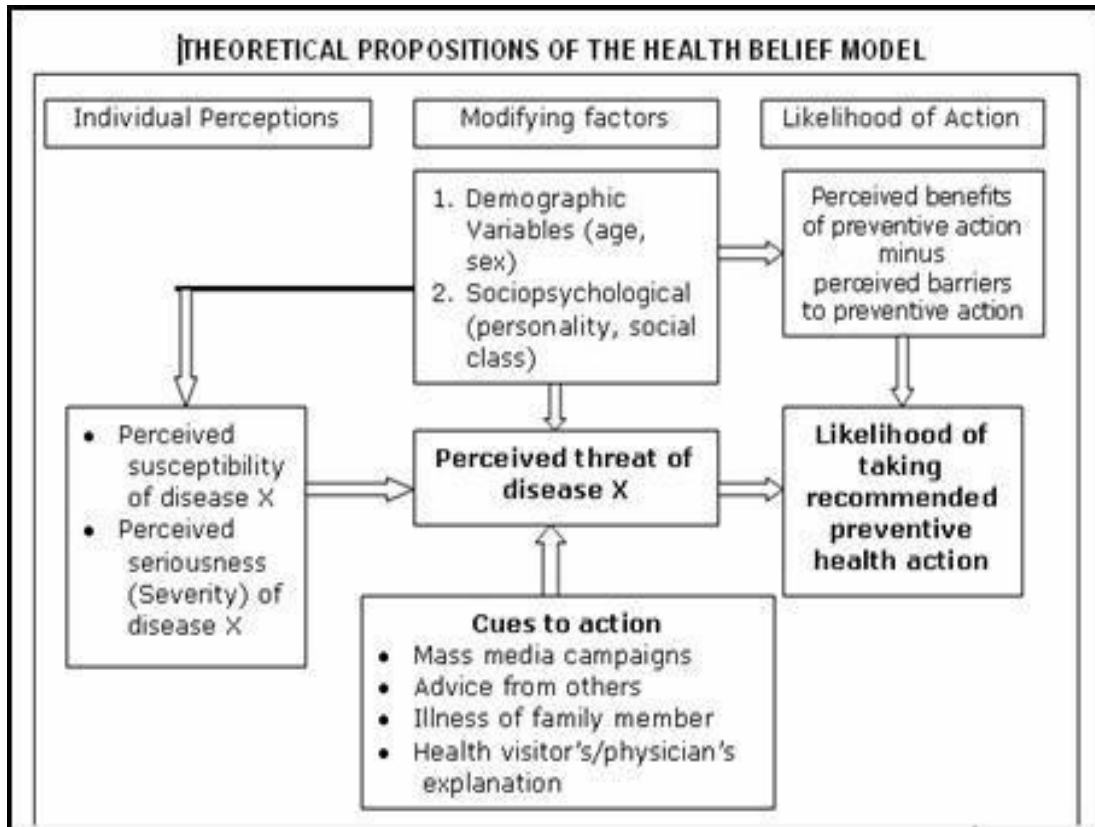


Figure 4: Health Belief Model. Source: Evan Burke; retrieved on 15 August 2016

One of the HBM's assumptions is that a person will take preventative action if that person is aware that by taking a proposed action, the adverse health state will be escaped. This model was used for the current study to help participants (nurses) to be aware of severity of CAUTI (perceived seriousness) to take preventive measures or to sustain already existing measures in their respective healthcare facilities to prevent the infection.

Nurses perceived the benefits of respecting the infection control measures such avoiding unnecessary catheterization among patients and timely catheter removal, performing necessary hand washing procedures before and after each nursing action, emptying collecting bag regularly,

and keep collecting bag under the level of the bladder in order to prevent CAUTI (Tarkang and Zotor, 2015, p. 2). Then it is necessary that the health care workers (HCW) has adequate knowledge regarding the appropriate indications for inserting urinary catheters as the most significant way for decreasing the frequency of CAUTI is limiting catheter use. While assessing the knowledge of doctors and nurses regarding indication for catheterization to help manage the problem of inappropriate catheterization and CAUTI, Jain et al (2015) found that the “overall experience of physicians was superior to that of nurses in detecting the indications for catheterization as physicians make the final determination on the need for a urinary catheter based on protocol” (Jain, et. al. 2015). Healthcare workers have to understand and keep in mind that CAUTI is a serious disease that may lead to different life threatening problems and then try to control and prevent it.

2.4.2. Adaptation of the HBM to CAUTI prevention.

In this study; individual perceptions are participant’s knowledge and beliefs on patient’s risk to get CAUTI and its seriousness or related complications.

After individual’s perceptions, some of the changing factors like demographic, structural variables and socio-psychological also will affect an individual’s opinions and influence health related behaviors. In addition to this, education can affect a person’s thoughts of susceptibility and severity of suffering negative effects resulting from CAUTI and one’s perceived benefits to be retrieved from avoiding urinary catheter as well as all barriers to the respect of 2009 CDC guidelines for urinary catheterization and CAUTI prevention.

In the present study these variables affecting the likelihood of action refer to nurses’ perceived benefits of using others catheter alternatives like condom catheter or urinal against the perceived barriers to taking action like poor knowledge about urinary catheterization indications.

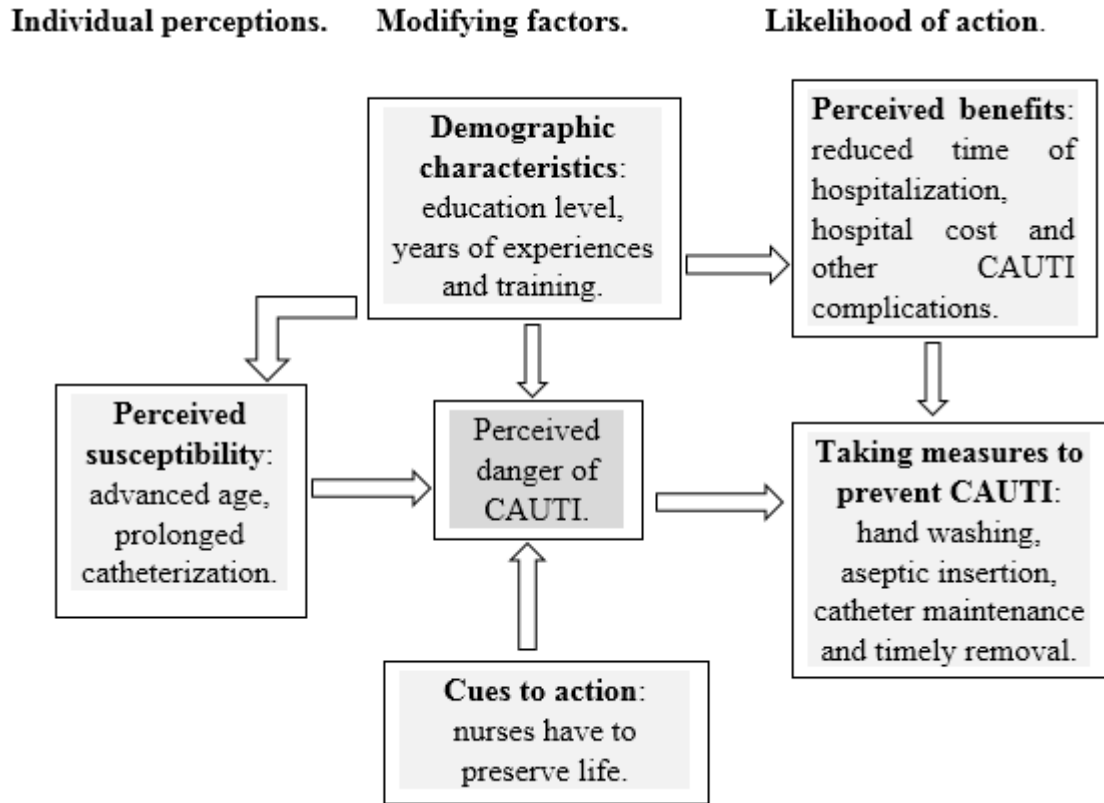


Figure 5: Adaptation of the HBM in this research study

Conclusion

The Review of Literature outlined the gaps in knowledge surrounding the appropriate and inappropriate indications of IUCs in different hospitals as well as proper technique of insertion.

CHAPTER 3. METHODOLOGY

3.1.Introduction

The following chapter explains in details the choice of research methods, the study design and techniques used to collect and analyze the data. It briefly described the study settings, study population, study design, sample size, data collection tool, reliability and validity, data management and dissemination and ethical consideration. Furthermore, selection criteria, study instrument, piloting, response rate, data collection and analysis process and finally the limitation of the study.

3.2. Research design.

This research study used a descriptive cross-sectional design consisting of a self-administered questionnaire and a checklist to collect data on nurses' knowledge, attitude and practice towards CAUTI prevention. In a descriptive study a researcher observed, described, and documented various aspects of an event (Sousa, et al. 2007); so that it was helpful to achieve a vision into what is happening in practice of nurses to prevent CAUTI.

3.3. Research approach

The approach helps the investigator to have important information by using new information or maintaining the existing ones (Ingham-Broomfield, 2015). The current study used quantitative approach which helps to evaluate and study the question of research, describe the phenomena, test relationships, study variables causes and effects as well as exploring the success of interventions (Sousa et al 2007). Then, it will be used to gain a vision into what is happening in practice of nurses to prevent CAUTI

3.4. Research setting

A study setting or study area is the area in which the research was done. In this case, the current study was conducted in two referral hospitals in Kigali including University Teaching Hospital of Kigali (UTHK) and King Faisal Hospital (KFH). UTHK, is located in the Centre of Kigali city in the District of Nyarugenge and Nyarugenge Sector. It is the main public health institution in the country that was built in 1918 and serving people from all district hospitals as a referral hospital. There are different departments in this hospital counting intensive care unit which

started in 1995 with 32 nurses and 14 beds. The other setting included in the study is King Faisal hospital located in Gasabo District, Kacyiru Sector and cell. The hospital has different clinical services including Intensive Care Unit (ICU) where critically ill patients are closely monitored by 28 nurses. The unit is operating since 2006 (P Munyiginya; P Brysiewicz; J Mill, 2016).

3.5. Study population.

All nurses working in ICU of two selected referral hospitals in Kigali were included in the population of interest. ICU nurses were included in this study because they are in the first line of defense in preventing bacterial colonization of the genital-urinary tract during routine nursing care delivered to patients like urinary catheterization, bed bath, and urine sample collection. Nurses also spend much time of their working hours with patients compared to other health care workers. The total number of nurses who were working in ICU of King Faisal Hospital and University Teaching Hospital of Kigali was 68 nurses; this include 33 ICU nurses at UTHK and 35 ICU nurses at KFH.

3.5.1. Inclusion criteria

Having a minimum of 6 months working experience in ICU.

Working as full time nurses in ICU

3.5.2. Exclusion criteria

ICU nurses who did not consent to participate in the study

All nurses who were not at work during the time of data collection like those on leave.

3.6. Sampling methods

3.6.1. Sampling procedure or strategy

Sampling is the process of selecting the portion or subset of the designated population to represent the entire population (Ruth Endacott, 2007). In this study total population sampling was used, that is one of purposeful sampling method used when the population to be studied is small and used as a whole without selecting some units of it was used. In this case all the participants that met the criteria were included in the study; this helped the researcher's concentration on people with specific characteristics (ICU nurses only) who were better to assist

with the relevant study and this sampling method is more commonly used when the number of cases to be studied is relatively small (Etikan, Musa and Alkassim, 2016).

3.6.2. Sample size

All registered nurses working in ICUs of the referral hospitals in Kigali (CHUK and KFH) that fulfilled the inclusion criteria and who were available during the whole period of data collection, were included in the study. All nurses working in the two ICUs were considered due to small number of the survey population. Then among 68 nurses who were working in ICU of the two selected hospitals at the time of data collection, only 53 filled well and returned back the questionnaire. Therefore only 15 nurses were missing either due to annual leave, sick leave or other personal reasons. One refused to consent and others nurses (7) were shifted to other unit during the reform that currently took place in one study setting.

3.7. Data collection

3.7.1. Data collection tool

A structured questionnaire and a checklist were used as instruments to collect data. The study questionnaire (Annex B) was made of 4 sections including the first section dealing with demographic characteristics of respondents including age, gender, education level, years of experience and training on infection control. The second section of 10 questions related to catheter indications, maintenance, and care and removal time, risk factors for CAUTI and complications of CAUTI to assess nurses' knowledge towards CAUTI prevention. The third section was made of 8 items to evaluate nurses' attitude towards CAUTI prevention while the fourth section dealt with an observational checklist made of 20 individual items to assess the practice of nurses towards CAUTI prevention. In knowledge questionnaire each correct answer was scored 1 and each wrong answer was scored 0. The attitude subsection was comprised of 8 items measuring perceptions and actions of nurses towards the prevention of CAUTI. The items were rated on 5-point Likert scale from 1 to 5 ((Strongly Disagree=1, Disagree=2, neither agree nor disagree=3, Agree=4, Strongly Agree= 5). The total score ranged from 1 to 40 and the individual score for each section were calculated into percentage. Lastly, the practice part was made of two sections including the self-reported practice (Catheter indications, hand hygiene,

catheter insertion and removal) and the observational part (catheter maintenance). The investigator observed each respondent for each performed action and the participants were scored 1 (yes) while the action was done or not applied was scored 0 (No).

3.7.2. Validity and Reliability of the tool.

The tools used was prepared based on WHO standard precaution of infection control and Centers for Disease Control (CDC, 2009) guidelines for the indication of catheterization and measures for prevention of CAUTI. Also the questionnaire developed and used by Manisha Jain, Vinita Dogra, Bibhabati Mishra, Archana Thakur and Poonam Sood Looma (2015, pp. 78-80) in the study entitled “Knowledge and attitude of doctors and nurses regarding indication for catheterization and prevention of catheter associated urinary tract infection in a tertiary care hospital” was adopted and modified based on literature. The permission to use the tool of this study was obtained from the author (Annex G). The content validity is the degree to which a tool measures what it is supposed to measure. Validity of the questionnaire and checklist was determined by matching the questions, study objectives and constructs of the conceptual framework (Table 1). In addition to this the content of the questionnaire was given to different experts in critical care who agreed that the questionnaire is suitable to be used for the current study.

Lastly, the content of the questionnaire was given independently to my colleagues who currently work in ICU for evaluating the simplicity of questions, clarity of language, accuracy, and adequacy of questions for the purpose of the study. Then the questions were refined to facilitate ease of answering questions during data collection period and confirmation of the reliability of the tool, thus decreasing data collection errors. To test the reliability of the questionnaire, Cronbach alpha was calculated after a test-retest by administering the questionnaire to 5 participants and the value was 0.76 that is in acceptable range.

Table 1: Content validity relating to study objectives, conceptual framework and items of the questionnaire.

Objectives	Conceptual framework HBM	Items of questionnaire
1. To assess level of knowledge of nurses regarding catheter insertion, maintenance, and removal	Modifying factors: level of education, years of experience and training on infection control.	To be deduced from the findings Section A
2. To evaluate the attitude of nurses towards catheter insertion, maintenance and removal to prevent CAUTI	Perceived severity Perceived threat Perceived benefits	Section B and C
3. To assess the level of practice of nurses towards the use of urinary catheter insertion, maintenance and removal 2009 CDC guidelines	Cues to action	Section B and D
4. To identify the factors influencing nurses' KAP towards the prevention of CAUTI.	Perceived benefits	Section A and others will be retrieved from the findings.

3.7.3. Data collection procedure

After obtaining the ethical clearance from the IRB/CMHS and the permission from the study settings to conduct the study, the investigator first introduced and explained the need and the purpose of the study to the unit managers. Afterwards the researcher was given the permission to meet staff nurses to continue with data collection. Next, the participants who agreed to participate in the study were informed of the aim of the study and explained the process of data collection, then after they were requested to sign a consent form. Data were collected using a questionnaire to evaluate the knowledge and attitudes of nurses while manipulating the urinary catheter.

The questionnaire was prepared in English and translated in French to facilitate participants who were French speakers only. The questionnaire was administered to ICU nurses from March 31st to April, 13th 2017 from 7 am to 5pm; Monday to Wednesday including weekend days sometimes. The study covered demographic details of the respondents including age, sex, qualification, designation, years of experience in health care setup and area of posting. The contents of the questionnaire intended to assess the level of knowledge of the health care professionals regarding indication for catheter use and the methods of preventing CAUTI in a catheterized patient including wearing gloves, hand washing, maintaining a sterile barrier, and using a no touch insertion technique. The questionnaire also included questions to assess the attitude level of nurses and a checklist to assess their practice regarding CAUTI prevention. The researcher was available during the filling of the questionnaire to explain and answer to any question from the respondents. To evaluate the practice of nurses towards CAUTI prevention, the researcher explained to participants that they have to be observed while performing any steps of catheter care and consented; but the exact time was not specified to avoid information bias.

3.8. Data analysis

Study data were captured via a computer software Statistical Package for Social Sciences (IBM SPSS statistic 23) and analyzed using descriptive and inferential statistics. A descriptive component such as central tendency measures, (mean, and median), standard deviation, and frequency distribution were used to present demographic data. Descriptive and inferential statistics like chi-square and Fischer exact test were used for the data analysis and testing relationship among selected variables (demographic characteristics and knowledge, attitude and practice), and data were presented in the form of tables, graphs, and diagrams. Pearson chi-square was used when expected frequency for each cell in the association was greater than five while Fisher's exact test was used when each cell in the association of variables had expected frequency equal or less than five.

3.9. Data management and storage.

In this study, data were collected using questionnaire and checklists; after data collection papers were kept in a well closed cupboard and the key was kept with the researcher herself. The data from the study was coded, transcribed and stored in a password protected personal computer and none is allowed their access.

3.10 .Ethical consideration

Initially ethical clearance was obtained from University of Rwanda, College of Medicine and Health Sciences Institutional Review Board (UR/CMHS/IRB). Then the letter was taken to University Teaching Hospital of Kigali and King Faisal Hospital Ethic Research Committee to get the permission to conduct the study in those hospitals. These two hospitals approved the proposal and the approval letter provided was submitted to the unit managers to be allowed to start the data collection from nurses of the unit. The purpose and nature of the study was explained to the nurse participants and then a written informed consent (Annex A) was obtained from all of them. Each ICU nurse was free to participate or not in the study and had the right to withdraw from it at any time without any pursuit. Also, nurses were informed that obtained data were only to be used for the research purpose and not for their assessment (Annex A). Confidentiality and anonymity of the subjects was maintained by keeping nameless the questionnaires and by coding all data and keeping them in a password protected computer.

3.11. Data dissemination

The study results will be disseminated via the online publication of a copy of known national and international journals; others will be available in the university library. All participants who were involved in the research will be given a report of the findings and asked to comment on them. The report will include the information concerning the prevention of CAUTI in their settings and the challenges they encounter. In addition to that, study results will be submitted to the concerned hospitals for them to improve patient care and empower nurses with in services training regarding CAUTI prevention. I plan to design and present these research findings at a national and international conference.

3.12. Limitations and challenges

It was tough to know the prevalence of catheter-associated urinary tract infections (CAUTI) due to limited reporting in Rwandan hospitals and there is no known study done for the purpose of CAUTI problem. Another limitation was the generalisation of the results due to a low number of respondents and the use of questionnaires that may limit the reflection of nurses on their actual practices. Another issue is that the study sample may not be large to be generalized in the whole

country. While the study was going on there have been a reform in one of the study settings and some nurses have been shifted to other units, the sample size was reduced.

3.13. Conclusion

The above chapter was presenting the study methodology which was explained in details. These include research approach used for the study, research design, study setting, sample size and sampling techniques, development and description of tool, pilot study, data collection procedure and plan of analysis for this study. Also the reliability and validity of the tool were explained, ethical consideration, data management, data dissemination, limitations and challenges were defined.

CHAP 4. RESULTS PRESENTATIONS AND INTERPRETATIONS.

4.1. Introduction

The current cross-sectional descriptive study investigated the knowledge, attitude and practice of nurses with regards to CAUTI prevention.

In the next chapter the results retrieved from this study were presented and interpreted under the following headings: respondent's characteristics, knowledge of nurses towards catheter indications and CAUTI prevention, attitude of nurses towards catheter use and CAUTI prevention, practice of nurses towards Catheter indication and the prevention of CAUTI and factors influencing nurses' KAP towards the prevention of CAUTI. Descriptive statistics was done to interpret the demographic features including age, sex, level of education qualification, years of experience and training on infection control as well as analyzing participant responses. In contrast, inferential statistic was used to test any influence of demographic factors on nurses' KAP towards CAUTI prevention. Each questionnaire was analyzed distinctly for completeness. Frequencies and percentages related to the study findings were presented using tables, graph and charts.

4.2. Demographic data of participants

The number of ICU nurses at the time of the study in two referral hospitals in Kigali (King Faisal Hospital and University Teaching Hospital of Kigali) was 68. Only 53 participated in the study with 15 missing either due to annual leave, sick leave or other personal reasons, one refused to consent and others nurses (7) were shifted to other wards than ICU due to reform that have been done in one of the study setting , so the response rate was 86.8 % (N=53). The mean age of participants was 32.47 with a minimum and maximum age being respectively 22 and 46 years and standard deviation of 5.06. However the majority of them were from 30-39 years old 37 (69.6%) while 13 (24.5%) were from 20-29 and the remaining 3 (5.7%) were above 40 years old. Nurses with diploma level A1 in nursing occupied the largest part of nurses in the two ICU accounting for 43 (81.1%); whereas 9 (17%) were holding a bachelors' degree in nursing and only 1 (1.9%) was an associate nurse.

Nurses with less than 5 years of experience were 29 (54.7%), occupying the majority category, followed by those with 6- 10 years of experience 19 (35.9%) and the remaining percentage of 5 (9.4%) having 11-15 years of experience in nursing profession. In addition to these findings, the majority of respondents were female 35 (66%) and most of the participants 42 (79.2%) have a training on infection control practices. The figure 6 and table 2 summarize all demographic characteristics of respondents in terms of frequencies and percentages.

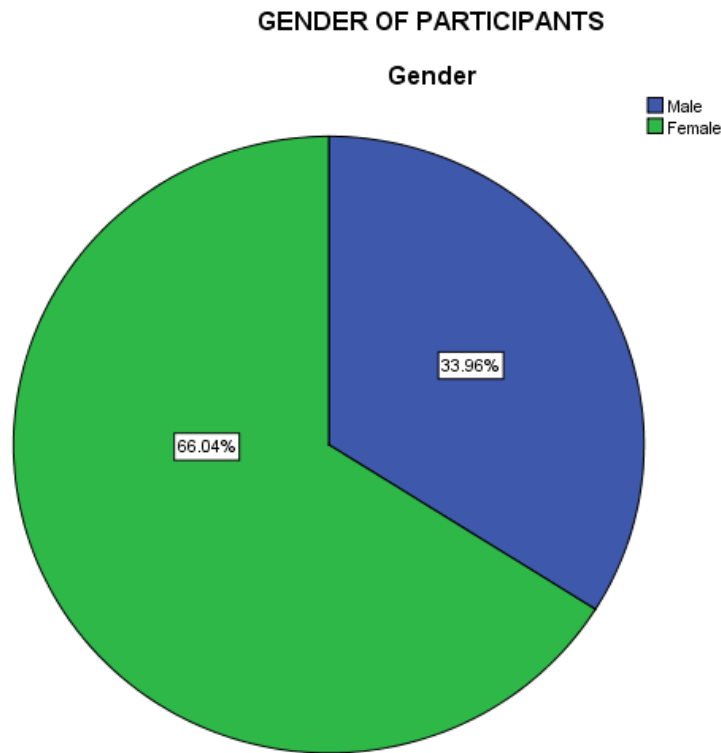


Figure 6: Gender of participants (N=53)

Table 2: Sociodemographic characteristics of participants (N=53)

Variables	Frequency (Percentage)
Age	
20-29 years	13 (24.5%)
30-39 years	37 (69.8%)
>40 years	3 (5.7%)

Level of education		
Associate Nurse (A2)	1	(1.9%)
Diploma level (A1)	43	(81.1%)
Bachelor's Degree	9	(17%)
Working experience		
Less than 1 year	8	(15.1%)
1 to 5 years	21	(39.6%)
5 to 10 years	19	(35.8%)
More than 10 years	5	(9.4%)
Training on infection control		
Yes	42	(79.2%)
No	11	(20.8%)

4.3. Knowledge of ICU nurses towards catheter indications and CAUTI prevention (N=53)

To assess knowledge among ICU nurses about catheter indications and CAUTI prevention, ten multiple choices questions (10 MCQs) were administered; where only one assertion was correct and given a score of 1 mark if chosen and 0 if not chosen. The knowledge questions were summarized into 5 items based on CDC 2009 recommendations for catheter indications and CAUTI prevention including a) proper technique for urinary catheter insertion (question 3 and 9); b) proper technique for urinary catheter maintenance (question 5 and 6); c) appropriate urinary catheter use (question 1, 2 and 4); d) risk factors for CAUTI (question 7 and 8) and e) complications of CAUTI (question 10). The overall knowledge of nurses was 64.52% indicating that nurses' knowledge towards CAUTI prevention was at low level. This overall knowledge score was obtained by computing all the correct responses percentage (total percentage sum =645.2) divided by the total number of questions.

Then, through this study only one question concerning catheter insertion scored (100%) as all respondents know that urinary catheter should be inserted using aseptic techniques with sterile equipment while only 43.4% know that urinary catheter maintenance is not changing drainage

bags routinely or at fixed intervals once the catheter is inserted. Additionally, of course only 62.3% know the appropriate indications of UC but 47.2% of them did not know the inappropriate indications of UC. Concerning the identification of CAUTI complications, 36 (67.9%) respondents know correctly that hypertension is not among CAUTI complications. On the other hand 27 (50.9%) know that CDC guidelines for catheter indications and CAUTI prevention advised that the catheter should be removed within 24 hours in post-operative patients.

Regarding the distribution of respondents based on the correct answers on knowledge questions, the most frequent correct answer was the question about proper technique used for indwelling urinary catheter Insertion 100%. The most frequent wrong was the question asking for what is not a nursing action to prevent infections from urinary catheter 43.4%. The mean percentage of the correctly answered questions by respondents as computed in table 3 was 64.52%. The comparison of the results with McDonald’s standards of learning outcome measured criteria, we got the level of knowledge as following:

Table 3: Sociodemographic characteristics of participants (N=53)

McDonald’s standards of learning outcomes	Percentage
Very low	<60%;
Low	60-69.9%;
Moderate	70- 79.9%;
High	80- 89.9%
Very high	> 90%;

From the above table, 64.52% is in the range of 60-69.9% indicating low level of respondent’s knowledge regarding catheter indications and CAUTI prevention.

The following table (Table 4) demonstrate the frequency and the percentage of respondents based on their correct score to different knowledge questions.

Table 4: Frequency distribution of nurses based on the way they answered correctly each knowledge question. N=53

Knowledge section variables	Yes		No	
	n	%	n	%
Among the following what is an inappropriate indication for indwelling urinary catheterization?				
Obtaining urine for culture when the patient can voluntarily void	28	52.8	25	47.2
Which is an appropriate indication of urinary catheterization among the following?				
Patients expected to receive large-volume infusions or diuretics during surgery.	33	62.3	20	37.7
Read the following carefully and select the proper technique used for indwelling urinary catheter Insertion?				
Using aseptic technique with sterile equipment	53	100	0	0
Based on CDC 2009 Guidelines for prevention of Catheter associated urinary tract infection, operative patients who have been catheterized, it is advised to remove the catheter as soon as possible post operatively, preferably with in				
24 hours	27	50.9	26	49.1
As a nurse in critical care unit, you find that the indwelling urinary catheter is obstructed during your patient assessment, what are you going to do?				
Change the catheter immediately	36	67.9	17	32.1
One of the following is not a nursing action to prevent infections from urinary catheter?				
Changing indwelling catheters or drainage bags only at routine, fixed intervals	23	43.4	30	56.6
Which one among the following is a risk factor for CAUTI?				
Prolonged time of catheterization	42	79.2	11	20.8
Among the following category of patients, who is at high risk of mortality or developing CAUTI?				
Elderly patients of more than 65 years and women	34	64.2	19	35.8

Prior to inserting urinary catheter a nurse has to perform all of the following to prevent CAUTI except:				
None of the above	30	56.6	23	43.4
All the following are complications of CAUTI except:				
Hypertension	36	67.9	17	32.1

4.4. Attitude of ICU nurses towards catheter use and CAUTI prevention N=53

As shown in the figure below, the study results indicated that more than half [n=28; (52.8%)] nurses working in ICU have a positive attitude towards catheter indications and CAUTI prevention. This attitude was obtained by computing all attitude related questions after reversing the negatively formed questions (4), the total attitude score was calculated and it was used to calculate the mean. The mean attitude score (31.45) was used as the cutoffpoint to group the nurses' attitude as positive or negative depending respectively to whether their score is above the mean or below the mean regarding catheter indications and CAUTI prevention. Therefore, the resulted categories were the following; (47.2%) were taken and categorized as having negative attitude as their score was below the mean and nurses who were categorized as positive attitude were (52.8%) had a score above the mean (Figure 7).

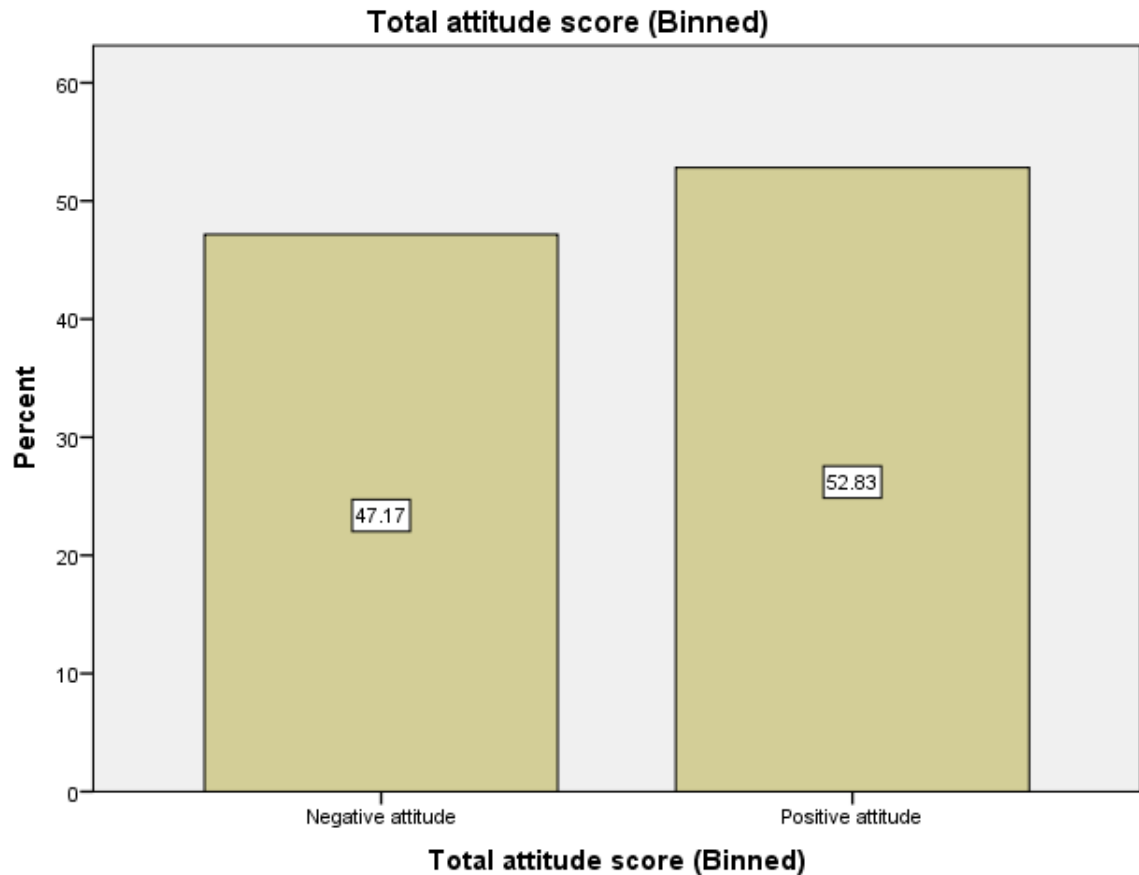


Figure 7: Distribution of respondents according to their attitude category N=53

The table 5 below show attitude of nurses from questions scored based on Likert scales from strongly agree to strongly disagree. Then through the results below, a big number of respondents (41.02%) strongly agree through the attitude test questions like the use of gloves and gown, during any manipulation of the catheter or collecting bag decrease the incidence of CAUTI, education about basic catheter care helps to prevent CAUTI, it helps if CAUTI prevention is in high priority list of hospitals and maintaining a closed drainage system prevents CAUTI. Furthermore, the highest percentage of ICU nurses (36%) strongly disagree with the statement like CAUTI is not a serious disease and CAUTI is a common problem and almost impossible to prevent it. Be that as it may, another number of nurses would neither agree nor disagree with the assertion that the catheter should be removed whenever it is convenient for healthcare provider (HCP) while the remaining high percentage would only agree with: It helps if CAUTI prevention is in high priority list of hospitals, Maintaining a closed drainage system prevents CAUTI and

Catheter can be inserted for nursing staff convenience. Also a big number of nurses (81.1%) knows that CAUTI is a big problem that is very critical to be prevented.

Table 5: Distribution of ICU nurses ‘attitude based on Likert scales regarding CAUTI prevention in two Referral hospitals in Kigali. N=53

Variables		Nurses’ attitude rate, N=53					
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total, N=53
1	The use of gloves and gown, during any manipulation of the catheter or collecting bag decrease the incidence of CAUTI.	29 54.7	15 28.3	7 13.2	0 0	2 3.8	N=53 100%
2	Education about basic catheter care helps to prevent CAUTI	24 45.3	22 41.5	7 13.2	0 0	0 0	N=53 100%
3	CAUTI is not a very serious disease.	2 3.8	2 3.8	3 5.7	5 9.4	41 77.4	N=53 100%
4	It helps if CAUTI prevention is in high priority list of hospitals	19 35.8	29 54.7	5 9.4	0 0	0 0	N=53 100%
5	CAUTI is a common problem and almost impossible to prevent it	2 3.8	4 7.5	4 7.5	12 22.6	31 58.5	N=53 100%
6	Maintaining a closed drainage system prevents CAUTI	15 28.3	28 52.8	6 11.3	3 5.7	1 1.9	N=53 100%
7	Catheter should be removed whenever it is convenient for healthcare provider (HCP)	6 11.3	12 22.6	21 39.6	14 26.4	0 0	N=53 100%
8	Catheter can be inserted for nursing staff convenience.	5 9.4	13 24.5	14 26.4	18 34	3 5.7	N=53 100%

**4.5.Practice of ICU nurses towards Catheter indication and the prevention of CAUTI.
N=53.**

The overall practice of nurses towards urinary catheter indications and CAUTI prevention was moderate (79.9%) as it is shown in the table 6 below. This practice score was obtained by computing all practice score percentages (total percentage sum =1598) divided by the number of practice items (number of items = 20). All the practice test score were illustrated and 79.9% of nurses implement CAUTI prevention practice during catheter insertion, maintenance and removal as well as respecting catheter indications for each patient in the two referral hospitals. This number is followed by 19 % nurses who did not do some of CAUTI prevention practices and only 1.1 % of nurse did not know if some of CAUTI prevention practices are done or not. From the table 6 below, respondents are described based on their daily practice to prevent CAUTI, therefore all respondents [53 (100%)] agreed that catheterized patients meet the appropriate indications of CAUTI and that they have to wash hands before catheter removal. In addition to this the majority of respondents (96.2%), knew that they had to wash hands after catheter insertion and record the catheter removal date, (52%) know that they must use aseptic techniques to insert the catheter, (94.3%) agreed that keeping the urine collecting bag below the level of the bladder and maintaining the closed system all the time decrease CAUTI infection. Also keeping the urine collecting bag off the floor, avoiding contact of the drainage spigot and the collecting container and protection during catheter removal are performed by (98.1%) of respondents. However, only few respondents (30.2%) knew that they had to secure the indwelling urinary catheter properly after insertion to prevent movement and urethral traction; 43.4% perform hand washing before manipulating UC while the remaining 56.6% would not that.

Table 6: Distribution of nurses according to their practice score. N=53

Variables	Practice score		
	YES n (%)	NO n (%)	I don't know n (%)
Catheter indications			
	53 (100)	0 (0)	0 (0)

The patient meet at least one of the appropriate indications	36(67.9)	17(32.1)	0 (0)
Are you familiar with the use of catheter alternatives like condom or adsorbent pads?			
Hand hygiene			
Wash hand before and after insertion	53(100)	0 (0)	0 (0)
Hand washing before catheter manipulation	23(43.4)	30(56.6)	0 (0)
Hand washing after catheter insertion	51(96.2)	2 (3.8)	0 (0)
Inserting the catheter			
Use sterile equipment like sterile gloves, drape, sponges and solution.	48(90.6)	5 (9.40)	0 (0)
Use aseptic technique to insert the catheter	52(98.1)	0 (0)	1 (1.9)
Use a single used bottle for lubricant.	34(64.2)	19(35.8)	0 (0)
Secure indwelling catheter properly after insertion to prevent movement and urethral traction.	16(30.2)	36(67.9)	1 (1.9)
Catheter maintenance			
Keep the catheter and collecting tube free from kinking	50(94.3)	2 (3.8)	1 (1.9)
Always keep the collecting bag below the bladder.	48(90.6)	5 (9.4)	0 (0)
Empty the collecting bag regularly and use a separate, clean urine collecting jug for each patient	29(54.7)	23(43.4)	1 (1.9)
Maintain the closed system all the time	50(94.3)	1 (1.9)	2 (3.8)
Keep the urine collecting bag out off the floor	52(98.1)	0 (0)	1 (1.9)
Avoid contact of the drainage spigot with the collecting container.	52(98.1)	1 (1.9)	0 (0)
Perform routine hygiene (cleansing of the perineal area during daily bathing or showering)	19(35.8)	32(60.4)	2 (3.8)
Use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system.	48(90.6)	5 (9.4)	0 (0)
Catheter removal			

Is there any catheter removal protocol in your facility?	30(56.6)	22(41.5)	1(1.9)
Protect yourself during catheter removal	52(98.1)	1 (1.9)	0 (0)
Removed date recorded	51(96.2)	1 (1.9)	1 (1.9)

4.6.Factors influencing nurses' KAP towards the prevention of CAUTI.

4.6.1. Demographic characteristics and nurses' knowledge towards CAUTI prevention.

In the table 7 below the association of demographic characteristics (level of education. Training on infection control and years of experience) show no significant influence on the respondents' knowledge towards catheter indications and CAUTI prevention. P values of those factors are respectively P = 0.357; 0.230 and 0.248. From the table 4.6 below, it is seen that a part from demographic characteristics of respondents there may be other factors that may affect respondents' knowledge regarding the prevention of CAUTI.

The table 7 below summarize the results of a cross tabulation between knowledge categories and sociodemographic characteristics of respondents. The Pearson chi-square and Fischer exact test were calculated to assess the relationship between demographic features and respondents' knowledge. The resulting numbers show that there is no statistical association between different studied variables as their p values are above 0.05. Moreover, a considerable number of respondents with advanced level of education 15 (28.3%) had a low level of knowledge while only 1 (1.8%) respondents with bachelor degree had a low level of education. The only one respondent with associate nurse has low level of knowledge. From the table 4.6 respondents with 6 to 10 years of experience in nursing professional 16.9% and 11.3% had respectively high level and moderate level of knowledge while a considerable number of respondents (18.8%) with less than 5 years of experiences had low level of knowledge. Even though respondents with 11 to 15 years of experiences were few, most of them (5.6%) had a low level of knowledge. The big number of respondents who had been trained about infection control measures 28.3% had high knowledge.

Table 7: Demographic characteristics of respondent and their knowledge level towards catheter indications and CAUTI prevention.

Demographic characteristics	Number of respondents (N=53)							
	Effect of demographic factors on respondents' knowledge.							
	Low level		Moderate level		High level		Test used	P-value
Education level	n	%	n	%	n	%	Fisher exact test	0.357
Associate nurse A2	1	1.8	0	0	0	0		
Diploma level A1	15	28.3	16	30.2	12	22.6		
Bachelors' degree A0	1	1.8	4	7.5	4	7.5		
Years of experience							Fisher exact test	0.230
Less than 5 years	10	18.8	13	24.5	6	11.3		
6 to 10 years	4	7.5	6	11.3	9	16.9		
11 to 15 years	3	5.6	1	1.8	1	1.8		
Training on infection control							Fisher exact test	0.248
Yes	12	22.6	15	28.3	15	28.3		
No	5	9.4	5	9.4	1	1.8		

P-value is significant if it is $p < 0.05$

4.6.2. Demographic characteristics and nurses' attitude towards CAUTI prevention.

While associating the demographic features and respondents' attitude, the resulted findings show that a big number of respondents (47.3%) with diploma level in nursing had a positive attitude. From the table 8, training on infection control has an impact on respondents 'attitude towards CAUTI prevention as a big number (43.5%) of trained respondents had a positive attitude regarding catheter indications and CAUTI prevention. In contrast the years of experience in nursing profession had no visible impact on respondents' attitude as most of respondents with less years of experience (less 5 years and 6 to 10 years) are respectively the ones to have a positive attitude (30.3% and 20.7%). The table 8 below give more details on association between demographic characteristics and respondents 'attitude.

Table 8: Demographic characteristics of respondent and their attitude category towards catheter indications and CAUTI prevention.

Demographic characteristics	Number of respondents (N=53)					
	Effect of demographic factors on respondents' attitude.					
	Negative attitude		Positive attitude		Test used	P-value
	n	%	n	%		
Education level					Fischer	0.204
Associate Nurse A2	1	1.9	0	0	test	
Diploma level A1	18	33.9	25	47.3		
Bachelors' degree A0	6	11.3	3	5.6		
Years of experience					Fischer	0.582
less 5 years	13	24.6	16	30.3	test	
6 to 10 yeas	8	15	11	20.7		
11 to 15 years	4	7.5	1	1.9		
Training of infection control					Fischer	0.367
Yes	19	35.8	23	43.5	test	
No	6	11.3	5	9.4		

P-value is significant if it is $p < 0.05$

4.6.3. Demographic characteristics and respondents' practice towards the prevention of CAUTI.

Table 4.8 show the findings resulting from computing demographic features and the practices of respondents. The majority of respondents (43.5%) with advanced level in nursing have high practice towards CAUTI prevention; they are followed by 5.6% with bachelors' degree also with high practice. The only respondents with associate nurse also have a high practice while 33.9% and 11.3% with a moderate practice level of respondents are respectively holding advanced diploma level and bachelors' degree. Among all participants, only two (3.8%) respondents with advanced diploma level had a low practice level. For more details, the table 9 below give more description.

Table 9: Demographic characteristics of respondent and their practice level towards catheter indications and CAUTI prevention.

Demographic Variables	Number of respondents (N=53)							
	Effect of demographic factors on respondents' practice.							
	Practice levels.							
	Low practice		Moderate practice.		High practice		Test used	p-value
n	%	n	%	n	%			
Education level							Fischer	0.526
Associate Nurse A2	0	0	0	0	1	1.9	test	
Diploma level A1	2	3.8	18	33.9	23	43.5		
Bachelors' degree A0	0	0	6	11.3	3	5.6		
Experience							Fischer	1.000
less 5 years	1	1.9	15	28.3	13	24.6	test	
6 to 10 yeas	1	1.9	9	16.9	9	16.9		
11 to 15 years	0	0	0	0	5	9.4		
Training							Fischer	0.169
Yes	2	3.8	19	35.8	21	39.6	test	
No	0	0	5	9.4	6	11.3		

P-value is significant if it is $p < 0.05$

Conclusion

The above chapter dealt with results presentation and analysis of data collected from 53 respondents; pie charts, graphs and tables were used in the presentation of data analysed using descriptive and inferential statistics. Data presented are demographic characteristics of respondents including level of education, age, gender, years of experience in the nursing profession and training on infection prevention measures. Beside these, the levels of knowledge, attitude position and practice level were presented. Finally the cross tabulation between the demographic variables and knowledge, attitude and practice of respondents were computed.

CHAPTER 5: RESULTS DISCUSSION.

The knowledge, attitude and practice of ICU nurses towards infection control in the use of urethral catheters and CAUTI prevention focused on proper technique for urinary catheter insertion, maintenance and removal; appropriate urinary catheter use, risk factors and complications for CAUTI. Additionally, the Health belief model that have been applied to a big number of health related study exploring health behaviors like health prevention and promotion, and agreement with recommended guidelines for infection control, provided the framework for the current study discussion. The results from the study were discussed with regards to the objectives and study research questions as well as the conceptual framework under the following sections.

5.0. Demographic characteristics of participants.

As revealed by the current study, the majority of respondents were female (66%) and largely aged between 30 to 39 years old (69.8%) followed by 24.5% aged between 20 to 29 years old. About 34% were males and a small percentage 5.7% was above 40 years old. Most of respondents (81.1%) were holding a Diploma level (A1) of education in nursing while only 1% had a bachelors' degree in nursing. Finally, the majority of respondents (79.2%) received any form of infection control training and most of respondents 39.6% and 35.8% had respectively 1 to 5 years and 6 to 10 years of experience in nursing profession, 15.1% had less than 5 years while only 9.4% had more than 10 years of experience in nursing. These findings revealed that the majority of nurses are females similar to findings of Ginny Kaushal et al, 2015 in the study to assess nurses' knowledge, attitude and practices regarding infection control standard precautions at the ICU of selected super speciality hospital. Then among 47 participants of the study, female nurses (85%) were many compared to males (15%) and the majority of participants (41%) had 2 to 5 years of work experience while 23% had more than 5 years of experience. A descriptive study to assess knowledge and practices of nurses on infection control in the use of urethral catheters in a private hospital in Iloilo City show different findings with the current study. Among 30 nurses included in the study, the majority 90% were between 21 to 29 years old, 56.7% were males, and most of them 76.7% were bachelors' degree holder (Opina and Oducado, 2014, p. 94).

5.1. Level of knowledge of nurses regarding catheter indications and CAUTI prevention.

After computing the correct responses of knowledge questionnaire as they were provided by respondents and then compare them with McDonald's standards of practice measured criteria, the findings of this study revealed that the majority of ICU nurses have a low level of knowledge (64.52%) regarding CAUTI prevention. The results are consistent with those found by Kose et al 2016 that nurses have inadequate level of knowledge concerning catheter care, the use of drainage bags and the urinary catheterization. But also the author added that ICU nurses were seen to have sufficient knowledge on applications needed to pay attention during insertion of urinary catheter and have better knowledge scores than the nurses that work in clinics (Kose *et al.*, 2016). Specifically the study findings revealed an excellent knowledge of proper techniques to insert the UC as all respondents [53 (100%)] included in the study knew that a catheter should be inserted aseptically with sterile equipment (Gould *et al.*, 2010, p. 12) find similar results through CDC guidelines on the prevention of CAUTI. This illustrate the nurses' perception of the seriousness of infections CAUTI included and their willingness to fight against that infection, so that the life of the patient is secured. Regrettably some respondents did not perceive the severity of CAUTI and believed that it is not a serious disease 7 (13.3%) and that it is a common problem and impossible to prevent 10 (18.8%). But this is so, 36 (67.9%) identified sepsis, hemorrhage and death as life threatening complications of CAUTI. This is not different from what was explained by different authors stating that bleeding is seen in newly catheterized patients or those with prolonged catheterization (Osamu, 2008, p. 482; Taleschian-tabrizi *et al.*, 2015).

Nurses are required to know who among the patients with urinary catheter is at high risk of developing CAUTI. Unfortunately, only 34 (64.2%) and 42 (79.2%) of respondents knew respectively that advanced age and prolonged time of catheterization are risk factors of developing CAUTI. Similar findings are found in the study on Risk factors for catheter-associated urinary tract infections in critically ill patients with subarachnoid hemorrhage (Thomas Hagerty, Louise Kertesz, J. Michael Schmidt, Sachin Agarwal, Jan Claassen, Stephan A. Mayer, Elaine L. Larson, 2015, p. 52); Strategies Used by Hospitals in a Southeastern State to Reduce Catheter Associated Urinary Tract Infections: Comparing the Outcomes by Hospital Structure and Processes (Rife, 2012, p. 40) and Catheter-Associated Urinary Tract Infections at a Hospital in Zinvie, Benin (West Africa) (Dougnon *et al.*, 2016, p. 6). Not only is CAUTI

inclusive to adult patient but children also are at high risk (Lee *et al.*, 2016, p. 12) even though elderly persons are more concerned.

Another point to mention in the current study is that nurses were found to have poor knowledge on the appropriate [33 (62.3%)] and inappropriate [28 (52.8%)] indications of urinary catheter. This indicated that if nurses as the primary health care provider have poor knowledge about appropriate catheter indications, the urinary catheter may stay in place even though it is no longer medically needed (Saint, 2014, p. 1; Jain *et al.*, 2015, p. 79) also discovered the same finding. Nurses also must be equipped with knowledge to ensure that inappropriate urinary catheters are removed promptly based on the protocol without calling the physicians as this catheter when removed on time will decrease infection rates (Peters, 2016, p. 67). As a matter of fact, even though most of participants (79.2%) attended some form of training, they needed to refresh on their knowledge about CAUTI prevention measures as emphasized by Hanan and colleagues that training should be designed to keep the health care personnel up to date with the new concepts, acquire more knowledge and practices (Hanan and Nasr, 2015, p. 7; Wicks, 2015, p. 152).

5.2. Nurses attitude towards catheter indications and CAUTI prevention.

In this study most of the nurses 52.83% were had positive attitude towards catheter indications and CAUTI prevention totally different from what was found by Jain et al 2015 that nurses have less awareness than physicians regarding reasons for urinary catheter indications and CAUTI preventive measures (Jain *et al.*, 2015, p. 80). In the same way, the present study findings show that some nurses (56.6%) do not wash their hands after any catheter manipulation increasing the risk of cross contamination; (Satish Prabhakar, 2016, p. 1855) stated that poor compliance to hand washing is associated with lack of awareness among staff nurses or negative organizational attitude towards hand washing. Finally, the majority of respondents 46 (86.8%) strongly agree or agree that education about basic catheter care as stimuli that helps in the prevention of CAUTI as long as this will help to make a distinction between appropriate and inappropriate urinary catheter indications. They are similar to the findings and conclusion of Satish, 2016 p.1856. There is also a small proportion of nurses who agreed with the statement that CAUTI is a common problem and almost impossible to prevent it (18.8%) and CAUTI is a serious disease (13.3%)

and then considered urinary catheter insertion as a helping intervention to the patient like prevention falls (Krein *et al.*, 2013, p. 883).

5.3. Nurses practice towards catheter indications and CAUTI prevention.

While ICU nurses have only low knowledge, their practice was found to be moderate with a total average score of 79.9% and a mean score of 16.4 (82%), Max=19 (95%), Min =12 (60%) and SD= 2.41. Furthermore, despite a moderate level of practice, a big number of respondents 46 (86.8%) perceive the benefit of performing routine hygiene 52 (98.1%) and maintaining a closed system 50 (94.3%) in the prevention of CAUTI. Most of nurses were aware of some basic CAUTI preventive practices including appropriate indications, hand washing before and after insertion (Satish Prabhakar, 2016, pp. 1854–1855), using gloves and protection, keeping the catheter free from kinking, but the present study discovered 60.4% respondents who did not know that they have to clean the perineal area daily to prevent CAUTI which is similar to the findings of Prasanna and colleagues . The authors found that there was a lack of knowledge regarding practicing of measures such as cleaning around the catheter daily, glove use, and hand hygiene with catheter manipulation, not disconnecting the catheter from its bag, not routinely irrigating the catheter .Then nurses need to be instructed on catheter care to improve their knowledge, attitude and practices related to catheter care (Prasanna and M, 2015, p. 186). The similar findings were seen by Kose and colleagues that nurses have inadequate information on maintaining the closed drainage system in catheter insertion, keeping the catheter under the level of bladder, maintaining the closed system when taking cultures and preventing the contact of the drainage system with the floor (Kose *et al.*, 2016). However the study of Oducado and Opina find that nurses have a good practices especially hand washing (Opina and Oducado, 2014). As far as factors to take action to change are concerned, a considerable number of respondents 23 (43.4%) did not know that in their facility exist catheter removal policy and protocol. On the other hand, the results of this study showed that only 67.9% of all respondents know and have used urinary catheter alternatives while the use of alternate types of urinary catheter materials, such as condoms and adsorbents have been effective to decreased CAUTI rates ((Galiczewski, 2016, p. 10). Additionally, 50 (94.3%) respondents mentioned the importance of keeping the catheter and collecting tube free from kinking and always keeping the collecting bag below the bladder 48 (90%) to prevent CAUTI.

5.4. Demographic factors ‘influence on nurses KAP towards catheter indications and CAUTI prevention.

Some of the modifying factors like socio demographic characteristics were thought to affect the respondents’ perceptions on the severity and susceptibility of complications and suffering from CAUTI. After studying the relationship that may exist between nurses knowledge, attitude and practice with selected demographic characteristics, it was found that statistically there is no influence of the later with nurses KAP towards CAUTI prevention ($p>0.05$). Similar findings were in the study done by Prasanna et al 2015 as the author found that there is no association between the level of knowledge of staff nurses regarding catheter care with some demographic variables like age, gender and professional experience (Jain *et al.*, 2015, p. 80; Prasanna and M, 2015, p. 186). However the results from studies conducted respectively by Sessa, Wicks and Kosse revealed that demographic features like level of education and years of experience has an impact on the level of nurses KAP towards catheter care ($p=0.047$; $p<0.05$) but no effect seen with being trained on infection control ($p>0.05$) as the score was the same (Sessa *et al.*, 2011, p. 6; Wicks, 2015, p. 152; Kose *et al.*, 2016, p. 78). Thus the study concluded that there is no impact of socio demographic characteristics on nurse’s knowledge, attitude and practice towards catheter indication and CAUTI prevention as the p values for all the results are above 0.05.

CHAP 6: CONCLUSIONS AND RECOMMENDATIONS.

Conclusions.

Catheter associated urinary tract infections is one of the most common health care associated infections as literature said but can be prevented. According to the results of this study, some nurses have shown a good implementation of different practices towards catheter indications and CAUTI prevention. But their knowledge was not satisfactory and among them a small percentage show a positive attitude. There were no associations of knowledge, attitudes and practice with the demographics in this study therefore there is a need for another study to about relationship between nurses' knowledge, attitude and practice.

Recommendations.

At the end of this research some recommendations are suggested including the use of catheter checklist for insertion, maintenance and removal that may be present in the patient file and filled daily. It is important that infection prevention and the proper insertion and maintenance of urinary catheters be taught, as this is recommended by the CDC, NHSN and HIPAC. Continuous professional development (CPD) should be emphasized to help in service nurses improve and update their knowledge and practice towards CAUTI prevention. In addition to this the use of protocols and policies is also essential because appropriate indications, proper catheter maintenance and the timely removal of unnecessary catheters minimizes the risk of infection. The CDC (2017) also recommends that urinary catheters should not be used unless it is a necessity and should be removed on time if no longer needed and add that it is essential that nurses know how to make decisions regarding urinary catheter removal based on evidenced guidelines. Nurses should have the privilege of removing the urinary catheter when no longer needed without waiting for the physician order.

Different studies regarding CAUTI are needed in Rwanda health care facilities like assessing the KAP on CAUTI prevention using a bigger number of participants in non-referral hospitals.

Replication of this study using a different approach to explore in details the attitude of nurses towards CAUTI prevention.

Hospital authorities have to include CAUTI prevention measures in their high priorities as it is done by other infections and establish policy and protocols guiding urinary catheter indications and CAUTI prevention.

Nurses should be trained on when and how to avoid unnecessary or inappropriate urinary catheters without physicians' orders as this may help to decrease the length of catheter use and decrease the risk of urinary tract infection.

REFERENCES.

- Anupriya, A., Priyanka, N., Snehalaxmi, R. and Uma, A. (2016) 'Health-care associated infections and infection control practices in intensive care hospital.', *Asian Journal of Pharmaceutical and Clinical Research*, 9(4).
- Bayliss, V. and Houghton, M. (2014) *Urinary Catheter Care Guidelines*, Southern health.
- Bond, J. M. (2014) *A three year review of catheter-associated urinary tract infections reported to the national healthcare safety network at a tertiary care hospital*.
- Deborah S Yokoe, Deverick J Anderson, Sean M. Berenholtz, David P. Calfee, Erik R. Dubberke, Katherine Ellingson, Dale N. Gerding, Janet Haas, Keith S. Kaye, Michael Klompas, Evelyn Lo, Jonas Marschall, Leonard A. Mermel, Lindsay Nicolle, C. S. and Kristina Bryant, David Classen, Katrina Crist, Nancy Foster, E. H. (2014) 'Introduction to " A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals : 2014 Updates "'', *Infection Control and Hospital Epidemiology*, 35(5), pp. 455–459. doi: 10.1086/675819.
- Dougnon, T. V., Bankole, H. S., Johnson, R. C., Toure, I. M., Houessou, C. and Boko, M. (2016) 'Catheter-Associated Urinary Tract Infections at a Hospital in Zinvie , Benin (West Africa) Baba-Moussa', *Internatonal Journal of Infection*, 3(2), pp. 0–7. doi: 10.17795/iji-34141.
- Etikan, I., Musa, S. A. and Alkassim, R. S. (2016) 'Comparison of Convenience Sampling and Purposive Sampling', *American Journal of Theoretical and Applied Statistics*, 5(1), pp. 1–4. doi: 10.11648/j.ajtas.20160501.11.
- Evelyn Lo, Lindsay E. Nicolle, Susan E. Coffin, Carolyn Gould, Lisa L. Maragakis, Jennifer Meddings, David A. Pegues, Ann Marie Pettis, Sanjay Saint, D. S. Y. (2014) 'Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals : 2014 Update', *infection control and hospital epidemiology*, 35(5), pp. 464–479. doi: 10.1086/675718.
- Fashafsheh, I., Ayed, A., Eqtait, F. and Harazneh, L. (2015) 'Knowledge and Practice of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals', *Journal of Educational and Practice*, 6(4), pp. 79–91.

- Gail L, J. (2016) *Prevention of Catheter Associated Urinary Tract Infections In a Long-term Acute Care Hospital* by. Available at: <http://hdl.handle.net/10755/201826>.
- Galiczewski, J. M. (2016) ‘Interventions for the prevention of catheter associated urinary tract infections in intensive care units : An integrative review’, *Intensive and Critical Care Nursing*. Elsevier Ltd, 32, pp. 1–11. doi: <http://dx.doi.org/10.1016/j.iccn.2015.08.007>.
- Gardner, A., Mitchell, B., Beckingham, W. and Fasugba, O. (2014) ‘A point prevalence cross-sectional study of healthcare-associated urinary tract infections in six Australian hospitals’, *BMJ (Clinical research ed.)*, pp. 1–10. doi: [10.1136/bmjopen-2014-005099](https://doi.org/10.1136/bmjopen-2014-005099).
- Gould, C. V, Umscheid, C. A., Agarwal, R. K., Kuntz, G. and Pegues, D. A. (2010) ‘Guideline for Prevention of Catheter-Associated Urinary Tract Infections 2009’, *infection control and hospital epidemiology*, 31(4). doi: [10.1086/651091](https://doi.org/10.1086/651091).
- Gould, C. V, Umscheid, C. A., Agarwal, R. K., Kuntz, G. and Pegues, D. A. (2017) *Guideline for Prevention of Catheter - associated Urinary Tract Infections 2009, Healthcare Infection Control Practices Advisory Committee*.
- Gould, C. V, Umscheid, C. A., Agarwal, R. K., Kuntz, G., Pegues, D. A. and Patrick, J. (2009) *Guideline for prevention of catheter associated urinary tract infections 2009*.
- Greene, L., James, M. and Oriola, S. (2008) ‘Guide to the Elimination of Catheter-Associated Urinary Tract Infections (CAUTIs)’, *ASSOCIATION FOR PROFESSIONALS IN INFECTION CONTROL AND EPIDEMIOLOGY (APIC)*, pp. 1–42. Available at: www.apic.org.
- Greene, M. T., Fakhri, M. G., Fowler, K. E., Meddings, J., Ratz, D., Safdar, N., Olmsted, R. N. and Saint, S. (2014) ‘Regional Variation in Urinary Catheter Use and Catheter-Associated Urinary Tract Infection: Results from a National Collaborative.’, *Infection Control and Hospital Epidemiology*, 35(S3), pp. S99–S106. doi: [10.1086/677825](https://doi.org/10.1086/677825).
- Hamed Sarani, A. B. and Nosratollah Masinaeinezhad, E. E. (2016) ‘Knowledge , Attitude and Practice of Nurses about Standard Precautions for Hospital-Acquired Infection in Teaching Hospitals Affiliated to Zabol University of Medical Sciences (2014)’, *Global Journal of Health Science*, 8(3), pp. 193–198. doi: [10.5539/gjhs.v8n3p193](https://doi.org/10.5539/gjhs.v8n3p193).
- Hanan, S. S. and Nasr, M. H. (2015) ‘Indwelling Urinary Catheter Management: Effect of an

Interactive Workshop on Nurses' practice and Perception', *New York Science Journal*, 8(5), pp. 117–126. Available at: <http://www.sciencepub.net/newyork>.

Health(MoH), M. of (2012) 'THIRD HEALTH SECTOR STRATEGIC PLAN', (July).

Health Research and Educational Trust (HRET). American Hospital Association (AHA) (2013) 'Eliminating Catheter-Associated Urinary Tract Infections'. Available at: www.hpoe.org/CAUTI-culture-patient-safety.

Herter, R. and Kazer, M. W. (2010) 'Case Study: Best practices in urinary catheter.', *Home Healthcare Nurse*, 28(6), pp. 342–349.

Hooton, T. M., Bradley, S. F., Cardenas, D. D., Colgan, R., Geerlings, S. E., Rice, J. C., Saint, S., Schaeffer, A. J., Tambayh, P. A., Tenke, P. and Nicolle, L. E. (2010) 'Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America', *Clinical Infectious Diseases CID*, 50(5), pp. 625–663. doi: 10.1086/650482.

Ingham-Broomfield, B. (2015) 'A nurses' guide to Quantitative Research.', *Australian Journal of Advanced Nursing*, 32(2), pp. 32–38.

Institute for Healthcare Improvement (2011) 'How-to Guide: Prevent Catheter-Associated Urinary Tract Infections'. Available at: www.ihl.org.

Ioannis, E. and Kostadinou, S. (2013) *Prevention of Catheter-Associated Urinary Tract Infections*. University Hospital Of Alexandroupolis, General Hospital of Kalamata; Greece.

Jain, M., Dogra, V., Mishra, B., Thakur, A., Poonam, S. and Loomba (2015) 'Knowledge and attitude of doctors and nurses regarding indication for catheterization and prevention of catheter-associated urinary tract infection in a tertiary care hospital', *Indian Journal of Critical Care Medicine*, 19(2), pp. 76–81. doi: 10.4103/0972-5229.151014.

Jessica Lynn, J. (2015) *An Evaluation of the Adherence to an Indwelling Urinary Catheter Maintenance Bundle*. University of Kentucky Hospital. Available at: http://uknowledge.uky.edu/dnp_etds/33.

Kaushal, G. (2015) 'Impact of Training on Knowledge, Attitude and Practices Scores of ICU

Nurses regarding Standard Precautions of Infection Control in a Super Speciality Hospital of Delhi.’, *Indian Journal of Research*, 4(8), pp. 282–285.

Khadoura, K. J. (2013) ‘Evaluation of Environmental Infection Control at Intensive Care Units in Gaza Governorates’.

Kose, Y., Leblebici, Y., Akdere, S. Sen, Cakmakci, H. and Otunctemur, S. (2016) ‘Level of Knowledge of the Nurses Work in a Public Hospital about the Prevention of Catheter Associated Urinary Tract Infections’, *The Medical Bulletin of Şişli Etfal Hospital*, 50(1), pp. 70–79. doi: 10.5350/SEMB.20151216103044.

Krein, S. L., Kowalski, C. P., Harrod, M., Forman, J. and Saint, S. (2013) ‘Barriers to reducing urinary catheter use: a qualitative assessment of a statewide initiative.’, *JAMA internal medicine*, 173(10), pp. 881–886. doi: 10.1001/jamainternmed.2013.105.

Kristi Felix, Mary Jo Bellush, B. B. (2014) *Guide to Preventing Catheter-Associated Urinary Tract Infections*. 1st edn. Edited by Linda Green. Washington, DC: APIC. Available at: www.apic.org/implementationguides.

Labib, M. and Spasojevic, N. (2013) ‘Problem of Catheter Associated Urinary Tract Infections in Sub – Saharan Africa’.

Lee, N. G., Marchalik, D., Lipsky, A., Rushton, H. G., Pohl, H. G. and Song, X. (2016) *Risk Factors for Catheter Associated Urinary Tract Infections in a Pediatric Institution*, *The Journal of urology*. Elsevier Ltd. doi: 10.1016/j.juro.2015.03.121.

Lewis, S. S., Knelson, L. P., Moehring, R. W., Chen, L. F., Sexton, D. J. and Anderson, D. J. (2013) ‘Comparison of non-intensive care unit (ICU) versus ICU rates of catheter-associated urinary tract infection in community hospitals.’, *Infection control and hospital epidemiology*, 34(7), pp. 744–7. doi: 10.1086/671000.

Lona, M., Sanjay, S., Andrezj, G., Shu, C. and Sarah L., K. (2010) ‘Knowledge of Evidence-Based Urinary Catheter Care Practice Recommendations Among Healthcare Workers in Nursing Homes NIH Public Access’, *Journal of the American Geriatrics Society*, 58(8), pp. 1532–1537. doi: 10.1111/j.1532-5415.2010.02964.x.

Loveday, H. P., Wilson, J. A., Pratt, R. J., Golsorkhi, M., Tingle, A., Bak, A., Browne, J.,

- Prieto, J. and Wilcox, M. (2014) ‘National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England’, *Journal of Hospital Infection*. The Healthcare Infection Society, 86(S1), pp. S1–S70. doi: 10.1016/S0195-6701(13)60012-2.
- Lúcia, V., Andrade, F., Alexandra, F. and Fernandes, V. (2016) ‘Prevention of catheter-associated urinary tract infection : implementation strategies of international guidelines 1’. doi: 10.1590/1518-8345.0963.2678.
- Marra, A. R., Camargo, T. Z. S., Goncalves, P., Sogayar, A. M. C. B., Mourra Jr, D. F., Guastelli, L. R., Rosa, C. A. C. A., Victor, E. da S., Santos, O. F. P. dos and Edmond B., M. (2011) ‘Preventing catheter-associated urinary tract infection in the zero-tolerance era’, *American Journal of Infection Control*, pp. 1–6. doi: 10.1016/j.ajic.2011.01.013.
- Martin, J. (2012) *Registered Nurses’ Practices and Perceptions of Indwelling Urinary Catheters and Number of Indwelling Urinary Catheter Days in a Hospitalized Population*. Gardner-Webb University.
- Md. Shariful Islam (2010) ‘Nurses’ Knowledge, Attitude, and Practice Regarding Pressure Ulcer Prevention for Hospitalized Patients at Rajshahi Medical College Hospital in Bangladesh’.
- Meddings, J., Rogers, M. A. M., Krein, S. L., Fakhri, M. G., Olmsted, R. N. and Saint, S. (2013) ‘Reducing unnecessary urinary catheter use and other strategies to prevent catheter-associated urinary tract infection: an integrative review’, *BMJ Qual Saf*, 23(0), pp. 1–13. doi: 10.1136/bmjqs-2012-001774.
- MoH (2014) ‘HEALTH SECTOR ANNUAL REPORT July 2013-June 2014’.
- National Infection Prevention and Control committee (NIPC) (2016) *NATIONAL INFECTION CONTROL GUIDELINES 2016 Draft for Consultation, SINGAPORE*. Available at: [https://www.moh.gov.sg/content/moh_web/home/Publications/guidelines/infection_control_guidelines/national-infection-control-guidelines--2016-draft-for-consultati/_jcr_content/entryContent/download/file.res/National Infection Control Guidelines - 2016 Draf](https://www.moh.gov.sg/content/moh_web/home/Publications/guidelines/infection_control_guidelines/national-infection-control-guidelines--2016-draft-for-consultati/_jcr_content/entryContent/download/file.res/National%20Infection%20Control%20Guidelines%20-%202016%20Draf).
- Nejad, S. B., Allegranzi, B., Syed, S., Ellis, B. and Pittet, D. (2011) ‘Health-care-associated

- infection in Africa: a systematic review', *Bulletin of the World Health Organization*, 89(10), pp. 757–765. doi: 10.2471/BLT.11.088179.
- Nicolle, L. E. (2014) 'Catheter associated urinary tract infections', *Antimicrobial Resistance and Infection Control*, 3(1), pp. 2–8. doi: 10.1186/2047-2994-3-23.
- Oman, K. S., Mary, B. F., Makic , Regina Fink, Nicolle Schraeder, Teresa Hulett, T. K. and Wald, H. (2011) 'Nurse-directed interventions to reduce catheter-associated urinary tract infections', *American Journal of Infection Control*. Elsevier Inc, (1–6). doi: 10.1016/j.ajic.2011.07.018.
- Opina, M. L. F. and Oducado, R. M. F. (2014) 'Infection Control in the Use of Urethral Catheters : Knowledge and Practices of Nurses in a Private Hospital in Iloilo City', *Asia Pacific Journal of Education, Arts and Sciences*, 1(5), pp. 93–100.
- Osamu, Y. I. J. W. N. (2008) 'Catheterization : Possible complications and their prevention and', *International Journal of Urology*, (15), pp. 481–485. doi: 10.1111/j.1442-2042.2008.02075.x.
- P Munyiginya; P Brysiewicz; J Mill (2016) 'Critical care nursing practice and education in Rwanda', *S Afr J Crit Care*, 32(2), pp. 55–57. doi: 10.7196/SAJCC.2016.v32i2.272.
- Peters, J. (2016) *Can Empowered Nurses Decrease Catheter Associated Urinary Tract Infection (CAUTI) Rates ?* Regis University.
- Prasanna, K. and M, R. (2015) 'Knowledge regarding Catheter care among Staff Nurses', *International Journal of Applied Research.*, 1(8), pp. 182–186. Available at: www.allresearchjournal.com.
- Ramasubramanian, V., Iyer, V., Sewlikar, S. and Desai, A. (2014) 'Epidemiology of healthcare acquired infection – An Indian perspective on surgical site infection and catheter related blood stream infection', (September), pp. 46–63.
- Rife, F. (2012) *Strategies Used by Hospitals in a Southeastern State to Reduce Catheter Associated Urinary Tract Infections : Comparing the Outcomes by Hospital Structure and Processes*. East Tennessee State University In.

- Rocco, T. S. and Plakhotnik, M. S. (2009) 'Human Resource Development Review'. doi: 10.1177/1534484309332617.
- Saint, S. L. K. S. (2014) 'Preventing catheter-associated urinary tract infection : a happy marriage between implementation and healthier patients', *Healthcare Infection*, 19, pp. 1–3. doi: <http://dx.doi.org/10.1071/HI13047>.
- Satish Prabhakar, A. M. N. (2016) 'Knowledge, Attitude and Practice Regarding Nosocomial Infections among General Health Practitioners and Medical College Students', *Scholar Journal of Applied Medical Sciences (SJAMS)*, 4(5F), pp. 1852–1856.
- Sessa, A., Giuseppe, G. Di, Albano, L., Angelillo, I. F. and Group, W. (2011) 'An Investigation of Nurses ' Knowledge , Attitudes , and Practices Regarding Disinfection Procedures in Italy'. doi: 10.1186/1471-2334-11-148.
- Susan, L., Pamela, C., Kristine, G., Janelle, H., Laura Croft, M., Victor, S. and Rita, Y. (2010) *Clinical practice Guidelines, Society of urological nurses and associates (SUNA)*. Available at: www.suna.org.
- Talaat, M., Hafez, S., Saied, T., Elfeky, R. and El-shoubary, W. G. P. (2010) 'Surveillance of catheter-associated urinary tract infection in 4 intensive care units at Alexandria university hospitals in Egypt', *American Journal of Infection Control*. Elsevier Ltd, 38(3), pp. 222–228. doi: 10.1016/j.ajic.2009.06.011.
- Taleschian-tabrizi, N., Farhadi, F., Madani, N. and Mokhtarkhani, M. (2015) 'Compliance With Guideline Statements for Urethral Catheterization in an Iranian Teaching Hospital', *International Journal of Health Policy and Management*, 4(12), pp. 805–811. doi: 10.15171/ijhpm.2015.128.
- Tarkang, E. E. and Zotor, F. B. (2015) 'Application of the Health Belief Model (HBM) in HIV Prevention : A Literature Review', 1(1), pp. 1–8. doi: 10.11648/j.cajph.20150101.11.
- Taylor, D., Bury, M., Campling, N., Carter, S., Garfied, S., Newbould, J. and Remie, D. T. (2007) 'A Review of the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) to study and predict health related behaviour change February 2007 (Draft for C',

National Institute for Clinical Excellence, February, pp. 1–19.

Thomas Hagerty, Louise Kertesz, J. Michael Schmidt, Sachin Agarwal, Jan Claassen, Stephan A. Mayer, Elaine L. Larson, J. S. (2015) ‘Risk factors for catheter-associated urinary tract infections in critically ill patients with subarachnoid hemorrhage’, *Journal Neuroscience Nursing*, 47(1), pp. 51–54. doi: 10.1097/jnn.0000000000000111.

V.Geng, H.Cobussen-Boekhorst, J.Farrell, M.Gea-Sanchez, I. Pearce, T. Schwennesen, S. Vahr, C. V. (2012) ‘Evidence-based Guidelines for Best Practice in Urological Health Care Catheterisation Indwelling catheters in adults Urethral and Suprapubic’, *European Association of Urology Nurses (EAUN)*, pp. 1–111. Available at: http://www.uroweb.org/fileadmin/EAUN/guidelines/EAUN_Paris_Guideline_2012_LR_online_file.pdf.

Wald, L. H., Ma, A., Bratzler, W. D. and Kramer, M. A. (2012) ‘Indwelling Urinary Catheter Use in the Postoperative Period Analysis of the National Surgical Infection Prevention Project Data’, *Journal of American Medical Association*, 143(6), pp. 551–557. Available at: [http://www.ucdenver.edu/academics/colleges/medicalschoo/departments/medicine/hcpr/cauti/documents/TeamPublications/Indwelling Urinary Catheter Use in the Postoperative Period Analysis of The National Surgical Infection Prevention.pdf](http://www.ucdenver.edu/academics/colleges/medicalschoo/departments/medicine/hcpr/cauti/documents/TeamPublications/Indwelling%20Urinary%20Catheter%20Use%20in%20the%20Postoperative%20Period%20Analysis%20of%20The%20National%20Surgical%20Infection%20Prevention.pdf).

Weber, D. J., Sickbert-Bennett, E. E., Gould, C. V, Brown, V. M., Huslage, K. and Rutala, W. a (2011) ‘Incidence of catheter-associated and non-catheter-associated urinary tract infections in a healthcare system.’, *Infection control and hospital epidemiology*, 32(8), pp. 822–823. doi: 10.1086/661107.

Wicks, K. (2015) *Investigation of Nursing Knowledge of Catheter Selection following the Introduction of a Catheter Decision Support Tool*. Australian Catholic University.

William B. Munier (2010) *AHRQ ’s Efforts to Prevent and Reduce Healthcare-Associated Infections*. Available at: www.ahrq.gov.

Annex A: Information document and informed consent (English version)

Information document (English version)

I am Jacqueline MUKAKAMANZI and I am studying Masters of Nursing in Critical Care and Trauma at the College of Medicine and Health Sciences of University of Rwanda. As per course requirements, I am going to conduct a research on intensive care unit (ICU) Nurses' knowledge, attitude and practice towards the prevention of catheter associated urinary tract infection and so I would like to ask you some questions about CAUTI prevention.

The purpose of this study is assess the knowledge, attitude and practice of ICU nurses towards the prevention of CAUTI. The results to be retrieved from this study will be used for nursing practice, education and further research that shall contribute to the quality of care and improvement of critical patient's outcome via appropriate handling of indwelling urinary catheter (IUC).

You have been chosen for this study because as ICU nurse, you are responsible for providing usual assessment and management of patients with IUC; you are also responsible for sterile insertion of catheter, its maintenance and its timely removal in order to prevent UT catheter related infection. Your participation in this study is voluntary and if you decide to take part you are still free to stop the interview or to withdraw at any time without having to provide a reason. Some possible risks that you may encounter are taking your time to fill in the questionnaire and potential disruption of ward routine activities. All the information that you are going to provide will remain confidential and you don't need to mention your name.

All data collected will be coded and stored securely and cannot be accessed by any third parties. For this reason, you are kindly requested to give your sincere and truthful answer about demographic data, knowledge, attitude and practice in relation to CAUTI prevention. All this is completely on voluntary bases and your refusal from participation or to answer questions will not affect your working environment and will have no effect on your life. Note that there is no reward or payments for participating in this study.

If you have further questions or would like to know the results of this study, please feel free to contact the principal investigator on

Investigator: MUKAKAMANZI Jacqueline; Tel: 0788215046/0784174960 or using email: manzijacky@gmail.com.

Supervisor: Dr Darius GISHOMA; Tel: 0783071616 or email: gisho3@yahoo.com

Co-supervisor: Prof. BUSISIWE Rose Mary Bhengu; email: bhengub2@ukzn.ac.za

In case you are not comfortable with the process of the research, please contact the research committee on:

Director for Research, Innovation and Postgraduate studies: Prof GAHUTU Jean Bosco; Tel +250 783340040 or on email: j.b.gahutu@ur.ac.rw

Director of Grants and Research Support: Dr Asiimwe- Kateera Brenda; Tel: +250 784841256 or on email: bkateera@gmail.com

Thank you.

Informed consent (English version)

I, have been informed about the purpose, objectives and process of this study. I also understood that the research imposes no risk and no complication to me and my family.

I have been told that if I feel discomfort to respond to any of the question, I feel free to drop it any time I wish to do so. I have understood the information given and that the participation is completely voluntary based and that no rewards or payment is to be provided. I have been told that my answers to the questions will not be given to anyone and not expect to write my name. Now I am giving my consent to participate in the study voluntarily.

.....Yes, I want to participate in the study (Please go to the next page).

.....No, I don't want to participate in the study (Thank you very much!).

Witness: Signature.....Date.....

Investigator: Signature.....Date.....

A copy of this consent form should be given to you.

Annex B: Questionnaire (English).

This questionnaire was prepared based on 2009 CDC guidelines for prevention of catheter-associated urinary tract infections published by Healthcare Infection Control Practices Advisory Committee (HICPAC)

General instruction: This instrument is divided into 4 sections. Section A is related to your personal data. Section B is your knowledge about Catheter Associated Urinary Tract Infections (CAUTI) prevention. Section C is your attitude related to CAUTI prevention. Section D is your practices regarding CAUTI prevention.

SOCIODEMOGRAPHIC CHARACTERISTIC OF RESPONDANTS

Instruction: Please fill in the provided space or put an X in the area provided.

1. Age:years
2. Sex (Put a X in the appropriate place)

Male	Female

3. **Level of education and have a license to practice.**

Qualification	Answers	License to practice
Associate Nurse (A2 level)		
Nursing Diploma (A1 level)		
Bachelors' degree in Nursing		
Masters' degree in Nursing		

4. Professional experience in ICU and training in one area of infection control practices

Years of experience in ICU	Answers	Training	
		Yes	No
Less than 1 year			
1-5 years			
6-10 years			
11-15 years			
16-20 years			
Above 21 years			

SECTION B: Knowledge of nurses on urinary catheter indications and CAUTI prevention.

Instruction: Please read carefully the statement and circle the most correct answer.

1. Among the following what is an inappropriate indication for indwelling urinary catheterization?

- a. Acute urinary retention and bladder obstruction.
- b. Getting urine for culture when the patient can void voluntarily
- c. Need for accurate measurements of urinary output in patients who are severely ill.
- d. To ensure comfort for end of life care.

2. Which is an appropriate indication of urinary catheterization among the following?

- a. Measurement of the urine output that can be obtained by means other than urinary catheter.
- b. As a replacement for nursing care for the patient or resident with incontinence
- c. For prolonged postoperative duration without appropriate indications
- d. Patients expected to receive a great amount of infusions or diuretics during surgery

3. Read the following carefully and select the proper technique used for indwelling urinary catheter Insertion?

- a. Using clean technique with clean equipment.
- b. Using clean technique with sterile equipment
- c. Using aseptic technique with sterile equipment
- d. Using aseptic technique with clean materials

4. Based on CDC 2009 Guidelines for prevention of Catheter associated urinary tract infection, operative patients who have been catheterized, it is advised to remove the catheter as soon as possible post operatively, preferably within in

- a. 24 hours
- b. 6 hours
- c. 36 hours
- d. 12 hours

5. As a nurse in critical care unit, you find that the indwelling urinary catheter is obstructed during your patient assessment, what are you going to do?

- a. Change the catheter immediately
- b. Notify the physician
- c. Clamping indwelling catheters and wait for the physician order
- d. Perform instillation of antiseptic or antimicrobial solutions into urinary drainage bag.

6. One of the following is not a nursing action to prevent infections from urinary catheter?

- a. Maintain continuous urine flow.
- b. Changing the urinary catheters or drainage bags only at routine and fixed intervals
- c. Keep the collecting bag under the level of the bladder at all times.
- d. Empty the collecting bag regularly using a separate, clean collecting container for each patient

7. Which one among the following is a risk factor for CAUTI?

- a. Prolonged immobility
- b. Using aseptic techniques during catheter insertion
- c. Prolonged time of catheterization
- d. None one of the above

8. Among the following category, which patient is at high risk of mortality or developing CAUTI?

- a. Children less than 12 years old
- b. Young adult between 18-25 years old

- c. Adult patients of 30-50 years old
- d. Elderly patients of more than 65 years and women

9. Prior to inserting urinary catheter a nurse has to perform all of the following to prevent CAUTI except:

- a. Hand hygiene immediately before and after insertion or any manipulation of the catheter device or site.
- b. Only properly trained persons who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility.
- c. Properly secure indwelling catheters after insertion to prevent movement and urethral traction.
- d. None of the above

10. All the following are complications of CAUTI except:

- a. Death
- b. Sepsis
- c. Hypertension
- d. Hemorrhage

SECTION C: Attitude of ICU nurses towards CAUTI prevention.

Instruction: Please read the statement carefully and tick the box that most closely reflects your answer to the following questions. Use number: **3** for “Agree”, **2** for “neither agree nor disagree”, **1** for “disagree”

Nursing rating	5	4	3	2	1
Statements					
The use of gloves and gown, during any manipulation of the catheter or collecting bag decrease the incidence of CAUTI.					
Education about basic catheter care helps to prevent CAUTI					
CAUTI is not a very serious disease.					
It helps if CAUTI prevention is in high priority list of hospitals					

CAUTI is a common problem and almost impossible to prevent it					
Maintaining a closed drainage system prevents CAUTI					
Catheter should be removed whenever it is convenient for healthcare provider (HCP)					
Catheter can be inserted for nursing staff convenience.					

SECTION D: Checklist to assess the Practice of ICU nurses towards CAUTI prevention

Observational checklist on ICU nurses practice regarding CAUTI prevention.

Instruction: Please read the statement carefully and put an X in the box that most closely reflects your answer to the following questions.

Elements performed by nurses to prevent CAUTI	YES (Y)	NO (N)	NOT APPLIED (X)
Catheter indications			
<ol style="list-style-type: none"> 1. The patient meet at least one of the appropriate indications 2. Being familiar with the use of catheter alternatives like condom or adsorbent pads. 			
Hand hygiene			
<ol style="list-style-type: none"> 1. Wash hand before and after insertion 2. Handwshing before catheter manipulation 3. Hand washing after catheter insertion 			
Inserting the catheter			
<ol style="list-style-type: none"> 1. Use sterile equipment like sterile gloves, drape, sponges and solution. 2. Use aseptic technique to insert the catheter 3. Use a single used bottle for lubricant 4. Secure indwelling catheter properly after insertion to prevent movement and urethral traction 			
Catheter maintenance			
<ol style="list-style-type: none"> 1. Keep the catheter and collecting tube free from kinking 			

<ol style="list-style-type: none"> 2. Always keep the collecting bag below the bladder. 3. Empty the collecting bag regularly and use a separate, clean urine collecting jug for each patient 4. Maintain the closed system all the time 5. Keep the urine collecting bag out off the floor 6. Avoid contact of the drainage spigot with the collecting container. 7. Perform routine hygiene (cleansing of the perianal area during daily bathing or showering) 8. Use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system. 			
Catheter removal			
<ol style="list-style-type: none"> 1. The facility has any catheter removal protocol. 2. Protect yourself during catheter removal 3. Removed date recorded 			

Annex F: CDC GUIDELINE FOR PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS 2009

I. Appropriate Urinary Catheter Use

A. Insert catheters only for appropriate indications, and leave in place only as long as needed.

1. Minimize urinary catheter use and duration of use in all patients, particularly those at higher risk for CAUTI or mortality from catheterization such as women, the elderly, and patients with impaired immunity.

2. Avoid use of urinary catheters in patients and nursing home residents for management of incontinence.

a. Further research is needed on periodic (e.g., nighttime) use of external catheters (e.g., condom catheters) in incontinent patients or residents and the use of catheters to prevent skin breakdown.

3. Use urinary catheters in operative patients only as necessary, rather than routinely.

4. For operative patients who have an indication for an indwelling catheter, remove the catheter as soon as possible postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use.

B. Consider using alternatives to indwelling urethral catheterization in selected patients when appropriate.

1. Consider using external catheters as an alternative to indwelling urethral catheters in cooperative male patients without urinary retention or bladder outlet obstruction.

2. Consider alternatives to chronic indwelling catheters, such as intermittent catheterization, in spinal cord injury patients.

3. Intermittent catheterization is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunction.

4. Consider intermittent catheterization in children with myelomeningocele and neurogenic bladder to reduce the risk of urinary tract deterioration.

5. Further research is needed on the benefit of using a urethral stent as an alternative to an indwelling catheter in selected patients with bladder outlet obstruction.

6. Further research is needed on the risks and benefits of suprapubic catheters as an alternative to indwelling urethral catheters in selected patients requiring short or long-term catheterization, particularly with respect to complications related to catheter insertion or the catheter site.

II. Proper Techniques for Urinary Catheter Insertion

A. Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site.

B. Ensure that only properly trained persons (e.g., hospital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility.

C. In the acute care hospital setting, insert urinary catheters using aseptic technique and sterile equipment.

1. Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion.
2. Routine use of antiseptic lubricants is not necessary.
3. Further research is needed on the use of antiseptic solutions vs. sterile water or saline for periurethral cleaning prior to catheter insertion.

D. In the non-acute care setting, clean (i.e., non-sterile) technique for intermittent catheterization is an acceptable and more practical alternative to sterile technique for patients requiring chronic intermittent catheterization.

1. Further research is needed on optimal cleaning and storage methods for catheters used for clean intermittent catheterization.

E. Properly secure indwelling catheters after insertion to prevent movement and urethral traction.

F. Unless otherwise clinically indicated, consider using the smallest bore catheter possible, consistent with good drainage, to minimize bladder neck and urethral trauma.

G. If intermittent catheterization is used, perform it at regular intervals to prevent bladder over distension.

H. Consider using a portable ultrasound device to assess urine volume in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions.

1. If ultrasound bladder scanners are used, ensure that indications for use are clearly stated, nursing staff are trained in their use, and equipment is adequately cleaned and disinfected in between patients.

III. Proper Techniques for Urinary Catheter Maintenance

A. Following aseptic insertion of the urinary catheter, maintain a closed drainage system.

1. If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment.
 2. Consider using urinary catheter systems with preconnected, sealed catheter-tubing junctions.
- B. Maintain unobstructed urine flow.
1. Keep the catheter and collecting tube free from kinking.
 2. Keep the collecting bag below the level of the bladder at all times. Do not rest the bag on the floor.
 3. Empty the collecting bag regularly using a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the nonsterile collecting container.
- C. Use Standard Precautions, including the use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system.
- D. Complex urinary drainage systems (utilizing mechanisms for reducing bacterial entry such as antiseptic-release cartridges in the drain port) are not necessary for routine use.
- E. Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised.
- F. Unless clinical indications exist (e.g., in patients with bacteriuria upon catheter removal post urologic surgery), do not use systemic antimicrobials routinely to prevent CAUTI in patients requiring either short or long-term catheterization.
1. Further research is needed on the use of urinary antiseptics (e.g., methenamine) to prevent UTI in patients requiring short-term catheterization.
- G. Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place. Routine hygiene (e.g., cleansing of the meatal surface during daily bathing or showering) is appropriate.
- H. Unless obstruction is anticipated (e.g., as might occur with bleeding after prostatic or bladder surgery) bladder irrigation is not recommended.
1. If obstruction is anticipated, closed continuous irrigation is suggested to prevent obstruction.
- I. Routine irrigation of the bladder with antimicrobials is not recommended.

J. Routine instillation of antiseptic or antimicrobial solutions into urinary drainage bags is not recommended.

K. Clamping indwelling catheters prior to removal is not necessary.

L. Further research is needed on the use of bacterial interference (i.e., bladder inoculation with a nonpathogenic bacterial strain) to prevent UTI in patients requiring chronic urinary catheterization.

Management of Obstruction

Q. If obstruction occurs and it is likely that the catheter material is contributing to obstruction, change the catheter.

R. Further research is needed on the benefit of irrigating the catheter with acidifying solutions or use of oral urease inhibitors in long-term catheterized patients who have frequent catheter obstruction.

S. Further research is needed on the use of a portable ultrasound device to evaluate for obstruction in patients with indwelling catheters and low urine output.

T. Further research is needed on the use of methenamine to prevent encrustation in patients requiring chronic indwelling catheters who are at high risk for obstruction.

IV. Quality Improvement Programs

A. Implement quality improvement (QI) programs or strategies to enhance appropriate use of indwelling catheters and to reduce the risk of CAUTI based on a facility risk assessment.

The purposes of QI programs should be: 1) to assure appropriate utilization of catheters 2) to identify and remove catheters that are no longer needed (e.g., daily review of their continued need) and 3) to ensure adherence to hand hygiene and proper care of catheters. Examples of programs that have been demonstrated to be effective include:

1. A system of alerts or reminders to identify all patients with urinary catheters and assess the need for continued catheterization
2. Guidelines and protocols for nurse-directed removal of unnecessary urinary catheters
3. Education and performance feedback regarding appropriate use, hand hygiene, and catheter care
4. Guidelines and algorithms for appropriate peri-operative catheter management, such as:
 - a. Procedure-specific guidelines for catheter placement and postoperative catheter removal

- b. Protocols for management of postoperative urinary retention, such as nurse-directed use of intermittent catheterization and use of bladder ultrasound scanners

V. Administrative Infrastructure

A. Provision of guidelines

1. Provide and implement evidence-based guidelines that address catheter use, insertion, and maintenance.
 - a. Consider monitoring adherence to facility-based criteria for acceptable indications for indwelling urinary catheter use.

B. Education and Training

1. Ensure that healthcare personnel and others who take care of catheters are given periodic in-service training regarding techniques and procedures for urinary catheter insertion, maintenance, and removal. Provide education about CAUTI, other complications of urinary catheterization, and alternatives to indwelling catheters.
2. When feasible, consider providing performance feedback to these personnel on what proportion of catheters they have placed meet facility-based criteria and other aspects related to catheter care and maintenance.

C. Supplies

1. Ensure that supplies necessary for aseptic technique for catheter insertion are readily available.

D. System of documentation

1. Consider implementing a system for documenting the following in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who inserted catheter, and date and time of catheter removal.
 - a. Ensuring that documentation is accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes is suggested. Electronic documentation that is searchable is preferable. **(Category II)**

E. Surveillance resources

1. If surveillance for CAUTI is performed, ensure that there are sufficient trained personnel and technology resources to support surveillance for urinary catheter use and outcomes.

Annex G: Authorization to use the tool

From: Ryan Michael Oducado [mailto:roducado@yahoo.com]

Sent: 23 September 2016 05:17 AM

To: Busisiwe Bhengu

Subject: Re: Request for a tool

Dear Prof. Busi,

Thank you for your interest in our study. You are hereby granted to use the tool. The items on the scale are available online in the article. However, no soft copy is available on hand of the instrument.

All the best,
Ryan