

**FACTORS ASSOCIATED WITH ADHERENCE TO
TRACHEOSTOMY CARE GUIDELINES AMONG
CRITICAL CARE NURSES AT KENYATTA NATIONAL
HOSPITAL**

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MASTER OF SCIENCE

(Nursing)

**JOMO KENYATTA UNIVERSITY OF
AGRICULTURE AND TECHNOLOGY**

2022

**Factors Associated with Adherence to Tracheostomy Care
Guidelines among Critical Care Nurses at Kenyatta National
Hospital**

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**A Thesis Submitted in Partial Fulfillment of the Requirements for
the Degree of Master of Science in Nursing of the Jomo Kenyatta
University of Agriculture and Technology**

2022

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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This thesis has been submitted for examination with approval from us as the university supervisors

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DEDICATION

This work is dedicated to my family. My father Engineer Henry Omwancha Ochoki and my beloved mother Zipporah Magere Ochoki. Your sacrifice to see me walk this journey is a blessing I hold dear in my heart. My siblings Emmah Nyanchera, Sharon Bochareri and Joseph Gekonde your immense prayers and encouragement is what makes you my dear family. God bless you all abundantly.

ACKNOWLEDGEMENT

I acknowledge my supervisors Dr Mutisya Albanus and Dr Elijah Mwangi for the countless times I have had to seek your support and the selfless dedication you had with my work. May many blessings come your way. Much appreciation also to Dr Drusilla Makworo and Dr Bernard Mbithi who gave me lots of encouragement to join post graduate program in nursing after finishing my undergraduate studies at the school of nursing. Together with the entire team in the school of nursing, I am deeply humbled for your support. I do acknowledge also my research assistant Stella Kamau of Kenyatta National Hospital ICU and the entire staff in the unit. Without you, this work could not be a success. Last and not least is my unit manager at Avenue hospital Thika Mr. Gabriel Njuguna Kilonzo and Prisca Makau of Kenyatta National Hospital School of Nursing whom have not only been close friends but a great resource that I have consulted many times. Together with all my classmates and others not mentioned I thank you all.

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ABBREVIATIONS AND ACRONYMS

AACN	American Association of Critical Care Nurses
AGREE	Appraisal of Guidelines for Research and Evaluation Instrument
ARCC	Advancing Research and Clinical Practice through Close Collaboration
CC	Critical Care
CPGS	Clinical Practice Guidelines
EBP	Evidence Based Practice
EBTCG	Evidence Based Tracheostomy Care Guidelines
GRADE	Grades of Recommendation Assessment, Development and Evaluation
GTC	Global Tracheostomy Collaborative
JKUAT	Jomo Kenyatta University of Agriculture and Technology
NTSP	National Tracheostomy Safety Project
PARIHS	Promoting Action on Research in Health Services
PICOT	Population, Intervention, Comparison, Outcome, Time
RCT	Randomized Controlled Trials

DEFINITION OF TERMS

Adherence	The act of sticking to something figuratively or literally
Evidence	The available body of facts indicating whether a proposition is valid
Guideline	A statement which is a principle that determines a way of acting
Determinant	A factor or characteristic affecting outcome of something
Tracheostomy Care	Process of cleaning tracheostomy site, change of inner Cannula, change of dressing and tracheostomy tube holder, and suctioning if required.
Tracheostomy	A tracheostomy is an opening created surgically in the anterior wall of the trachea inferior to the cricoid cartilage.

ABSTRACT

Tracheostomy care should be undertaken using evidence based guidelines. Failure to use these guidelines leads to a higher risk of poor prognosis, which causes burden to the patient, patient's family and to healthcare workers including nurses. Several factors affect adherence to tracheostomy care guidelines among nurses in critical care units. The objective of this study is to establish factors associated with adherence to tracheostomy care guidelines among critical care nurses in Kenyatta National Hospital. An analytical cross-sectional study was carried out at the critical care unit. A total of 79 nurses were recruited into the study through a census method. An observational checklist was used to collect data on adherence level while performing tracheostomy care on a single observation. A self-administered questionnaire was then used to collect data on reported adherence and nursing and health system factors affecting adherence. Data was analyzed using R studio version 1.4.1103. Descriptive statistics was used to describe data. Pearson's Chi square test and Fishers exact test was used to identify significant factors for binary logistic regression in the multivariate analysis. Significant factors were those with a P value of less than 0.05 with a 95% confidence interval. Mean age of the nurses was 39.1 years with females 56 (70.9%) being the majority. On observation of tracheostomy care 18(22.8%) nurses adhered to tracheostomy care guidelines while 61(77.2%) did not. On filling a self-reporting tool on adherence those who adhered were 41(51.9%) while 38(48.1%) did not adhere. Among the nursing factors affecting adherence, knowledge of the nurses on tracheostomy care guidelines was significantly associated with adherence in the multivariate analysis (AOR= 4.29; 95%CI= 1.19-17.90; P=0.031). In the bivariate analysis of health system factors, status of critical care unit workload (OR=3.47; 95%CI= 1.18-10.8 P= 0.025) and awareness of hospital management strategies and activities regarding tracheostomy care guidelines (OR= 0.01; 95%CI: 0.05-0.73; P=0.016) were significantly associated with adherence. In the multivariate analysis, hospital management strategies and activities regarding tracheostomy care guidelines was the only health system factor significantly associated with adherence (AOR= 0.21; 95%CI= 0.05-0.73; P=0.019). In conclusion, majority of the nurses did not adhere to tracheostomy care guidelines on observation compared to their self-reports in the questionnaire. Knowledge of tracheostomy care guidelines and awareness of hospital management strategies and activities regarding tracheostomy care guidelines were the factors affecting adherence to the guidelines. This study therefore recommends nurses in the unit to increase adherence to tracheostomy care guidelines through problem-based learning. Nurse managers in the hospital should also ensure nurses are informed of hospital policies regarding application of new tracheostomy care guidelines in the unit to increase adherence to the guidelines.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Tracheostomy placement is indicated for acute respiratory failure and for traumatic or neurologic insults which leads to airway or mechanical ventilation support. This procedure has been performed from 3600 BC (Pierson, 2005). With a tracheostomy in place, care should be done to maintain its effectiveness and to prevent complications. Tracheostomy care is a routine procedure in critical care units. This care should be performed using evidence based guidelines for better patient outcomes. The care includes cleaning of the stoma site, changing the cannula and suctioning if indicated. The procedure is performed both in adults and children.

In Australia, a study by Garrubra *et al.* (2009) shows high level of adherence to tracheostomy care guidelines leads to decreased complications and death with reduced periods to decanulation. The United Kingdom released tracheostomy care guidelines in 2017, with an aim of enhancing evidence based practice among nurses. In 2010, the ministry of health in Singapore also released a set of guidelines for nursing patients with tracheostomies. The guidelines relied on the strongest evidence and evidence based guidelines. (Ministry of health Singapore nursing clinical practice guidelines, 2010). In California, United States of America (USA) poor outcomes such as tracheal occlusion and stoma ulcers prompted a systematic review of tracheostomy care. Evidence based approach was taken using the Problem, Intervention, Comparison, (PICO) method to evaluate the problem. Tracheostomy care guidelines were made whilst considering actual patient values and beliefs (Melissa & Judy, 2008). Nurses' characteristics and health system factors towards evidence based practice (EBP) need to be known, before developing protocols (Gulzar *et al.*, 2015). These factors are important to be identified as they do affect level of adherence to guidelines such as with tracheostomy care.

Silva *et al.* (2018) in their study found that evidence based guidelines on suctioning of tracheostomized children was not followed by about a third of pediatric intensive

care nurses. Knowledge on evidence based tracheostomy care guidelines was one of the nurse characteristics identified to affect adherence to the guidelines.

The health systems of hospitals should also put strategies to promote high adherence of guidelines such as ensuring resources such as internet are available. Eltayeb *et al.* (2019) in their study in Sudan recommended a partnership between ministry of health in Sudan and hospitals to ensure high adherence to evidence based nursing practice.

Locally, in Kenya the ministry of health in collaboration with relevant organizations is responsible to publish tracheostomy care guidelines for use. In the absence of national guidelines hospitals or qualified health workers can develop the care guidelines.

This study therefore conducted in Kenyatta National Hospital investigated level of adherence to tracheostomy care guidelines and identified the nurse and health system factors which affect the adherence level. The data obtained was used to establish statistically which factors significantly affect adherence to tracheostomy care guidelines and will be presented to critical care nurses in the intensive care unit with the aim of using it to promote adherence level to tracheostomy care guidelines.

1.2 Problem Statement

Adherence to tracheostomy care protocols promote better patient outcomes thus limiting tracheostomy complications. This has benefits to the patient, patient's family and healthcare providers. The challenge with utilization of these guidelines in critical care units is low adherence levels. In their study Welton *et al.* (2016) state there should be adherence level measurement to review patient status during tracheostomy care.

For adherence of tracheostomy care guidelines to be optimal critical care unit nurses must have the requisite characteristics to promote adherence. Proper knowledge, required training and correct attitudes are some. Some critical care unit nurses have inadequate mastery of the knowledge of tracheostomy care guidelines and do not make reference to the guidelines during care. In other cases, evidence based scientific

methods are not used to obtain available level of evidences on tracheostomy care and put them into use. Mc Donough *et al.* (2016) in their study indicate there is low knowledge and confidence with tracheostomy care and they recommend nursing schools should use common evidence based guidelines as effective tools to improve nursing knowledge and self-efficacy with head and neck surgical airways.

The health system should encourage evidence based nursing practice through continuous support with necessary resources. This has however not been the case always. Health systems that lack resources such as computers, internet connection, printing machines and an overburdened nurse workforce are likely to have low adherence to evidence based tracheostomy care guidelines. Identifying the health system factors is just the first step to removing hindrances to the use of evidence based nursing practice. Investment in resources will be needed for high adherence levels (Barzagani, Tabrizi & Aghdash, 2014).

At Kenyatta National Hospital ICU prevalence of tracheostomies are about 40% based on anecdotal reports and observation. These patients develop stoma site infections and end up staying for long at the ICU. This can easily be traced to care that they receive during tracheostomy care. Lack of full application of evidence during tracheostomy care by nurses and inadequate resources by the hospital such as lack of closed system suctioning catheters are a problems faced in the hospital and need to addressed.

1.3 Study Justification

Tracheostomy care is a routine nursing procedure in the critical care unit Azizan *et al.* (2016). This study aims to advance maximum quality of this procedure so as to reduce poor patient outcomes through adherence of evidence based tracheostomy care guidelines. Previous research indicates low utilization of these guidelines and at Kenyatta National hospital critical care unit the protocols are not readily present.

Kenyatta National Hospital ICU was chosen because common reasons for admission include head injuries and sepsis with multiorgan failure. Such patients usually present with acute respiratory failure and require tracheostomies. Tracheostomy care

in these scenarios are normally performed on a routine basis. The bed occupancy is always 100% and this also makes the study site suitable.

This study therefore gives situational analysis of adherence levels towards evidence based tracheostomy care guidelines at the critical care unit and provide recommendations to promote adherence thus leading to improved patient outcomes.

Adherence to these guidelines is affected by various factors. They include nurse related and health system factors. Understanding these factors at Kenyatta National Hospital critical care unit will make it possible for the administration through the nurses to intervene where the factors cause low adherence levels and likewise enhance the factors which cause high adherence levels.

The results from this study offer a basis for further nursing research among critical care nurses in Kenya and globally. This will broaden the knowledge base in nursing and nurses at critical care units will translate the new knowledge to practice for better patient outcomes.

1.4 Research Questions

1. What is the level of adherence towards tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital?
2. Which nurse related factors influence adherence to tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital?
3. Which health system factors influence adherence to tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital?

1.5 Objectives

1.5.1 Broad Objective

To establish factors associated with adherence to tracheostomy care guidelines among critical care nurses at critical care units in Kenyatta National Hospital.

1.5.2 Specific Objectives

- i. To determine level of adherence to tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital.
- ii. To establish nurse related factors influencing adherence to tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital.
- iii. To determine health system factors influencing adherence to tracheostomy care guidelines among critical care nurses at the critical care unit in Kenyatta National Hospital.

1.6 Hypothesis

1.6.1 Null Hypothesis

1. There is no significant relationship between nurse related factors and adherence to tracheostomy care guidelines among ICU nurses at Kenyatta National Hospital.
2. There is no significant relationship between health system related factors and adherence to tracheostomy care guidelines among ICU nurses at Kenyatta National Hospital.

1.7 Theoretical Framework

This study adapted Promoting Action on Research Implementation in Health services (PARiHS) framework by Allison, Gill and Brendan (1998). The framework explains why implementation of evidence into practice is successful or not. The theory argues successful implementation of evidence into practice depends on three factors namely evidence, context and facilitation.

In defining evidence, while accepting the definition as being, the combination of research, clinical expertise and patient choice the theory looked at a spectrum of positions from which research, clinical experience and patient preferences were located in a continuum. For successful utilization of research which supports effectiveness of a clinical intervention, evidence needs to be located at the continuum

where there are randomized controlled trials, systematic reviews and evidence based protocols. Clinical practice and patient values need to be located at the continuum where there is high level of consensus and partnerships respectively.

In this theory the concept of Context is viewed as the environment or where the proposed change is to be implemented. It means an understanding of forces at work which give the setting character and touch. Context has been divided into three: first an understanding of the existing culture such as continuing medical education, secondly the nature of relationships among people summarized as leadership duties and thirdly an organization's continuous monitoring system. The three contexts move in a continuum from those that do not encourage use of evidence (low contexts) to those that support use of evidence (high contexts).

The concept of Facilitation is a process through which one individual makes things simple for others. The term is synonymous to help that is required to change people's attitudes, skills, ways of thinking and working. Within the facilitation concept, the following are identified; first personal characteristics such as openness, secondly role of the facilitator if it is understood or misunderstood and thirdly skills, knowledge and style of the facilitator. In this theory facilitation seeks to concentrate on organizational and professional development of interpersonal and group skills.

The hypothesis of this theory is; successful adherence of research into practice, needs a clearly understood evidence in use, worthiness of context in relation of its reliability to cope with change and facilitation needed to guarantee a successful change. In conceptual terms the equation $SI = (E, C, F)$ is represented to show Evidence (E), Context (C), and facilitation (F) can function (f) in a way in which outcome (successful implementation:SI) can be positive(high) or negative(low).

The assumptions of this theoretical framework are as follows:

1. Evidence entails codified and non-codified sources of knowledge, including research, clinical practice, patient values and experiences.
2. Combining and implementing such evidence into practice is a team work that involves negotiation about benefits, harm and risks of new over the old.

3. Some contexts are good for successful implementation of evidence into practice comparing to others-these are contexts that have strategic leaders, elements of learning organization and appropriate feedback mechanism.
4. There is significance on the need for appropriate facilitation to improve successful implementation. Type of facilitation, role and skill of the facilitator is determined by evidence, resources, culture and values, leadership method and evaluation system.

1.8 Application of the Theory in This Study

Cheryl et al. (2011) in their guide of using PARiHS framework state that the framework provides a companionship for targeted evidence-based practice implementation. In this study the targeted evidence based practice is tracheostomy care

Adherence to the evidence based tracheostomy care guidelines in view of the theoretical framework by Allison, Gill and Brendan (1998) will be either high or low depending on two key concepts namely context and facilitation as identified in the framework. The context in the theory is presented as the setting in which the proposed change is to be implemented. The contexts move in a dimension from low context to high context. Low context does not support successful implementation of evidence while high context does support. In this study the context will be the health system factors. Health system factors such as availability of computer resources will be high contexts while low contexts will be barriers to evidence based practice use such as lack of research utilization policies in the hospital.

Facilitation in the theory is seen as support that is required to implement successfully evidence. It includes knowledge, attitude and ways of working. The theory goes ahead to propose that facilitation is done by a facilitator who should have a clear role of evidence implementation. In this study the facilitator is the critical care unit nurse who has various characteristics in terms of knowledge of evidence based practice on tracheostomy care, research skills, evaluation skills and attitude.

The equation presented in the theory SI (successful implementation) =f (function of) (E: evidence C: context, Facilitation) or simply $SI=f(E, C, F)$ for conceptualization is thus applicable to this study because adherence to evidence based tracheostomy care guidelines (SI) will be determined by knowledge of evidence based practice(E), Health system factors(C) and nurse's characteristics(F).

1.9 Conceptual Framework

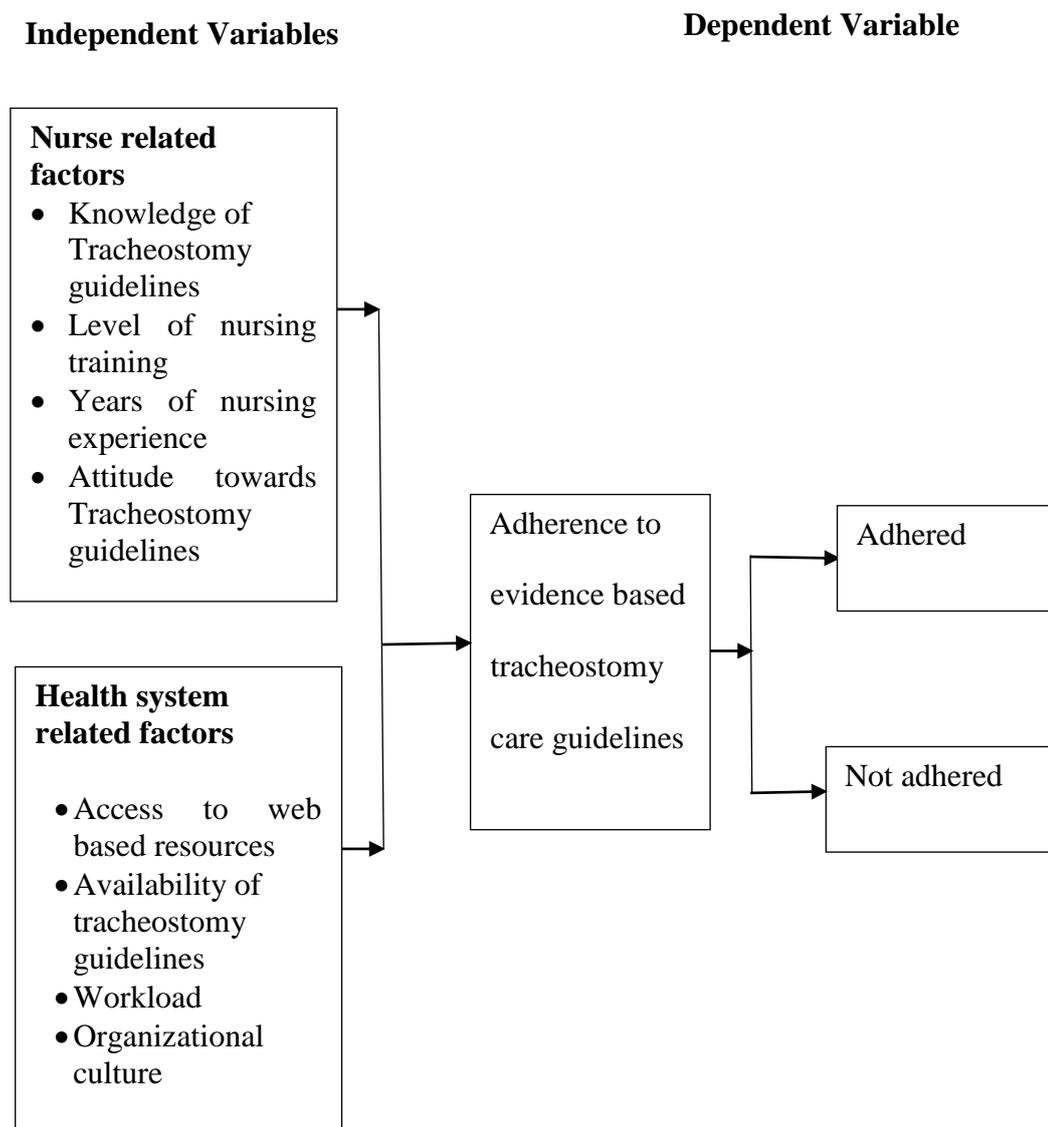


Figure 1.1: Conceptual framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Evidence Based- Nursing Practice

Evidence based practice competencies facilitate effective use of evidence based process. Evidence based practice competencies include; using both internal and external evidence to explain gaps, promoting an evidence based practice work system, coordinating with other health cadres in utilizing evidences and actualizing mechanisms to promote evidence based practice. Hospitals that have clinical guidelines should adopt the competencies to ensure quality improvement in patient care through EBP process. Nurse Managers should endorse the competencies in their policies as well in clinical training curriculums (Melnyk *et al.*, 2017).

Critical thinking is an essential skill required to make evidence based practice a success. Papathanassiou *et al.* (2014) define critical thinking as the mental activity of analysis, synthesis and evaluation of gathered information through seeing, participating and talking that leads to a decision for action. This decision for action is the evidence based process. Applying evidence into practice is a process which requires critical thinking in every step.

Critical thinking skills include; clarity, precision, accuracy and relevance. In answering gaps in tracheostomy care, nurses should use critical thinking skills such as; seeking information, analyzing, interpreting and drawing conclusions from available information. To translate the evidence into practice so that there is adherence requires flexibility, persistence and self-awareness. Critical thinking at the end will have been integrated into three processes in the John Hopkins Evidence based process namely: practice question, evidence and Transition (Deborah & Sandra, 2017).

The evidence based process in a study by Melnyk *et al.* (2017) is successful when there are resources and mentors who have been trained in facilitating evidence based process. In that study, ARCC (Advancing research and clinical practice through close

collaboration) model was tested through control and behavioral theories. Later, evidence based practice mentors were identified to advance EBP in a hospital system. The evidence based process here included seven step process of: cultivating a spirit of inquiry, asking a PICOT-formatted question, collecting, carefully critiquing evidence, using evidence with clinical expertise and client preferences, evaluating and finally disseminating practice change outcomes.

Evidences include scientific research and expert opinions on clinical practice. In hierarchical form levels of evidence from strongest to weakest is; High quality randomized controlled trials (RCT), cohort research, case controls, case series, case reports, animal studies and finally opinions from authority experts. As limitations to this rating of evidence was observed, newer methods of rating have been developed such as Grades of Recommendation Assessment, Development and Evaluation (GRADE). This method looks at all authenticity features of an evidence such as research design, bias, accuracy, consistency of variables, usability and impact of the research. This method is effective especially with clinical guidelines because it considers patient preferences and the need for shared decision making (Djulbegovic, & Guyatt 2017).

Strengths of guidelines recommendations are properly understood by the Grading of Recommendation Assessment, Development and Evaluation (GRADE) system. With proper understanding, there will be distinction of evidence quality and strength of recommendation. This allows observational studies to be upgraded higher in the rank of evidence quality if they fulfill set criteria. Recommendations on guidelines are made on each outcome of interest and do not depend on the quality of evidence. Other factors affecting settling on a recommendation include cost implications and patient values and beliefs. Recommendations move from strong for utilization to weak against utilization (Goldet & Howick, 2013).

In the revision and validation of Iowa model of evidence-based practice by Buckwalter et al. (2017) the model remains a practical guide for the EBP process. The model was validated across diverse settings. The 7 steps of evidence based process in the model are: selection of a topic, forming a team. Evidence retrieval,

grading the evidence, developing an EBP standard, implementing the EBP and evaluation.

The evidence based processes can simply be stated as framing a clinical question in practice gap, retrieving best evidence systematically to solve the gap, appraising the evidence, applying the results to a patient and evaluating the results of the evidence.

2.2 Evidence-Based Tracheostomy Care Guidelines

The Sicily statement on research based care by Dawes *et al.*, (2011) states that evidence based practice requires tasks in healthcare to be based on the best available, current, valid and relevant evidence. These decisions should be made by patients and informed nurses within the confines of available resources. These guidelines should put into consideration patients values and preferences.

Several evidence based tracheostomy care guidelines can be applied by critical care nurses depending on unique presenting scenarios of individual patients. The National tracheostomy safety project (NTSP) is one such organization that has worked to develop resources for tracheostomy care that are evidence based. They have a focus on basic care, emergency care and quality improvement. These evidence based tracheostomy care guidelines come in documents, papers, video and media. The guidelines collectively termed as comprehensive tracheostomy care, combines various evidence levels while considering patient values. They have been developed in collaboration with Global Tracheostomy Collaborative (GTC) which implements best practices and conducts research to facilitate improvement in tracheostomy care (National tracheostomy safety project, 2019).

Patients with reversible conditions leading to tracheostomy tube placement should be prepared for decannulation. This reduces incidences of complications. Decannulation should be undertaken through use of the nursing process guided by evidence based decannulation guidelines. The American association of critical care nurses provides a 10 step tracheostomy progression to decannulation. A checklist for tracheostomy progression to decannulation should also be complete for successful decannulation. The

association places nurses on the lead to facilitate decanulation because they understand the unique patient values (Morris, McIntosh & Whitmer2014).

In establishing an evidence based protocol for tracheotomy care in adult patients Wang et al. (2017) came up with an evidence based protocol for tracheostomy care which has 5 sections, 16 dimensions and 61 items. The protocol can play an important role in solving unique tracheotomy care problems.

In 2017, the Royal Children's Hospital in Australia published an evidence based tracheostomy care guidelines in their website. These guidelines highlight several spectrum of care including: emergency care, post-operative care of a new tracheostomy, humidification, suctioning, management of abnormal secretions, tracheostomy tie and tube changes, stoma care, oral care, feeding and nutrition, communication, discharge planning, tracheostomy decanulation among others. These guidelines were developed through reviews of peer reviewed articles. The development process included a collaborative effort of the clinical effectiveness committee and the clinical practice guideline group. The guidelines published are reviewed in 3 years to ensure they are up to date with the most recent evidence.

Since many tracheostomy care guidelines are available, critical care nurses should use knowledge of evidence based practice to pick the best. In a systematic review by Siddiqui *et al.* (2013) a total of 80 guidelines were identified and 5 followed Appraisal of guidelines for research and evaluation instrument (AGREE) standards. Among the 5 only 3 covered the entire scope of tracheostomy care.

In London, England while developing tracheostomy care guidelines Dawson (2014) noted there are not enough scientific research to come up with evidence based guidelines. Acknowledging the lack of empirical research on which tracheostomy care is based on is thus important. Consensus from authorities with tracheostomy care was mostly used in developing the care protocol. The guidelines included; indications for a tracheostomy, knowledge on main parts of a tracheostomy tube, 12 principles of nursing care of an adult on a tracheostomy and nursing interventions during emergencies and weaning.

In Kenya evidence based tracheostomy guidelines are available through training manuals used by schools training nursing. These manuals are developed through a thorough review of evidenced by experts in nursing. The ministry of health is responsible to audit and accredit such guidelines through oversight institutions such as Nursing council of Kenya and professional chapters such as Critical care nurses chapter of National Association of Nurses in Kenya (Nursing council of Kenya, 2009). Hospital based standard operating procedures also form part of the guidelines on tracheostomy care available locally in Kenya.

2.3 Adherence to Evidence Based Tracheostomy Care Guidelines among Critical Care Nurses

The dictionary defines adherence as acting in a targeted manner while participating in something. Adherence to evidence based tracheostomy care guidelines benefits both patients, nurses and the health system at large. Ten of eleven practice protocols generate significant financial savings (Kosimbei *et al.*, 2011).

In a hospital in Iran adherence to tracheostomy care guidelines was favorable by 52.8% of the nurses. A significant percentage of 47.2% of the nurses did not comply as required and they needed additional mentorship on evidence based care. Infection prevention measures was the most adhered to aspect of care. This included hand washing and use of sterile gloves (Hasanvand & Abedi 2016). Likewise, in Iran only 2 nurses were found to be fully compliant to a tracheostomy guideline when they were observed. Among the items in the guideline that were performed included explaining procedure to patient by 13 nurses, Oxygenation before suctioning by 21 (50%) nurses and use of closed system suctioning by 36 (85.7%) nurses.

Azizan *et al.* (2016) performed a mixed retrospective and prospective study on assessment of basic post-operative tracheostomy care. The study found tracheostomy care was poor due unavailability of guidelines. In that study they recommended use of tracheostomy guides for better prognosis. In another study done by Heffner (2009) specific plans bring about good tracheostomy care compared to guidelines.

Adherence to Milne Tracheostomy care bundle in a hospital in London was 58% among critical care nursing staff before training on the bundle. After training compliance was 94%. The bundle assessed adherence of guidelines on; humidification, inner cannula care, dressing changes, cuff pressure, weaning and documentation of nursing care plan. This increased adherence led to reduction in decanulation time after discharge from the critical care unit from 21 days to 5 days (Arora *et al.*, 2008).

Mah *et al.* (2016) found adherence to post-operative tracheostomy care guidelines led to reduced time to decanulation and tolerance of oral meals from the normal ranges. Thomas *et al.*, (2017) introduced EBTCG in a hospital and its adherence led to reduction of tracheostomy related skin breakdown around the stoma from 20 of 183 tracheostomies (10.93%) to 2 of 155 tracheostomies (1.29%)

In a one-year prospective study, to find out death rates and factors associated with mortality in the intensive care unit at a hospital in Uganda, Ssemogerere (2013) states protocols should be available in print and followed while managing intensive care patients. In that study, ventilated patients generally had a high death rate, while the use of tracheostomy care guidelines was associated with low mortality. This points out high adherence to tracheostomy care guidelines can lead to nil or reduced mortality rates.

Introduction, training and adherence to a clinical care pathway on tracheostomies among nurses at a Veterans hospital in USA led to; increased competence in providing care and reduced readmissions, compared to pretest period. There was also improved readiness of patients to be discharged due to health education on tracheostomy care that nurses taught patients (Pandian *et al.*, 2016).

Although many guidelines are adopted into clinical practice, adherence is sometimes poor. In developing a ventilator associated pneumonia bundle in a nursing facility, nurses had challenges adhering to tracheostomy cuff seal guidelines (Guthrie *et al.*, 2018). Leddy and Wilkinson (2015) state that although critical care nurses were aware of evidence based guidelines, there was inconsistency between adherence and self-reported practice in tracheostomy care.

2.4 Factors Influencing Adherence to Tracheostomy Care Guidelines among Critical Care Nurses

The factors that influence adherence to tracheostomy care guidelines in this section of literature review are grouped into nursing factors and health system factors.

2.4.1 Nurse Related Factors Influencing Adherence to Evidence Based Tracheostomy Care Guidelines

Nurse related predictors of adherence to tracheostomy care guidelines in intensive care unit can include knowledge of the guidelines (EBTCG), attitude, years of nursing experience, time constraints, level of training and their attitude towards EBTCG.

In a study to measure compliance to tracheostomy care guidelines in a hospital in Iran, factors such as age, years of nursing experience and level of training positively affected adherence to evidence based tracheostomy care guidelines. In that study all nurses were female 72 (100%), their mean age and years of experience was 37.34 and 9.26 years respectively. Nurses who had permanent employment status also showed high adherence levels compared to those on contractual employment (Hasanvand & Abedi 2016).

To assess utilization of evidence based practice in Kazakhstan attitude was determined as one of the contributing factors. The attitude factor of resenting audit on practice had the highest score while that of sticking to tried and tested methods rather than changing to new evidence had the lowest and thus most negative. Nurses agreeing to put their time to evidence based practice were 12.83% while those accepting audit to their practice was 18.42% Pulatova (2019).

In India Dhaliwal et al. (2018) established a weak positive correlation between knowledge and adherence of tracheostomy care guidelines. In that study 43% of the nurses had good knowledge score on tracheostomy guidelines while the remaining had average scores. Kalhor et al. (2017) in their study found level of nurses' knowledge on research based interventions was average and advised on educational

techniques using needs review can improve knowledge research guided interventions. Lack of research, resources, time, inadequate skills, lack of knowledge and financial barriers were found out to be the common hindrances to evidence based practice by (Sadegi, Tabrizi & Azami, 2014). Although nurses knew the benefits of EBP to patients care they perceived their own evidence- based practice knowledge and skills inadequate (Saunders & Julkunen, 2015). To develop an educational syllabus for provision of research guided care Onuha (2019) noted nurses had poor knowledge on evidence guided interventions which can lead to infections.

Pritchett et al. (2017) found out nurses aware of tracheostomy care protocols and have experience with tracheostomy care compared to non ICU colleagues. This was due to differences in teaching. In the same study new nurses of less than 5 years' at work felt uneasy with frequent tracheostomy tube changes compared to their old colleagues. This shows that comfort with tracheostomy care and utilization of its guidelines varied as a function of nursing experience in both duration and work in the ICU. In that study nurses who had a training of degree and above were 102 (79%). Senior nursing officers were 7 (5%) and were the ones with specialized training.

In a study to establish factors influencing adherence to EBP Barako (2011) found that age of nurses does not have a significant association with evidence based practice. In the same study he observed time constrain due to busy nature of work at the ICU was a barrier to adherence of EBP.

Books, colleagues and doctors were found to be common sources of research information among nurses at a teaching and referral hospital in Kenya in a study conducted by Mugambi (2013). Low awareness to published work as an information source in this study was because of insufficient publicity of research work by institutions and also few work being done. This was despite computer technology being taught as part of the nursing training.

In USA, Surveillance among nurses led to high adherence to a tracheostomy care protocol. Surveillance was a reinforcement method to ensure adherence to the guidelines. This strategy led to decreased incidences of fatal mucus plugging. In incidences where mucus plugging occurred, recovery was quick and outcomes were

positive. This guideline was recommended for clinical practice in USA while considering reinforcement through surveillance as an important factor among nurses leading to adherence to tracheostomy care guidelines (Masood *et al.*, 2018).

In a hospital in Ireland, clinical experience and tracheostomy care training was found to increase confidence with emergency tracheostomy care. This was in comparison to those with no training or prior experience. In the same hospital tracheostomy care guidelines was known among only few of the staff undergoing critical care training. Incorporating evidence based guidelines in training was viewed crucial in creating awareness, skills, knowledge and confidence for promoting adherence to tracheostomy care guidelines (Nizam *et al.*, 2016).

2.4.2 Health System Factors Influencing Adherence to Evidence Based Tracheostomy Care Guidelines

Health system factors affecting adherence to evidence based practice include access to the internet, resources such as computers, workload below standard ratio and availability of evidence based guidelines within the health system. Hospital culture of resistance to new practices, Management support and availability of equipment to utilize evidence into practice are also others. (Williams, Perillo & Brown, 2015).

Tracheostomy care is complicated and it brings the need for hospitals to improve it through assessment of different cadres undertaking it including tracheostomy nurse specialists. For better quality, tracheostomy care plans should be introduced and also be evaluated based on evidence based tracheostomy care guidelines (Liu *et al.*, 2014). Pritchett (2016) states evidenced based tracheostomy care training of one nurse as the leader of a multidisciplinary tracheostomy care team in hospitals will reduce differences that arise from nursing school training and improve on patient outcomes.

Mpaata, Lubogoyi and Okiria (2017) found a relationship between hospital resources and patient care in several parameters, management being one. They further state hospital managers are supposed to be equipped with skills to lead with a motivation so that there are good patient outcomes through availing resources required.

Institutionalizing programs for tracheostomy care among critically ill patients in hospitals leads to improved tracheostomy discharge numbers, reduced mortality and morbidity. These programs should use evidence based process where patient values and beliefs are highly considered during tracheostomy insertion and tracheostomy care. The family members are also supposed to be continually consulted on every aspect of tracheostomy care by physicians and nurses (Pan *et al.*, 2015).

To adhere to evidence guided procedures Gardner et al. (2016) used journal discussions in a health facility to help nurses utilize guidelines. This approach got rid of excuses to adherence such as lack of time, lack of knowledge, or heavy workload.

With advancing technology and many patients there has been a reason to develop evidence based methods of tracheostomy care to prevent adverse events (Thomas & Mary, 2018). The Global tracheostomy collaborative has been developing this agenda through use of online videos and research articles. Among key objectives it oversees is tracheostomy guidelines. Utilizing the Global tracheostomy collaborative (GTC) into health facilities has benefited patients (Mc Grath *et al.*, 2017). More use of health system informatics, including nursing decision support materials on the internet will lead to adherence of evidence based tracheostomy care guidelines that is based on patient values and beliefs (Keiffer, 2016).

Jun, Kovner and Stimpfel (2016) in an integrative review of factors affecting nurses use of guidelines established organizational norms, management, resources and appearance of protocols as external features interfering with clinical practice guidelines(CPGs)use. In a study by Bourgault et al. (2014) health system factors affecting use of guidelines were viewed as; nurse's role, database accessibility and presence of existing policies. These factors were viewed as to affecting skills of nurses also.

According to Katinda (2014), there is a relationship between hospital environment and resources with output that staff give. Intensive care units equipped with correct tools to support evidence based practice have positive outcomes to their patients. In that study the author recommends adequate equipment should be provided to support nurse's work.

Williams, Perillo and Brown (2015) state that even if a nurse is motivated and confident to adhere to evidence based guidelines health system barriers will impact their ability to adhere to them. To act on health system barriers affecting adherence to clinical guidelines there should be working instructions on specific procedures which considers hospital setting and finally the guidelines should have support from the ward managers and hospital administration as a whole (Fischer *et al.*, 2016).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter explains research design, data collection procedures and methods of analyzing data. It also explains who formed the study population and the criteria to include or exclude them.

3.2 Research Design

The study adopted an analytical cross sectional study design. These are studies which measure exposure and outcomes at a single time (Setia, 2016). The design enabled collection of quantitative data at a single point for measurement of associations without influence. This design was relevant because it allowed for measurement of exposure and outcomes within the specific defined population in the study at one point.

3.3 Study Area

The study took place at the general intensive care unit in Kenyatta national hospital. The hospital is located in Nairobi the capital city of Kenya. It was founded in 1901 and was renamed to King George VI hospital and eventually Kenyatta national hospital. It is a teaching and referral hospital owned by the Kenyan government. It is the largest in the region serving east and central Africa.

The hospital has a general ICU and other specialized satellite critical care units including; pediatric, neonatal, burns, medical, obstetric, neurological and Cardiological ICU. This study will be conducted at the general ICU which has a capacity of 21 beds. There is a skills mixture including nurses, lab technicians, doctors and physiotherapists among others working at the unit. The general ICU has about 140 nurses working at different shifts in a day. Admissions in the unit is done on a 24-hour basis depending on bed availability.

Kenyatta National Hospital ICU was chosen because common indications for admission include traumatic head injuries, neurological conditions and severe sepsis. Most of these patients are usually under tracheostomy care because of the associated acute respiratory failure. Tracheostomy care in these scenarios are normally performed on a routine basis. The bed occupancy rates at KNH ICU are normally 100% and this also made the hospital a good choice of study area.

3.4 Study Population

The population under investigation consisted of 100 nurses working in the general ICU. These nurses are qualified to practice after being registered by the nursing council of Kenya. They are the ones who are involved in routine tracheostomy care.

3.4.1 Sample Size Determination

The study was a census type where all 100 nurses at the general ICU who fulfilled the inclusion criteria were recruited to participate in the study. This was used because the population was small and most of the nurses could therefore be accessed to participate in the study. Fischer's formula was however used to calculate the least sample size that would be used. It was then adjusted by the Cochran formula since the study population was less than 10,000.

Fischer's formula $n = \frac{z^2 pq}{d^2}$

$$d^2$$

n= desired sample size

z= standard normal deviation confidence level which at 95% confidence Level the z will be 1.96

p= proportion estimated with characteristic being studied which is 50% or 0.5 q=1-p= 0.5

d= Statistical significance level= 0.05

Therefore, $n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384$

$$0.05^2$$

Since the study population is less than 10,000 Cochran formula will be used for adjustment of the sample size as follows

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

nf= sample size

N= Study population

Therefore;

$$nf = \frac{384}{1 + \frac{(384-1)}{100}}$$

nf= 79 nurses

3.4.2 Inclusion Criteria

1. Registered nurses employed and stationed to work at the ICU in Kenyatta National Hospital
2. Nurses who were taking care of patients with a tracheostomy

3.4.3 Exclusion Criteria

Those excluded include:

1. Nurses on leave
2. Nurses not taking care of tracheostomized patients

3.4.4 Sampling Procedure

The study was a census type where all nurses who fulfilled the inclusion criteria were recruited into the study. This was used because the population was small and most of the nurses could therefore be accessed to participate in the study

3.4.5 Recruitment and Consenting of Participants

Letter of approval from ethics committee and KNH research program department was given to the in charge at the ICU before recruiting and consenting of study participants. The nurses signed the consent and participant forms only after confirming they have understood their role in the study and what the study was about. Recruiting and consenting was undertaken at the critical care unit during the period which data was collected.

3.5 Data Collection

3.5.1 Data Collection Tools

Data collection tools consisted of a self-administered questionnaire and an observational checklist. The questionnaire had 5 parts including; Socio demographic section, reported adherence to tracheostomy care guidelines section, Knowledge of tracheostomy care guidelines section, attitude towards tracheostomy care guidelines section and health system factors affecting adherence to tracheostomy care guidelines section. Data on Socio-demographic characteristics and health system factors was collected using semi structured questions. Reported adherence to tracheostomy care guidelines and knowledge of tracheostomy care guidelines was collected using structured questions adapted and modified from the evidence based tracheostomy care guidelines by American society of critical care nurses. Attitude towards tracheostomy care guidelines was collected using structured questions adopted and modified from the evidence based practice questionnaire by Upton (2006). To confirm data on reported adherence to tracheostomy care guidelines, an observational checklist was used while nurses were performing tracheostomy care. The checklist was also adopted and modified from the evidence based tracheostomy care

guidelines published by American society of critical care nurses and distributed through various avenues such clinical manuals and standard operating procedures in KNH and government websites across the globe.

3.5.2 Reliability and Validity of Data Collection Tools

The data collection tools and observational checklist were pre tested for reliability from a sample of 10 nurses from the neurological ICU in KNH. Neurological ICU was chosen because it admits patients who are on tracheostomy care like the general ICU. Reliability was confirmed by a test-retest. The questionnaire had a cronbach's alpha of 0.753. Face validity was ensured through restructuring the tools into sections. Content validity was ensured through giving the tool to senior critical care nurses to ascertain if all content is included. Construct validity was ascertained through checking items in the tools against study objectives.

3.5.3 Training of Research Assistant

The research assistant was a nurse working in the general intensive care unit. She had been registered by nursing council of Kenya and with specialized training in critical care. She had 15years experience in nursing. The nurse was trained on; objectives of the study, data collection tool, facilitating signing of informed consent and data collection procedure including coding of the tools used. The assistant was also trained on research ethics and did observation without the participants knowing to eliminate bias. Other issues raised by the assistant were also addressed.

3.5.4 Data Collection Procedure

Data was collected upon understanding of objectives of the study and obtaining informed signed consent from the nurses. The principal investigator and research assistant did a single observation on practice on tracheostomy care guidelines and entered the data on an observational checklist. The nurses were not aware observation was done on them to hawthorn's effect bias. The research assistant and principal investigator thereafter issued the nurses with a self-administered questionnaire to collect data on reported adherence to tracheostomy care guidelines

and nursing and health system factors affecting adherence to the guidelines. The nurses were required to fill all 5 sections of the questionnaire. The observational checklist and the self-administered questionnaire had the same code for each of the nurses who agreed to participate in the study. Data was collected from 8th September 2020 to 30th November 2020.

3.6 Data Management

3.6.1 Data Entry, Cleaning and Storage

Data was coded then entered to Epidata version 3.1. It was then cleaned. Thereafter it was exported to Microsoft excel 2010. The data is stored under a password protected computer belonging to the principal investigator. Back up of this data is through a secure mailing system and a password protected universal serial bus (USB). This data will be stored for a period of up to five years safely from any distortion before being destroyed.

3.6.2 Data Analysis and Presentation

Data was analyzed using Rstudio version 1.4.1103. Descriptive Statistics was used to describe frequencies, means and percentages of socio-demographic characteristics, reported and observed adherence to tracheostomy care guidelines, nurse related factors and health system factors affecting adherence to tracheostomy care guidelines.

Percentage adherence to tracheostomy care guidelines was then dichotomized with a cut off of 80 %. This threshold is adopted from Haynes (1976) who developed a model for adherence to therapeutic regimens through multivariate analyses and structural modeling procedures. Those who scored less than 80 % were non-adherent while those scoring 80% and above were adherent.

Percentage of knowledge on tracheostomy care guidelines was also dichotomized. This was based on a threshold of 75% adopted from Olubunmi (2016) knowledge on health research guidelines among biomedical researchers. Those scoring below 75%

were deemed not knowledgeable while those scoring 75% and above were deemed knowledgeable.

Pearson's Chi-square test or Fishers Exact Test was performed to find associations between nursing and health system factors with observed adherence level to tracheostomy care guidelines. Odds Ratio (OR) and 95% Confidence Interval (CI) was used to estimate the strength of association between the independent and dependent variables. The alpha for statistical significance was set at $p < 0.05$.

All nursing and health system factors identified to significantly associate with observed adherence to tracheostomy care guidelines at bivariate analysis were considered together in a multivariate analysis. This was performed using Binary logistic regression where backward conditional method was specified. Adjusted odds Ratios (AOR) together with their respective 95% Confidence Interval (CI) were used to estimate the strength of association. Analyzed data in the study was then presented in the form of tables and charts.

3.6.3 Study Variables

Dependent variables in the study was adherence level towards tracheostomy care guidelines while independent variables were nurse related and health system factors affecting adherence to tracheostomy care guidelines.

3.7 Dissemination Plan

Dissemination of the results in peer reviewed journal, repository of Jomo Kenyatta university of Agriculture and technology and Kenyatta national hospital critical care unit goes a long way to share study findings.

3.8 Ethical Considerations

Ethical consent to conduct the study was sought from Kenyatta National Hospital-University of Nairobi (KNH-UON) ethics research committee with registration of P198/03/2020. National commission for science, technology and innovation (NACOSTI) gave license to conduct the study as per the Kenyan government laws

with registration P/20/6590. Additional permission to conduct the study was given from the KNH research programs department. Data obtained was held in confidentiality through a coding system that is password protected. The nurses who participated were not coerced into taking part in the study and they had a right to withdraw from the study anytime they wished with no consequence. They were also not subjected to any harm during data collection and will benefit from the study through offering quality tracheostomy care based on suggestions from study findings. To prevent risk of transmission of corona virus disease 2019 the following was undertaken;

- i. Regular washing of hands from one participant to the other
- ii. Provision of a hand sanitizer to sanitize hands of participants before issuing them with the questionnaire
- iii. Nurses were observed from a 1.5-meter distance on how they are performing tracheostomy care based on guidelines
- iv. N-95 and Surgical masks were used throughout while in the ICU
- v. Clean gloves were used while touching surfaces or patients in the ICU
- vi. COVID-19 test screening was done daily

3.9 Study Limitations

1. The nurses may have been biased while reporting their adherence towards tracheostomy care guidelines. An observation tool was therefore used to find out the observed adherence for comparison
2. Study was conducted in one center. The study therefore recommends future studies to be done in multiple centres.

CHAPTER FOUR

STUDY RESULTS

4.1 Socio-Demographic Characteristics

The response rate in this study was 100%. The study participants consisted of 79 nurses. The mean age of the participants was 39.1 years. The nurses had a mean experience of 13.3 years. The standard deviation for the mean age and years of experience was 7.1 and 6.8 years respectively. A total of 23 (29.1 %) nurses were male while 56 (70.9 %) were female. Majority of the participants 60 (75.9%) had trained up to higher national diploma level. In relation to specialty training, 70 (88.6 %) nurses had been trained on critical care nursing while 9(11.4%) had no specialized training in critical care. In terms of their cadre, senior nursing officers were the majority at 39(49.4%). Table 4.1 below summarizes this information.

Table 4.1: Socio-demographic characteristics

Socio - Demographics	Characteristic	n (%)
Gender	Male	23 (29.1)
	Female	56 (70.9)
Age	Years (SD)	39.1 (7.1)
Experience	Years (SD)	13.3 (6.8)
Education	Diploma	3 (3.8)
	Higher Diploma	60 (75.9)
	Degree	14 (17.7)
	Masters	2 (2.6)
Specialty Training	Critical care nursing	70 (88.6)
	Not trained on critical care	9 (11.4)
Cadre	Nursing Officer III	6 (7.6)
	Nursing Officer II	21 (26.6)
	Nursing Officer I	8 (10.1)
	Senior Nursing Officer	39 (49.4)
	Assistant Chief Nursing Officer	5 (6.3)
	Total (n)	79

4.2 Adherence Level to Tracheostomy Care Guidelines

4.2.1 Reported Adherence Level towards Tracheostomy Care Guidelines

Assessment on reported level of adherence towards tracheostomy care guidelines was done through a questionnaire containing 16 items. Clinical assessment of the airway was reported to be done by a majority of 47 participants. When it came to use of a closed system catheter none of the nurses reported to use it during suctioning. When using an aspirator majority of the nurses 31 (39.2%) reported to often maintain suctioning pressure between 100mmHg-120mmHg. Referring of swallowing difficulties to speech and language therapists was reported to be done by a minority of 5(6.3%) nurses while a majority of 43(54.4%) rarely refereed the cases. The response to each of the items is shown on table 4.2 below.

Table 4.2: Reported response to items on adherence level towards evidence based tracheostomy care guidelines

Guideline	Very often, n (%)	Often, n (%)	Sometimes, n (%)	Rarely, n (%)
1. Clinical assessment of the airway for patency	47 (59.4)	25 (31.6)	6 (7.6)	1 (1.3)
2. Suctioning only when clinically indicated	22 (27.8)	47 (59.5)	10 (12.7)	0 (0.0)
3. Applying aseptic technique when performing tracheostomy suctioning	64 (81.0)	11 (13.9)	4 (5.1)	0 (0.0)
4. Use closed system catheter for suctioning patients on mechanical ventilation	2 (2.5)	9 (11.4)	13 (16.5)	55 (69.6)
5. Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter	12 (15.2)	13 (16.5)	17 (21.5)	37 (46.8)
6. Maintaining suctioning pressure between 100mmHg-120mmHg	20 (25.3)	31 (39.2)	18 (22.7)	10 (12.7)
7. Suctioning for not more than 15 seconds	36 (45.6)	33 (41.8)	4 (5.1)	6 (7.6)
8. Pre oxygenate prior to performing suctioning	45 (57.0)	20 (25.3)	13 (16.5)	1 (1.3)
9. Not instilling normal saline routinely to liquefy secretion	14 (17.7)	27 (34.2)	34 (43.1)	4 (5.1)
10. Humidifying air using a humidifier system or heat moisture exchange filter	49 (62.0)	15 (19.0)	7 (8.9)	8 (10.1)
11. Referring swallowing difficulties to speech and language therapists for screening	5 (6.3)	8 (10.1)	23 (29.1)	43 (54.4)
12. Checking 8 hourly or in every shift to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise	12 (15.2)	21 (26.6)	26 (32.9)	20 (25.3)
13. Inspecting the inner cannula at least 6 hourly and reinserting it after cleaning according to manufacturer's instruction	8 (10.1)	10 (12.7)	29 (36.7)	32 (40.5)
14. Changing the stoma dressing and tapes daily or whenever it has been soiled	61 (77.2)	11 (13.9)	6 (7.6)	1 (1.3)
15. Planning and clearly documenting weaning, while evaluating the decision with other health care team members	33 (41.8)	32 (40.5)	11 (13.9)	3 (3.8)
16. Carrying out weaning gradually	37 (46.8)	33 (41.8)	8 (10.1)	1 (1.3)

The responses to items on adherence level towards tracheostomy care guidelines were weighted on a scale as follows: very often = 4, often = 3, sometimes = 2 and rarely = 1. The maximum attainable score from the 16 questions was therefore, 64 (a product of 16 and 4). This was effectively used as the denominator when computing the percentage adherence score for each nurse.

Percentage adherence score was then dichotomized with a cut off of 80 %. Those who scored less than 80 % were non-adherent while those scoring 80% and above were adherent. A total of 41 (51.9%) subjects adhered while 38 (48.1%) did not adhere. Figure 4.1 below summarizes this information.

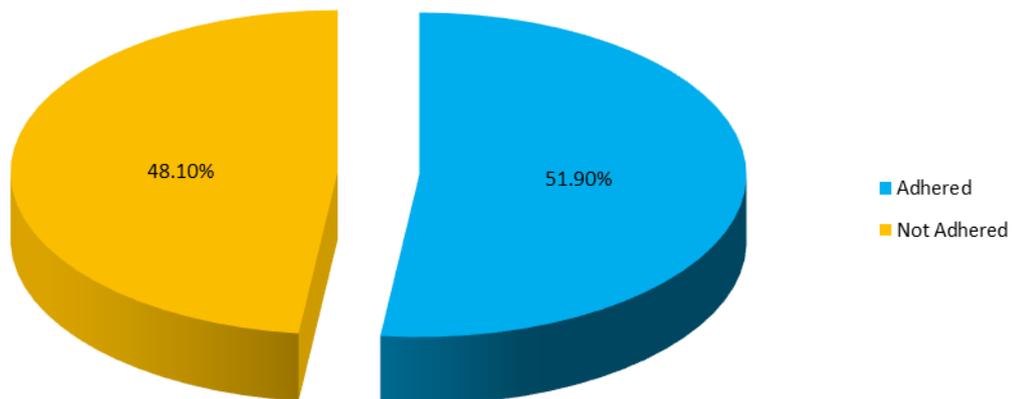


Figure 4.1: Pie chart of level of reported adherence to tracheostomy care guidelines

4.2.2 Observed Adherence Level towards Evidence Based Tracheostomy Care Guidelines

An observational checklist was used to find out observed adherence level towards tracheostomy care guidelines. Clinical assessment of the airway for patency was performed by all the 79 (100%) nurses. Among the 79 participants only 31(39.2%) nurses performed suctioning only when clinically indicated. A total of 78 nurses (98.7%) applied aseptic technique when performing tracheostomy suctioning.

All the 79 (100%) nurses did not use a closed system catheter for suctioning patients on mechanical ventilation. In reference to the actual procedure, only 5 nurses (6.3%) divided the inner tracheostomy tube diameter by two then multiplied the result by three to determine the French gauge of suction catheter. A total of, 3 nurses (3.8%) maintained the suctioning pressure between 100mmHg-120mmHg while 40 nurses (50.6%) suctioned for not more than 15 seconds. Pre oxygenation prior to performing suctioning was performed by 21 nurses (26.58%). A total of 76 nurses (96.2%) did not instill normal saline to liquefy secretion while 78 (98.7%) humidified air using either a humidifier system or heat moisture exchange filter.

Nine out of 79 nurses (11.4%) referred swallowing difficulties to speech and language therapists for screening. Only 6 nurses (7.6%) performed 8 hourly checks to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicated otherwise.

A total of 8 participants (10.1%) performed 6 hourly inspections of the inner cannula and reinserted it after cleaning it as per the manufacturer's instruction and 70 nurses (88.6%) changed the stoma dressing and tapes daily or whenever it had been soiled. Weaning was planned and clearly documented while evaluating the decision with other health care team members was done by 43.04% of the nurses. Gradual weaning was performed by 78 nurses. This constituted 98.7% of the respondents. Table 4.3 below summarizes this information.

Table 4.3: Observed adherence towards evidence based tracheostomy care guidelines

	Guideline	Performed n(%)	Not Performed n(%)
1.	Clinical assessment of the airway for patency	79 (100.0)	0 (0.0)
2.	Suctioning only when clinically indicated	31 (39.2)	48 (60.8)
3.	Applying aseptic technique when performing tracheostomy suctioning	78 (98.7)	1 (1.3)
4.	Using closed system catheter for suctioning patients on mechanical ventilation	0 (0.0)	79 (100.0)
5.	Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter	5 (6.3)	74 (93.7)
6.	Maintaining suctioning pressure between 100mmHg-120mmHg	3 (3.8)	76 (96.2)
7.	Suctioning for not more than 15 seconds	40 (50.6)	39 (49.4)
8.	Pre oxygenate prior to performing suctioning	21 (26.6)	58 (73.4)
9.	Not instilling normal saline to liquefy secretion	76 (96.2)	3 (3.8)
10.	Humidifying air using a humidifier system or heat moisture exchange filter	78 (98.7)	1 (1.3)
11.	Referring swallowing difficulties to speech and language therapists for Screening	9 (11.4)	70 (88.6)
12.	Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise	6 (7.6%)	73(92.4%)
13.	Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction	8 (10.1)	71 (89.9)
14.	Changing the stoma dressing and tapes daily or whenever it has been soiled	70 (88.6)	9 (11.4)
15.	Planning and clearly documenting weaning, while evaluating the decision with other health care team members	34 (43.0)	45 (57.0)
16.	Carrying out weaning gradually	78 (98.7)	1 (1.3)

A score of 1 was awarded for each of the 16 interventions that was done by the nurses and a score of zero for each intervention not done. The maximum attainable score from the 16 observed items was therefore 16. This was used to compute the percentage score on observed adherence for each of the nurses.

Percentage adherence score was then dichotomized with a cut off of 80 %. Those who scored less than 80 % were non-adherent while those scoring 80% and above were adherent. A total of 18 (22.8 %) subjects adhered while 61 (77.2 %) did not adhere. Figure 4.2 below summarizes this information.

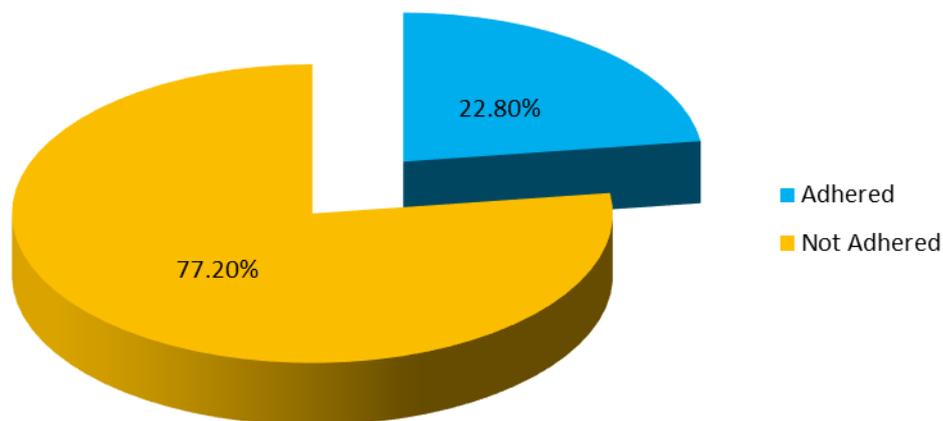


Figure 4.2: Pie chart of level of observed adherence to tracheostomy care guidelines

4.3 Nurse Related Factors Affecting Adherence to Tracheostomy Care Guidelines

In this section description of nursing factors that affect adherence to tracheostomy care guidelines is presented. Afterwards inferential statistics on the nursing factors is done. The nursing factors that were investigated were socio-demographic characteristics, knowledge of tracheostomy care guidelines and attitude towards tracheostomy care guidelines.

4.3.1 Socio-Demographic Characteristics of the Nurses affecting adherence to tracheostomy care guidelines

The socio-demographic characteristics that were investigated to affect adherence to tracheostomy care guidelines among the nurses were; Age, years of experience, level of education and cadres.

4.3.2 Bivariate Analysis between Socio-Demographic Characteristics and Adherence to Tracheostomy Care Guidelines

Fishers and Chi square tests were fitted to assess the association between socio-demographic characteristics and adherence. A 95% confidence level was used and crude odds ratios generated. Significant factors were those that had a P value of less than 0.005. On performing the test there was no significant association between adherence and gender (p = 0.564), education (p = 0.338), training (p = 1.000), cadre (p = 0.788), age (p = 0.500) and experience (p = 0.164). Table 4.4 below summarizes the information

Table 4.4: Bivariate analysis between socio-demographic characteristics and adherence to tracheostomy care guidelines

	Category	Adherence		OR	95% CI		P Value
		No(n = 61)	Yes (n = 18)		Lower	Upper	
Gender	Female	42 (77.0)	14 (77.8)	1.57	0.42	7.45	0.564
		19 (23.0)	4 (22.2)				
Education	Male			0.42	0.04	2.18	0.338
	Degree, Masters	14 (23.0)	2 (11.1)				
	Diploma	47 (77.0)	16 (88.9)	0.96	0.09	5.79	1.000
Training	Critical Care	54 (88.5)	16 (88.9)				
	Nursing			1.33	0.41	4.63	0.788
	No CCN	7 (11.5)	2 (11.1)				
	Training			1.03	0.95	1.11	0.500
Cadre	Senior Nursing	33 (54.1)	11 (61.1)				
	Officer			1.06	0.98	1.14	0.164
	Nursing Officers	28 (45.9)	7 (38.9)				
Age	Mean in years (SD)	38.8 (7.4)	40.1 (6.0)				
Experience	Mean in years (SD)	12.7 (6.5)	15.3 (7.7)				

4.3.3 Knowledge of Tracheostomy Care Guidelines

A set of 17 evidence based tracheostomy care guidelines questions was used to test knowledge on tracheostomy care guidelines. Each correct answer to questions on knowledge towards tracheostomy care guidelines was given a score of 1 while a wrong answer was given a score of zero. The maximum attainable score from the 17 questions was therefore 17. This was used to compute the percentage score on knowledge for each nurse that participated in the study. Table 4.5 below summarizes the distribution of scores on knowledge of tracheostomy care guidelines.

Table 4.5: Distribution of scores on knowledge

	Score	n (%)
1.	Below 50	2 (2.5)
2.	50 – 59	23 (29.1)
3.	60 – 69	17 (21.5)
4.	70 – 79	35 (44.3)
5.	Above 80	2 (2.5)

Percentage knowledge score was further dichotomized with a cut off threshold of 75%. Those who scored less than 75 % were deemed not to have been knowledgeable on tracheostomy care guidelines. Those who scored 75% and above were deemed to be knowledgeable. A total of 26 (32.9 %) subjects were knowledgeable while 53 (67.1 %) were not knowledgeable. The pie chart below depicts this information.

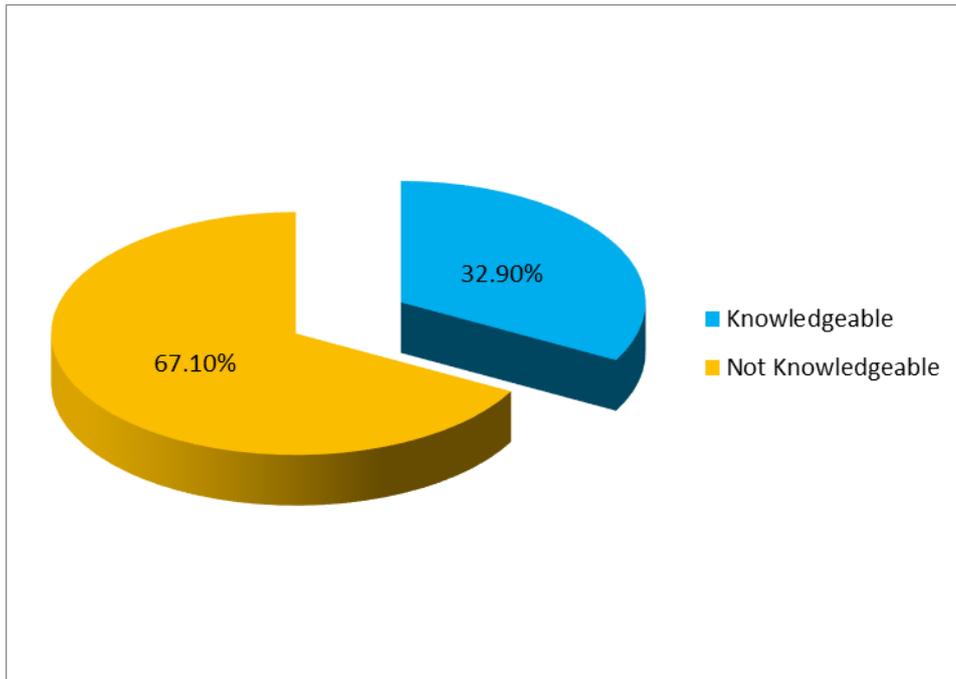


Figure 4.3: Pie chart on knowledge of tracheostomy care guidelines

4.3.4 Bivariate Analysis between Knowledge of Tracheostomy Care Guidelines and Adherence to Tracheostomy Care Guidelines

Fischer’s test was fitted to assess the association between knowledge and adherence. A 95% confidence level was used and crude odds ratios generated. A Significant factor was that with a P value of less than 0.05. There was a significant association between adherence and knowledge (OR 3.45; CI: 1.03-12.11; P=0.026). Nurses who were knowledgeable on tracheostomy care guidelines were 3.45 times likely to adhere to tracheostomy care guidelines than those who were not knowledgeable. This therefore means that, there is a significant association between knowledge and adherence to tracheostomy care guidelines. The null hypothesis that, “there is no significant relationship between knowledge and adherence” therefore was rejected. Table 4.6 below summarizes this information

Table 4.6: Bivariate analysis between knowledge of tracheostomy care guidelines and adherence to tracheostomy care guidelines

	Category	Adherence		OR	95% CI		P Value
		No(n= 61)	Yes(n=18)		Lower	Upper	
Knowledge	Knowledgeable	16 (22.2)	10 (55.6)	3.45	1.03	12.11	0.026
	Not Knowledgeable	45 (73.8)	8 (44.4)				

4.3.5 Attitude towards Tracheostomy Care Guidelines

Attitude was assessed on four areas related to tracheostomy care guidelines. The four, targeted attitude of the nurses towards amount of workload, tracheostomy care audits, time spent searching for tracheostomy care guidelines and lastly attitude on adopting new tracheostomy care guidelines. Each of these areas had five possible responses namely; strongly agree, agree, undecided, disagree and strongly disagree as illustrated in table 4.7. The responses were later broken down as positive, neutral and negative attitude as per the Upton (2005) attitude tool as illustrated in table 4.8. Majority of the participants 24(30.4%) reported a positive attitude towards workload and how it affects adoption of new tracheostomy care guidelines. A minority of 9 (11.4%) participants had negative attitude on tracheostomy care audit. None of the nurses 0(0.0%) had a negative attitude on utilizing their time on tracheostomy care guidelines while a majority of 47 (59.5%) nurses had a positive attitude on spending their time on tracheostomy care guidelines.

Table 4.7: Attitude score distribution

Attitude Items	Strongly Agree n (%)	Agree, n (%)	Undecided, n (%)	Disagree, n (%)	Strongly Disagree n (%)
1. My workload is too much for me to keep up to date with new evidence based tracheostomy care guidelines	6 (7.6)	14 (17.7)	4 (5.1)	31 (39.2)	24 (30.4)
2. I resent having my tracheostomy care audited	9 (11.4)	18 (22.8)	9 (11.4)	24 (30.4)	19 (24.1)
3. Evidence based tracheostomy care guidelines is a waste of my time	0 (0.0)	5 (6.3)	3 (3.8)	24 (30.4)	47 (59.5)
4. I stick to tried and trusted methods rather than changing to new evidence based tracheostomy care guidelines	2 (2.5)	10 (12.7)	13 (16.5)	26 (32.9)	28 (35.4)

Table 4.8: Attitude towards tracheostomy care guidelines

Attitude areas	Negative n (%)	Neutral n (%)	Positive n (%)
1. High Workload and use of tracheostomy guidelines	20 (25.3)	4 (5.1)	55 (69.6)
2. Tracheostomy care audit	24 (34.2)	9 (11.4)	43 (54.4)
3. Spending enough time searching for tracheostomy care guidelines	5 (6.3)	3 (3.8)	71 (89.9)
4. Adoption of new tracheostomy care guidelines	12 (15.2)	13 (16.5)	54 (68.4)

4.3.6 Bivariate Analysis between Attitude to Tracheostomy Care Guidelines and Adherence to the Guidelines

Fischer's and Chi square test was fitted to assess the association between attitude of the nurses and adherence. A 95% confidence level was used and crude odds ratios generated. A Significant factor had a P value of less than 0.05. There was no significant association between adherence level and attitude of the nurses towards workload, tracheostomy audit, time spent on evidence based tracheostomy care guideline and adoption of new tracheostomy care guidelines. Table 4.9 below summarizes this information.

Table 4.9: Bivariate analysis between attitudes to tracheostomy care guidelines and adherence

Attitude item	Category	Adherence		OR	95% CI		P Value
		No(n= 61)	Yes(n= 8)		Lower	Upper	
Workload	Neutral	3 (4.9)	1 (5.6)	6.33	0.21	194.44	0.232
	Negative	39 (63.9)	16 (88.9)	7.79	1.42	145.85	0.054
	Positive	19 (31.1)	1 (5.6)				
Tracheostomy care Audit	Neutral	8 (13.1)	1 (5.6)	0.89	0.65	1.24	0.499
	Negative	32 (52.5)	11 (61.1)	1.03	0.84	1.27	0.749
	Positive	21 (34.4)	6 (33.3)				
Time to search for evidence based tracheotomy care guidelines	Neutral	3 (4.9)	0 (0.0)	0.82	0.44	1.52	0.521
	Negative	54 (88.5)	17 (94.4)	1.04	0.70	1.54	0.842
	Positive	4 (6.6)	1 (5.6)				
Adoption of new tracheostomy care guidelines	Neutral	13 (21.3)	0 (0.0)	0.92	0.67	1.27	0.610
	Negative	37 (60.7)	17 (94.4)	1.26	0.97	1.63	0.078
	Positive	11 (18.0)	1 (5.6)				

Based on the above bivariate analysis of nursing related factors affecting adherence to tracheostomy care guidelines knowledge was the only variable significantly associated with adherence, thus multivariate analysis was not performed at this stage.

4.4 Health System Related Factors Affecting Adherence to Tracheostomy Care Guidelines

Several aspects of health systems factors that were thought to affect the adherence of nurses to tracheostomy care guidelines were assessed (Table 4.10 below). In relation to availability of evidence based tracheostomy care guidelines at the critical care unit, 21 (26.6 %) of the respondents reported that they were available, 30 (38.0 %) said that they were not available while 28 (35.4 %) were not sure.

When the nurses were asked whether the hospital had a reliable internet connection that could facilitate access to scientific databases with information on evidence based tracheostomy care guidelines, 33 (41.8 %) said the access was adequate, 44 (55.7 %) said it was inadequate while 2 (2.5 %) nurses said others.

While finding out whether the hospital had access to scientific data bases for nurses to retrieve information on evidence based tracheostomy care guidelines 13 (16.5 %) said that it was openly accessible while 9 (16.5 %) said they could access it through subscription, a total of 44 (55.7 %) of them were not sure. There were 5 (6.3 %) who said that they could access it both openly and through subscription while 8 (10.0%) said they could not access them completely.

Nurses were asked if the critical care unit had adequate printers for printing of evidence based tracheostomy care guidelines. A total of 2 (2.5 %) nurses reported there were enough printing resources. A total of 49 (62.0 %) nurses said that the printing resources were not enough while 28 (35.5%) said the resources were not available at all.

Workload status with regard to adherence to evidence based tracheostomy care guidelines at the critical care unit was also checked. A total of 44 (55.7 %) nurses reported that the nurse to patient ratio of 1:2 was attained while 3 (3.8 %) out of 79

nurses said that the ratio was above 1:2. 30 (40.0 %) nurses said the ratio was below 1:2 while 2 (2.5 %) nurses said others.

In relation to nurses' awareness on hospital management strategies, policies or activities regarding evidence based tracheostomy care guidelines 25 (31.7 %) participants were aware while 43 (54.4 %) nurses were not sure. The other 11 (13.9 %) nurses were not aware.

On the critical care unit's information seeking tradition 8 (10.1 %) of the nurses reported seeking information from books while 15 (19.0 %) nurses said they inquire from fellow nurses. A total of 52 (65.8 %) nurses sought information from doctors while 4 (5.1 %) utilized the evidence based practice hierarchy of evidence.

Nurses were also asked about the format of evidence based tracheostomy care guidelines that was available in the critical care unit. Of the 79 nurses, 2 (4.5 %) mentioned videos, 19 (43.2 %) indicated research papers, 35(44.3%) said others, while 23 (52.3 %) said published working document.

A total of 18 (22.8 %) nurses agreed that the hospital had a mechanism to cover them when an unintended risk occurred from application of tracheostomy care guidelines. Those who disagreed were 20 (25.3 %) while 41 (51.9 %) were not sure.

A total of 53 (71.6 %) nurses agreed the critical care unit had the necessary equipment and supplies which could be applied for use as indicated in tracheostomy care guidelines while 17 (23.0 %) nurses disagreed. The remaining 9 (5.4 %) nurses indicated others.

Table 4.10: Health system related factors affecting adherence to tracheostomy care guidelines

Health System Factor	Category	n (%)
1. Availability of evidence based tracheostomy guidelines	Available	21(26.6%)
	Not available	30 (38%)
	Not sure	28 (35.4%)
2. Availability of reliable internet connection in the hospital	Adequate access	33(41.8%)
	Inadequate access	44 (55.7%)
	Others	2 (2.5%)
3. Access to scientific databases	Subscription access	9 (16.5%)
	Open access	13(16.5%)
	Not sure	44 (55.7%)
	Open & subscription	8 (10%)
4. Availability of printers for printing	Enough	2(2.5%)
	Not enough	49 (62%)
	Not available	28 (35.5%)
5. Status of critical care unit's workload	Below 1:2	30 (40%)
	Ratio 1:2	44(55.7%)
	Above 1:2	3 (3.8%)
	Others	2 (2.5%)
6. Hospital management strategies or activities regarding tracheostomy care guidelines	Aware	25(31.7%)
	Not sure	43 (54.4%)
	Not aware	11 (13.9%)
7. Source of Information of tracheostomy care guidelines at the critical care unit	Fellow nurses	15 (19.0%)
	Books	8(10.1%)
	Doctors	52 (65.8%)
	Evidence based practice hierarchy	4 (5.1%)
8. Format of tracheostomy care guidelines available in the critical care unit	Research papers	19 (43.2%)
	Videos	2(4.5%)
	Published working documents	23 (52.3%)
9. Availability of a mechanism to cover nurses when an unintended risk occurs from tracheostomy care	Yes	18(22.8%)
	No	20 (25.3%)
	Not sure	41 (51.9%)
10. Availability of necessary equipment and supplies	Yes	53(71.6%)
	No	17 (23%)
	Others	9 (5.4%)

4.4.1 Bivariate Analysis between Health System Factors and Adherence to Tracheostomy Care Guidelines.

Fishers and Chi square tests were fitted to assess the association between adherence and health system factors reported by the nurses. A 95% confidence level was used and crude odds ratios were generated. Significant factors were those that had a P value of less than 0.05. There was a significant association between status of critical care unit workload and adherence level to tracheostomy care guidelines (OR 3.47; CI:1.18-10.8 P= 0.025). Nurses who agreed a workload ratio of 1:2 was attained in the unit were 3.47 times likely to adhere compared to those who said the ratio was above 1:2.

There was also a significant association between adherence level to tracheostomy care guidelines and awareness of hospital management strategies regarding tracheostomy care guidelines (OR 0.002; CI: 0.000013-0.03.; P=0.016). Nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware of the management strategies. Table 4.11 below summarizes this information

Table 4.11: Bivariate analysis between health system factors and adherence level to tracheostomy care guidelines

Health System Factor	Category	OR	95% CI		P-Val
			Lower	Upper	
Availability of evidence based tracheostomy guidelines	Not available	0.35	0.06	1.64	0.193
	Not sure	1.77	0.51	6.74	0.373
Availability of reliable internet connection in the hospital	Inadequate access	0.22	0.01	6.14	0.311
	Others	0.33	0.01	8.90	0.451
Access to scientific databases	Yes	1.77	0.59	5.21	0.299
Availability of adequate printers for printing	No enough resource	0.40	0.02	10.58	0.527
	No resources	0.12	0.003	3.55	0.169
Critical care unit's workload	1:2 ratio	3.47	1.18	10.8	0.025
Hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.002	0.000013	0.03	0.016
Source of Information on tracheostomy guidelines at the critical care	Information from colleagues	0.75	0.11	4.90	0.756
	Information from doctors	0.90	0.22	4.53	0.887
Format of evidence based tracheostomy care guidelines available in the critical care unit	Videos, Research papers, Published working documents	2.68	0.89	9.22	0.091
Mechanism to cover nurses when an unintended risk occurs from tracheostomy care	No	0.28	0.03	1.57	0.173
	Not sure	0.95	0.28	3.52	0.939
Availability of necessary equipment and supplies	No	0.65	0.16	2.14	0.277

4.5 Multivariate Analysis of Nurse Related and Health System Factors with Adherence Level to Tracheostomy Care Guidelines

Significant factors from the bivariate analysis of nurse related and health system factors affecting adherence were carried on to perform a multivariate analysis. On the nurse related factors knowledge $p=0.026$ was carried to multivariate analysis. On health system factors, status of critical care unit workload $p=0.025$ and awareness of hospital management strategies regarding tracheostomy care guidelines $p= 0.016$ were carried to multivariate analysis. A binary logistic regression model was then fitted. Significant factors from the multivariate logistic model were those with a P value of less than 0.05. In the multivariate analysis the association between adherence and status of critical care unit's workload became non-significant ($p = 0.101$).

There was a significant association between adherence level to tracheostomy care guidelines and knowledge on tracheostomy care guidelines. (AOR 4.29; CI: 1.19-17.90; $P=0.031$). Adjusting for other factors nurses who were knowledgeable on tracheostomy care guidelines were 4.29 times likely to adhere to tracheostomy care guidelines compared to those who were not knowledgeable.

There was also a significant association between adherence level to tracheostomy care guidelines and awareness of hospital management strategies regarding tracheostomy care guidelines (AOR 0.21; CI: 0.05-0.73; $P=0.019$). Adjusting for other factors 79% of nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware. The table below summarizes the information below.

Table 4.12: Multivariate analysis of nursing and health system factors affecting adherence

Factor	Category	Adj. OR	95% CI		P-Val
			Lower	Upper	
Knowledge of tracheostomy care guidelines	Knowledgeable	4.29	1.19	17.90	0.031
Status of critical care unit's workload	1:2 ratio	2.74	0.82	9.56	0.101
Awareness of hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.21	0.05	0.73	0.019

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Adherence towards Evidence Based Tracheostomy Care Guidelines

In this study majority of the nurses did not adhere to tracheostomy care guidelines when they were observed. This is similar to a study conducted by Mosazade (2014) from Iran who also established majority of the nurses did not adhere to tracheostomy care guidelines when they were observed. Pre-oxygenation prior to performing suctioning was performed by 21(26.6%) nurses while in Mosazade's study it was performed by 21 nurses who formed 50% of the sample size. Use of a closed system suction was performed by no nurse in this study while in Mosazade's study it was performed by 36 (85.7%) nurses. The self-reported adherence by nurses was high compared to the observed one. On reporting 12 (15.2%) nurses said they regularly check 8 hourly to ascertain tracheostomy cuff pressure is between 15cmHg-25cmHg while on observation this was done by only 6 (7.6%) nurses. Likewise, inspection of inner cannula 6 hourly and reinserting it after cleaning was reported to be performed by a total of 47 nurses while on observation this was performed by only 8 nurses. This finding is in agreement with Leddy (2015) in Canada who also noted a difference between reported adherence and observed adherence. Reported adherence was high in contrast to the observed adherence. These differences could be because nurses lack enough time to practice fully what is in the guidelines and biasness when filling questionnaires.

5.2 Nurse Related Factors Affecting Adherence to Tracheostomy Care Guidelines

5.3.1 Socio-demographic Characteristics and Adherence to Tracheostomy Care Guidelines

This study revealed age of the nurses does not significantly affect adherence to tracheostomy care guidelines. This finding is similar to a study done previously in Kenya by Barako (2013) who established age is not a significant factor to application

of guidelines. The finding in this study can explain the fact that despite having many years of experience as shown in this study with a mean of 12 years, there is need to explore what updated guidelines say so as to update practice.

In terms of training this study showed no association between specialized critical care training and adherence to tracheostomy care guidelines. This finding is in contrast to that by Nizam (2016) in Ireland who found critical care training was associated with adherence to tracheostomy care guidelines. This difference might have been contributed to the fact that Ireland is a developed country with a more specialized training in critical care as compared to Kenya.

There was no association between cadre of the nurses and adherence to tracheostomy care guidelines. Senior nursing officers were the majority in this study. This finding is in contrast to Pritchett (2016) in USA who established senior nursing officers were significantly associated with compliance to tracheostomy care guidelines. This difference could have been contributed by differences medical technology between the two countries.

5.3.2 Knowledge of Tracheostomy Care Guidelines

Twenty-six nurses who formed 32.9% of the participants were knowledgeable on tracheostomy care guidelines. Majority of the nurses in this study who formed 67.1% of the participants were not knowledgeable. This finding is consistent to that by Dhaliwal (2018) from India who on assessment of nurse's knowledge on tracheostomy care guidelines found 43% of the nurses were knowledgeable while a majority of 57% were not knowledgeable. This could imply nurses from both countries have not understood well the rationale behind practices advocated in the tracheostomy care guidelines. These rationales are the most important element in delivering care that is safe with good outcomes.

5.3.3 Relationship between Knowledge of Tracheostomy Care Guidelines and Adherence to Tracheostomy Care Guidelines

Knowledge of tracheostomy care guidelines was significantly associated with adherence to tracheostomy care guidelines in this study. This study revealed being knowledgeable increased chances of adhering to the guidelines. This finding is similar to that by Dhaliwal (2018) from India who found a positive correlation between knowledge and adherence. In his study increase in knowledge was associated with increase in adherence to tracheostomy care guidelines. These two findings illustrate that understanding the scientific reasons for performing practices advocated in guidelines lead to actual performance of the tasks as indicated.

5.3.4 Relationship between Attitude and Adherence to Tracheostomy Care Guidelines

Majority (54.4%) of the nurses reported to have a positive attitude on tracheostomy care audit. This finding is different from a study conducted in Kazakhstan by Pulatova (2019) who established nurses had negative attitude. This difference might have been due to the manner in which audits are conducted in the two countries. If victimization is present a negative attitude will likely develop.

Attitude towards workload was positive. Majority of the nurses viewed workload as not being a hindrance to using tracheostomy care guidelines. This finding is different from a study by Dhaliwal *et al.*, (2018) in India which established a negative attitude on workload. In that study high workload was shown to affect use of the guidelines.

This study also revealed majority of the nurses had a positive attitude towards spending time searching for evidence based guidelines on tracheostomy care. This is similar to a study conducted by Pulatova (2019) in Kazakhstan who also had majority of respondents having a positive attitude. These two findings could mean accessibility to online resources is quick and easy thus nurses do not find any challenge to spend time searching for the evidence based guidelines.

When attitude was assessed in regard to adoption to new tracheostomy care guidelines, majority of the nurses reported to have a positive attitude. This is in contrast to Pulatova's study whose findings showed the nurses had a negative attitude. In Pulatova's study this aspect of attitude was the most negative. The differences in these findings could imply culture of change varies in different settings and can be affected by attitude.

In both this study and that by Pulatova (2016) there was no significant association between attitude and adherence to tracheostomy care guidelines.

5.4 Relationship between Health System Factors and Adherence to Tracheostomy Care Guidelines

A ratio of 1:2 in the intensive care unit was significantly associated with adherence to tracheostomy care guidelines in the bivariate analysis. This finding is similar to a study by William (2015) in Australia who established a work ratio of 1:2 was associated with adherence to tracheostomy care guidelines.

Nurses who were not aware that hospital management strategies and activities regarding tracheostomy care guidelines existed were less likely to adhere to the guidelines than those who were aware. This is similar to Williams's study where he established that awareness of organizational management support among the nurses led to adherence. These similarities suggest that nurses will practice new methods of care if hospital management lay policies to support them and information on such policies be made aware to the nurses. Majority of nurses in this study were not aware of any hospital mechanism to cover nurses when an unintended risk occurs from adopting tracheostomy care guidelines. This did not also affect adherence to tracheostomy care guidelines. This is in contrast with Thomas (2017) in the USA who found adoption of a care bundle on tracheostomy care that had mechanisms of protection against tracheostomy related ulcers led to adherence. The differences from the two studies could be attributed to many number of litigation because of patient awareness in the USA leading to cautionary measure as compared to Kenya.

5.5 Conclusions

Majority (77.2%) of the nurses in the critical care unit had low adherence to tracheostomy care guidelines when observed. The number of nurses who adhered to the guidelines was however higher (48.1%) when the nurses filled a self-reporting adherence tool. The socio-demographic characteristics of the nurses did not affect adherence to tracheostomy care guidelines. On knowledge, nurses who were knowledgeable on tracheostomy care guidelines were more likely to adhere to the guidelines than those who were not.

On the health system factors, nurses in the unit who were not aware of Hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy care guidelines compared to those who were aware. Findings on the health system factors also revealed a nurse to patient ratio of 1:2 and below favored adherence to tracheostomy care guidelines

These findings therefore add to previous studies which have shown adherence to tracheostomy care guidelines among critical care nurses is affected by knowledge of the nurses on tracheostomy care guidelines and their awareness of hospital strategies regarding the guidelines.

5.6 Recommendations

1. Adherence level to tracheostomy care guidelines be increased through training on tracheostomy guidelines to the ICU nurses in workshops by the clinical instructor.
2. Nurse to patient ratio in critical care units to be maintained to 1:2 or below by the unit manager so as to increase level of adherence towards tracheostomy care
3. Hospital policies regarding application of new guidelines on tracheostomy care to be made aware to ICU nurses by the director of nursing services so as to increase level of adherence to the guidelines.
4. Further studies to be conducted on tracheostomy care emergencies nursing interventions

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APPENDICES

Appendix I: JKUAT Clearance for Ethical Body Review



JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY

COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING

TEL: 067- 58-70000-5, Ext. 4063, Box 62000-00200 NAIROBI Email: deannursing@jkuat.ac.ke/school.nursing@jkuat.ac.ke

REF: HSN311-1928/2018

DATE: 28th February, 2020

TO WHOM IT MAY CONCERN

RE: NEWTON ONGAKI OCHOKI

This is to confirm that the above named is a bonafide student of Jomo Kenyatta University of Agriculture and technology pursuing Masters in Nursing.

He has successfully defended his proposal titled "**determinants of adherence to evidence based tracheostomy care guidelines among critical care nurses at Kenyatta National Hospital**" and he is to proceed for approval to an Institutional Ethical Review Committee and NACOSTI.

We therefore kindly request you to grant him the permit.

Yours faithfully,



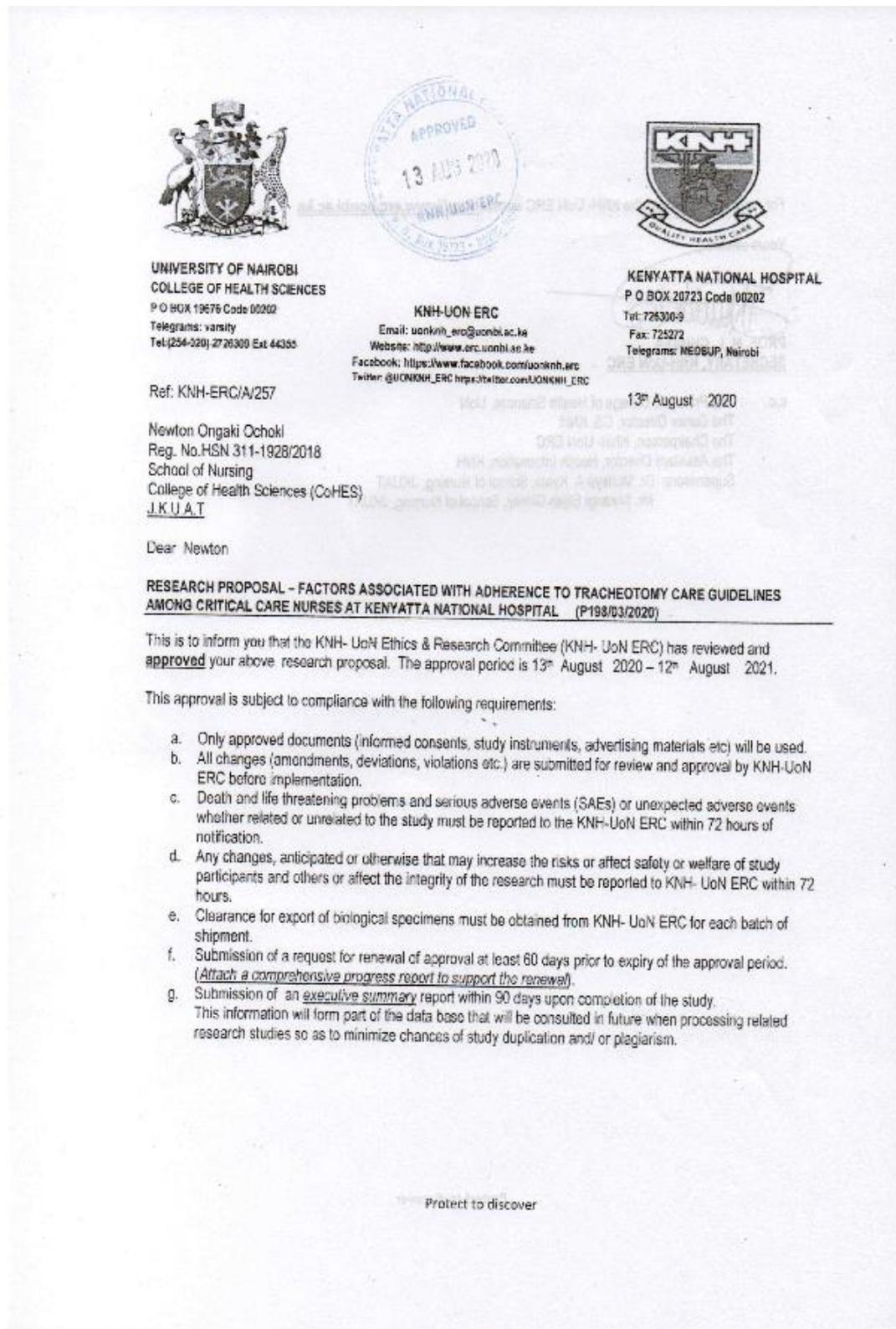
DR. SHERRY OLUCHINA
COD, NURSING EDUCATION LEADERSHIP, MANAGEMENT & RESEARCH



JKUAT is ISO 9001:2015 and ISO 14001:2015 Certified
Setting Trends in Higher Education, Research, Innovation and Entrepreneurship



Appendix II: KNH-UoN Ethical Review Approval



Appendix III: NACOSTI Research License


REPUBLIC OF KENYA


**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: **949850** Date of Issue: **13/September/2020**

RESEARCH LICENSE



This is to Certify that Mr. Newton Ochoki Ongaki of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Nairobi on the topic: FACTORS ASSOCIATED WITH ADHERENCE TO TRACHEOSTOMY CARE GUIDELINES AMONG CRITICAL CARE NURSES AT KENYATTA NATIONAL HOSPITAL for the period ending : 13/September/2021.

License No: **NACOSTI/P/20/6590**

Applicant Identification Number: **949850**


Director General
**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION**

Verification QR Code



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

Appendix IV: Notification for Data Collection at ICU



Newton Ongaki Ochoki
Reg No. Hsn 311-1928/2018
School of nursing
College of health sciences JKUAT
Newtonongaki001@gmail.com
Nairobi
08.24.2020

Deputy Director Medical Research
Kenyatta National Hospital
Nairobi
08.24.2020

*Please register this study
Dr. Ngunjiri
24/8/2020*

Dear Sir/Madam,

**REF: REQUEST TO COLLECT DATA AT THE GENERAL INTENSIVE CARE UNIT
FOR THE STUDY TITLED "FACTORS ASSOCIATED WITH ADHERENCE TO
TRACHEOSTOMY CARE GUIDELINES AMONG CRITICAL CARE NURSES AT
KENYATTA NATIONAL HOSPITAL"**

I am Newton Ongaki Ochoki of national identity 30063308, a master of science in nursing student at Jomo Kenyatta University of Agriculture and Technology specializing at critical care. My registration number at the university is Hsn 311-1928/2018, while my nursing practice license number is 175190. As part of the requirement to graduate I am conducting a study titled, "Factors Associated With Adherence To Tracheostomy Care Guidelines Among Critical Care Nurses At Kenyatta National Hospital." I am kindly seeking permission to collect data at the general intensive care unit in the hospital. The purpose of the study is to establish factors associated with adherence to tracheostomy care guidelines among critical care nurses in Kenyatta National Hospital. Since tracheostomy care is a routine procedure in the intensive care unit identifying the factors affecting adherence to tracheostomy care guidelines will ensure tracheostomy care is provided using evidence thus leading to improved patient outcomes to the society the hospital serves.

A self-administered questionnaire will be used to collect quantitative data from nurses on adherence level and on factors associated with adherence to tracheostomy care guidelines. Additionally an observational checklist will be used by the researcher to observe nurses while they are performing tracheostomy care to ascertain what they have reported in the questionnaire. Research assistant for this study will be a nurse working in the general intensive care unit where data will be collected from. The assistant will be a nurse registered with nursing council of Kenya and with specialized training in critical care with at least 1 year experience after certification as a specialized ICU nurse. The nurse will be trained on; objectives of the study, data collection tool, providing informed consent and data collection procedure. Other issues raised by the assistant will be addressed too.

With the current ongoing COVID-19 pandemic the following preventative measure were submitted to KNH-UON Ethical review committee and they will be strictly observed during data collection;

- i. Regularly washing hands or sanitizing while in the critical care unit
- ii. Maintaining a 1.5 meter distance with the respondents during answering of the questionnaire
- iii. A hand sanitizer will be provided to sanitize the hands of respondents before issuing them with the questionnaire
- iv. Nurses will be observed from a 1.5 meter distance on how they are performing tracheostomy care
- v. Since tracheostomy is an aerosol producing procedure N95 mask, face shield, protective body gown and boots will be strictly used for protection against Covid 19 to staff, self and patient
- vi. Clean gloves will be used while touching surfaces in the ICU
- vii. Undertaking daily screening of COVID -19 and ensuring the same has been done to the respondents

Attached with this letter are copies of ethical approval letter and abstract of the study. Your support and assistance will be greatly appreciated.

Yours Sincerely



Newton Ongaki Ochoki

0713301278/0773206680

Appendix v: KNH Research Program Registration Certificate

KNH/R&P/FORM/01



KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
NEWTON ONGAKI OCHOKI
2. Email address: newtonongaki01@gmail.com Tel No. 07733206680
3. Contact person (if different from PI) Dr. Mutasya Kyalo Albanus
4. Email address: amutasya@khat.ac.ke Tel No. 0921484869
5. Study Title
FACTORS ASSOCIATED WITH ADHERENCE TO TRACHEOSTOMY CARE GUIDELINES AMONG CRITICAL CARE NURSES AT KENYATTA NATIONAL HOSPITAL
6. Department where the study will be conducted ANAESTHESIA
(Please attach copy of Abstract)
7. Endorsed by Research Coordinator of the KNH Department where the study will be conducted.
 Name: _____ Signature _____ Date _____
8. Endorsed by KNH Head of Department where study will be conducted.
 Name: Dr. K. Mwananyi Signature [Signature] Date 02/09/2020
9. KNH UoN Ethics Research Committee approved study number P198/03/2020
(Please attach copy of ERC approval)
10. NEWTON ONGAKI OCHOKI commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Medical Research.
 Signature [Signature] Date 02/09/2020
11. Study Registration number (Dept/Number/Year) Anaesthetics / 130 / 2020
(To be completed by Medical Research Department)
12. Research and Program Stamp _____

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Medical Research and Investigators **must commit** to share results with the hospital.

Version 2 - August 2014

Appendix VI: Participant Information Sheet

Title: Factors Associated With Adherence to Tracheostomy Care Guidelines among Critical Care Nurses at the Critical Care Unit in Kenyatta National Hospital

Name of researcher: Newton Ongaki Ochoki

Contact: 0773206680/0713301278

Name of institution: Jomo Kenyatta University of agriculture and technology (JKUAT)

College of Health sciences (COHES)

School of Nursing

JUJA main campus

Introduction: I am a nursing student at JKUAT, undertaking Masters of Science in nursing (Critical care).I am undertaking this research project titled factors associated with adherence to tracheostomy care guidelines among critical care nurses in the CCU at KNH. The details here will assist you to make an informed decision to be involved in this research.

Purpose of the study

The purpose of the study is to establish the determinants of adherence to evidence based tracheostomy care guidelines among critical care nurses in the critical care unit in KNH. Tracheostomy guidelines include various concepts of tracheostomy care that use best research available, nursing expertise and preferences of patients while providing for tracheostomy care. Practices that are not evidence based rely on intuition, tradition or other unproven methods. The determinants to adherence to evidence based tracheostomy care guidelines in this study will include nurse related and hospital system factors.

Benefits of the study

The information you offer will help establish adherence level and factors affecting it. This will enable me establish a relationship between the two and thus the study will be able to recommend to critical care nurses the determinants that need reinforcement and those that need to be made available for high levels of adherence. This information will be key for promotion of better patient outcomes and also offer opportunities for interventional research by ICU nurses.

Participation

Participation in this study is voluntary and the data you provide will be held in confidentiality. Refusing to participate or withdrawing from the study will not result in disciplinary action. You will be selected from among other registered critical care nurses who meet the inclusion criteria.

Study procedure

If you agree to participate in this study, you will be issued with the data collection tool. The questions have been simplified for understanding and you are free to seek clarification from the research assistants where you do not understand. You will also be required to fill in full the data collection questionnaire.

Risks

There are no risks associated with this study. Only about 15 minutes or less of your time off the work schedule during breaks will be needed.

Compensation

There is no monetary compensation in participating in this study.

Conflict of interest

The researcher and the supervisors declare no conflict of interest in conducting this research. Your cooperation is highly appreciated. For further clarification kindly contact the following:

1. Principal investigator- Newton Ongaki Ochoki

MScN (student), BScN

Contact: 0773206680 / 0713301278

Email: newtonongaki001@gmail.com

2. Supervisor- Dr. Mutisya Albanus Kyalo

PhD, MScN, BScN, CEN

Senior lecturer school of Nursing JKUAT

Contact: 0721484869

Email: amutisya@jkuat.ac.ke

3. Supervisor- Dr. Mwangi Elijah Githinji

PhD, MScN, BScN, HND

Lecturer school of nursing JKUAT

Contact: 0722349473

Email: eligimwa@yahoo.com

4. The Secretary KNH-UON ethics committee

Contact: 020-2726300 or Extension number 44355

Email: Uonknherc@uonbi.ac.ke

Appendix VII: Consent Form

If you agree to be involved in the study, please sign below after reading through;

I hereby agree to participate in this study. I understand that my participation is out of my choice and that it will not be used to victimize me. I may also opt out this research. I have also been reassured that the information I give will be held in confidentiality. I confirm that all my concerns about participation in the study have been addressed adequately by the investigator who also asked questions to ascertain my understanding of the information provided in the participant information sheet.

Participants signature..... Date.....

I Newton Ongaki Ochoki hereby confirm that I have clearly and fully explained to the participant the nature of the study and contents of this consent form in detail and the participant has agreed to participate voluntarily without undue pressure or coercion.

Researchers signature.....

Date.....

Appendix VIII: Tracheostomy Care Guideline Questionnaire

Date..... Code.....

Title: Factors Associated With Adherence to Tracheostomy Care Guidelines among Critical Care Nurses at Kenyatta National Hospital

Instructions:

1. All 5 sections in the following questionnaire should be answered
2. Tick in the appropriate choice where applicable

A. Socio Demographic Data

1. Gender

- a. Male b. Female

2. Age..... (Please indicate in years)

3. Highest level of nursing education

- a. Certificate
- b. Diploma
- c. Higher diploma
- d. Degree
- e. Masters
- f. PhD

4. Years of nursing experience..... (Please indicate in years)

5. Specialty training

- a. Critical care nursing
- b. Other; specify.....
- c. None

6. Which is your cadre in nursing

a. Nursing officer III

b. Nursing officer II

c. Nursing officer I

d. Senior nursing officer

e. Assistant chief nursing officer

Adherence Level Towards Tracheostomy Care Guidelines

How often do you perform the following with regards to tracheostomy care?

ITEM	Very often	Often	Sometimes	Rarely
1. Clinical assessment of the airway for patency				
2. Suctioning only when clinically indicated				
3. Applying aseptic technique when performing tracheostomy suctioning				
4. Use closed system catheter for suctioning patients on mechanical ventilation				
5. Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter				

6. Maintaining suctioning pressure between 100mmHg-120mmHg				
7. Suctioning for not more than 15 seconds				
8. Pre oxygenate prior to performing suctioning				
9. Not instilling normal saline to liquefy secretion				
10. Humidifying air using a humidifier system or heat moisture exchange filter				
11. Referring swallowing difficulties to speech and language therapists for screening				
12. Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise				
13. Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction				
14. Changing the stoma dressing and tapes daily or whenever it has been soiled				
15. Planning and clearly documenting				

weaning, while evaluating the decision with other health care team members				
16. Carrying out weaning gradually				

B. Nurse Related Factors Affecting Adherence to Tracheostomy Care Guidelines

I. Knowledge Of Evidence Based Tracheostomy Care Guidelines

1. What is the significance of early detection of respiratory changes in a patient with a tracheostomy?
 - a) To promote timely suctioning of the airway
 - b) To ensure timely interventions to avoid airway complications
 - c) To allow for timely resuscitation of the patient

2. When should suctioning be done in a patient with a tracheostomy?
 - a) According to patient's respiratory status
 - b) At preset institution time points
 - c) Strictly after Every 4 hours

3. Which of the following statements is true about suctioning in a patient with a tracheostomy tube?
 - a) Suctioning introduces staphylococcus aureus to the ICU ward
 - b) Suctioning can introduce microorganisms to the airway via the tracheostomy tube
 - c) Suctioning always introduces virulent bacteria to the airway

4. What is the significance of a closed system suction catheter in tracheostomized patient under a ventilator?
 - a) Maintenance of mechanical ventilator pressures
 - b) Infection prevention at the tracheostomy stoma
 - c) Comfort during the suctioning procedure

5. What size of suction catheters should be used in tracheostomized patients?
 - a) Dependent on the size of the tracheostomy tube in place
 - b) Size less than the internal diameter of the tracheostomy tube
 - c) Size equal or less than the external diameter of the tracheostomy tube

6. Which of the following can cause atelectasis and mucosal damage with regard to suctioning in a patient with a tracheostomy tube?
 - a) Suctioning done many times in 24 hours
 - b) Suctioning under very high pressures
 - c) Suctioning with normal saline under very high pressure

7. Which of the following increases the risk for trauma during suctioning in a patient with a tracheostomy tube?
 - a) Suctioning done over a long period of time
 - b) Suctioning done on a newly placed tracheostomy tube
 - c) Suctioning done at pre-determined times

8. Which of the following can reduce suctioning induced hypoxemia in tracheostomized patients?
 - a) Prior oxygenation of a patient before the procedure
 - b) Putting the patient in a semi fowlers position
 - c) Assessing the arterial blood gas results before suctioning

9. What is the effect of normal saline instilled during suctioning?
- a) To liquefy secretions
 - b) No benefit at all
 - c) Stimulating cough thus dislodging secretions
10. Which of the following statements is true about humidification for patients with a tracheostomy?
- a) Heated humidifiers are indicated for patients awaiting discharge
 - b) Moisture exchange filter is indicated for new tracheostomy tubes
 - c) Heated humidifiers are indicated for new tracheostomy tubes while moisture exchange filters for patients awaiting discharge
11. What increases the risk of aspiration in tracheostomized patients?
- a) Difficulty in swallowing
 - b) Dislodged tracheostomy tubes
 - c) Compression of the esophagus
12. Why should cuff pressure of a tracheostomy tube be constantly monitored?
- a) To promote airway clearance
 - b) To maintain mechanical ventilator fraction of inspired oxygen setting
 - c) To avoid complications of over and under inflation
13. What is the purpose of 6 hourly inner tracheostomy tube inspection?
- a) For suctioning to be done
 - b) For reduction of incidences of obstruction
 - c) For cleaning purposes before reinsertion
14. Which of the following measures can reduce weaning related complications in tracheostomized patients?
- a) Weaning during the night under close observation

- b) Weaning decision that is multidisciplinary evaluated
- c) Weaning after surgical and medical conditions affecting a patient have improved

15. Gradual weaning is important for;

- a) Enhancing the capacity of accessory respiratory muscles
- b) Assessment of oxygenation to the brain
- c) Building confidence in breathing

16. Which of the following is an emergency for patients with a tracheostomy tube?

- a) Tracheostomy tube dislodgement especially within 7 days after it has been inserted
- b) Cuff deflation
- c) Patient with a tracheostomy tube fighting the ventilator

17. In a tracheostomy tube obstruction, when is suctioning indicated?

- a) If coughing fails to remove the blockage
- b) If removing the inner cannula and coughing fails to remove the blockage
- c) If removing the inner cannula fails to remove the blockage

II. Attitude Towards Tracheostomy Care Guidelines

	STRONGLY AGREE	AGREE	UNDECI- DED	DISAGREE	STRONGLY DISAGREE
1) My workload is too much for me to keep up to date with new evidence based tracheostomy					

care guidelines					
2) I resent having my tracheostomy care audited					
3) Evidence based tracheostomy care guidelines is a waste of my time					
4) I stick to tried and trusted methods rather than changing to new evidence based tracheostomy care guidelines					

C. Health System Factors Affecting Adherence to Tracheostomy Care Guidelines

1. Are evidence based tracheostomy care guidelines available at the critical care unit?

a. Available b. Not available c. Not sure d. Other (specify).....

2. Does the hospital have a reliable internet connection so that you can access scientific databases with information on evidence based tracheostomy care guidelines?

a. Adequate access b. inadequate access c. Other (specify).....

3. Does the hospital have access to scientific data bases so that you can retrieve information on evidence based tracheostomy care guidelines?

a. Openly accessible

b. Subscription access

c. Not sure

d. Both open and subscription access

e. Other (specify).....

4. Does the critical care unit have adequate printers for printing of evidence based tracheostomy care guidelines to nurses?

a. Enough printing resources

b. Not enough printing resources

c. No printing resources

d. Other (specify).....

5. What is the critical care unit workload status with regard to adherence to evidence based tracheostomy care guidelines?
 - a. Nurse to patient ratio of 1:2
 - b. Nurse to patient ratio below 1:2
 - c. Nurse to patient ratio above 1:2
 - d. Other (specify).....

6. Are you aware of any hospital management strategies, policies or activities regarding evidence based tracheostomy care guidelines?
 - a. Aware
 - b. Not sure
 - c. Not aware
 - d. Other (specify).....

7. What is critical care unit information seeking culture towards evidence based tracheostomy care guidelines?
 - a. A culture that seeks information from Books
 - b. A culture that seeks information from colleague nurses
 - c. A culture that seeks information from doctors
 - d. A culture that utilizes the evidence based practice hierarchy of evidence
 - e. Others (Specify).....

8. What format of evidence based tracheostomy care guidelines is available in the critical care unit?
 - a. Videos
 - b. Research Papers
 - c. Published working document
 - d. None
 - e. Others. (Specify).....

9. Does the hospital have a mechanism to cover you when an unintended risk occurs from tracheostomy care based that is based on evidence based tracheostomy care guidelines?
 - a. Yes
 - b. No
 - c. Not sure
 - c. Other (specify).....

10. Does the critical care unit have necessary equipment and supplies which can be applied for use as indicated from evidence based tracheostomy care guidelines?

a. Yes b. NO c. Other (specify).....

Appendix IX: Observational Checklist on Adherence Level towards Tracheostomy Care Guidelines

Title: Factors associated with adherence to tracheostomy care guidelines among critical care nurses at Kenyatta National Hospital

Date.....

Code.....

ITEMS	Performed	Not performed
1. Clinical assessment of the airway for patency		
2. Suctioning only when clinically indicated		
3. Applying aseptic technique when performing tracheostomy suctioning		
4. Use closed system catheter for suctioning patients on mechanical ventilation		
5. Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter		
6. Maintaining suctioning pressure between 100mmHg-120mmHg		
7. Suctioning for not more than 15 seconds		
8. Pre oxygenate prior to performing suctioning		
9. Not instilling normal saline to liquefy secretion		
10. Humidifying air using a humidifier system or		

heat moisture exchange filter		
11. Referring swallowing difficulties to speech and language therapists for Screening		
12. Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise		
13. Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction		
14. Changing the stoma dressing and tapes daily or whenever it has been soiled		
15. Planning and clearly documenting weaning, while evaluating the decision with other health care team members		
16. Carrying out weaning gradually		

Appendix X: Objective 1 Manuscript publication

International Journal of Nursing Science 2021, 11(2): 36-40
DOI: 10.5923/j.nursing.20211102.02

Health System Factors Associated with Adherence to Tracheostomy Care Guidelines among Critical Care Nurses at a National Referral Hospital in Kenya

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Abstract Tracheostomy care is a routine nursing procedure in critical care units of many hospitals. This study therefore sought to establish health system factors associated with adherence to tracheostomy care guidelines among critical care nurses. This was an analytical cross-sectional study conducted in a national referral hospital in Kenya among critical care nurses. The sample size comprised a total of 79 nurses working in the critical care unit. An observational checklist and a self-administered questionnaire was used to collect quantitative data. Data was analyzed using R studio version 1.4.1103. In the bivariate analysis Fishers exact test or chi-square test was used to find associations between health system factors and adherence to the guidelines while in the multivariate analysis binary logistic regression was used to establish health system factors associated with adherence to the guidelines. Statistical significance was set at a P value below 0.05 at 95% confidence interval. The study findings revealed that 18(22.8%) nurses adhered to tracheostomy care guidelines while 61(77.2%) did not. Awareness of hospital management strategies and activities regarding tracheostomy care guidelines was the only health system factor associated with adherence to tracheostomy care guidelines in the multivariate analysis (AOR 0.21; 95% CI: 0.05-0.73; P=0.019). Nurses who were not aware of hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy care guidelines compared to those who were aware.

Keywords Adherence, Tracheostomy care guidelines, Health system factors, Critical care unit

1. Introduction

1.1. Background of the Study

Tracheostomy placement is indicated for respiratory distress. The care of a tracheostomy is routine in intensive care units. This care should be done through utilizing tracheostomy care protocols. Internationally adherence to tracheostomy care guidelines is affected by various factors [1].

These guidelines give information on assessment of the airway for patency, sizes of suction catheters, use of a humidifier system or heat moisture exchange, duration for suctioning and infection prevention techniques such as through use of closed system suction catheters. The guidelines also give information on multidisciplinary team work in the care of a tracheostomized patient [2].

In Kenya the devolved system of governance allows for counties through partnerships with the national government

to publish such guidelines. In the absence of county and national guidelines, hospitals or nurses can develop the guidelines based on scientific evidence. Studies from Sub Saharan Africa regions have established the importance of all stakeholders in provision of healthcare to work with government institutions to facilitate adherence to the guidelines and establish factors affecting adherence [3].

For adherence of tracheostomy care guidelines to be optimal intensive care units should ultimately have infrastructure which facilitates access to tracheostomy care guidelines. This will enable practice of tracheostomy to be evidence based and upto current standards [4].

1.2. Research Objective

To establish health system factors associated with adherence to tracheostomy care guidelines among critical care nurses at a national referral hospital in Kenya.

2. Methodology

2.1. Study Design

This was an analytical cross-sectional study design. These are studies which measure exposure and outcomes but at a

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Received: Jul. 10, 2021; Accepted: Jul. 21, 2021; Published: Jul. 30, 2021

Published online at <http://journal.sapub.org/nursing>

single time [5]. The design enabled collection of quantitative data at a single point for measurement of associations without influence. This design was relevant because it allowed for measurement of exposure and outcomes within the specific defined population in the study at one point.

2.2. Sampling and Recruitment Procedure

Due to the number of the study population, the researcher carried out a census that included a target population of 79 critical care unit nurses. The study therefore did not involve sampling. The inclusion criteria for this study were all nurses stationed at the general intensive care unit. The exclusion criteria included student trainees who are normally not routinely involved in provision of tracheostomy care.

2.3. Data Collection

A coded self-administered questionnaire and observational checklist for each nurse was used to collect quantitative data. To eliminate biasness nurses were observed without their knowledge when they were performing tracheostomy care. The guidelines for adherence were adopted from scientific databases such as PubMed and Cinahl published across various platforms for use including government websites [6]. Health system factors affecting adherence were obtained from filling a structured questionnaire by the nurses. Pre-testing of the data collection tools was done with ten nurses at the neurological intensive care unit of the national referral hospital. Data was collected for a period of three months. Data collection was done by a trained research assistant who is a licensed critical care nurse. The research assistant did not participate in the study and was trained on study objectives, study informed consent, data collection procedure and checking completeness of questionnaires.

2.4. Data Management

Data was coded then entered to Epidata version 3.1. It was later cleaned. Thereafter it was exported to Microsoft excel 2010. The data was then afterwards exported to Rstudio version 1.4.1103 for analysis. Descriptive Statistics was used to describe frequencies, means and percentages. Adherence to tracheostomy care guidelines was binary with a cut off of 80% [7]. Fishers test and Chi-square test was used to test for association between health system factors and observed adherence level in the univariate analysis. Binary logistic regression was later used in the multivariate analysis to determine statistically significant factors affecting adherence to the guidelines when controlling for possible confounders. The threshold for Statistical significance in the study was set at a P value of < 0.05 with a 95% confidence interval.

2.5. Ethical Considerations

Ethical approval was provided by University of Nairobi ethical review body along with the study hospital ethical

review body. Afterwards license to conduct the study was issued upon application by the National commission for science, technology and innovation of Kenya (NACOSTI). All the information in the study was held in strict confidentiality through assigning codes to the questionnaires. Signed informed consent was gained from the participants to collect data and no harm was present during the study period. Directives by the Kenyan government on prevention of transmission of COVID-19 during the study was also followed.

2.6. Study Limitation

Limitation of this study, is that it was conducted in one center and thus the situation in other hospitals may not have been reflected. Another limitation is that tracheostomized patients in the hospital, did not report what they viewed as health system factors affecting adherence to tracheostomy care guidelines as it was only done by the nurses.

3. Results

The study participants consisted of 79 nurses stationed at the intensive care unit.

Table 1. Socio-Demographic Characteristic of the Nurses

Socio - Demographics	Characteristic	n (%)
Gender	Male	23 (29.1)
	Female	56 (70.9)
Education	Diploma	3 (3.8)
	Higher Diploma	60 (75.9)
	Degree	14 (17.7)
	Masters	2 (2.6)
Specialty Training	Critical care nursing	70 (88.6)
	Not trained on critical care	9 (11.4)
Cadre	Nursing Officer III	6 (7.6)
	Nursing Officer II	21 (26.6)
	Nursing Officer I	8 (10.1)
	Senior Nursing Officer	39 (49.4)
	Assistant Chief Nursing Officer	5 (6.3)
Age	Years Mean(\pm SD)	39.1 (7.1)
Experience	Years Mean(\pm SD)	13.3 (6.8)
	Total	79

Mean age of the participants was 39.1 years and they had a mean experience of 13.3 years. A total of 23 (29.1%) nurses were male while 56 (70.9%) were female. Majority of the nurses 60 (75.9%) had trained up to higher national diploma level. In relation to specialty training, 70 (88.6%) nurses had been trained on critical care nursing while 9(11.4%) had no specialized training in critical care. In terms of cadre, senior nursing officers were the majority at 39(49.4%). Table 1 shows a descriptive analysis of the socio-demographic data.

An observational checklist was used to find out the observed adherence level towards tracheostomy care guidelines among the nurses. The nurses were observed on whether they were performing what is in the guidelines or if they were not. Observation was done during the care of patients with a tracheostomy. Table 2 gives the information on observation of tracheostomy care guidelines among the nurses. A total of 18 (22.8%) nurses adhered to the guidelines while 61 (77.2%) did not adhere to the tracheostomy care guidelines on observation.

Table 2. Observation of Adherence towards Tracheostomy Care Guidelines

Guideline	Performed n (%)	Not Performed n (%)
Clinical assessment of the airway for patency	79 (100.0)	0 (0.0)
Suctioning only when clinically indicated	31 (39.2)	48 (60.8)
Applying aseptic technique when performing tracheostomy suctioning	78 (98.7)	1 (1.3)
Using closed system catheter for suctioning patients on mechanical ventilation	0 (0.0)	79 (100.0)
Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter	5 (6.3)	74 (93.7)
Maintaining suctioning pressure between 100mmHg-120mmHg	3 (3.8)	76 (96.2)
Suctioning for not more than 15 seconds	40 (50.6)	39 (49.4)
Pre oxygenate prior to performing suctioning	21 (26.6)	58 (73.4)
Not instilling normal saline routinely to liquefy secretion	76 (96.2)	3 (3.8)
Humidifying air using a humidifier system or heat moisture exchange filter	78 (98.7)	1 (1.3)
Referring swallowing difficulties to speech and language therapists for Screening	9 (11.4)	70 (88.6)
Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise	6 (7.6%)	73(92.4%)
Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction	8 (10.1)	71 (89.9)
Changing the stoma dressing and tapes daily or whenever it has been soiled	70 (88.6)	9 (11.4)
Planning and clearly documenting weaning, while evaluating the decision with other health care team members	34 (43.0)	45 (57.0)
Carrying out weaning gradually	78 (98.7)	1 (1.3)

Table 3. Bivariate Analysis between Health System Factors with Adherence to Tracheostomy Care Guidelines

Health System Factor	Category	OR	95% CI		P-Val
			Lower	Upper	
Availability of evidence based tracheostomy guidelines	Not available	0.35	0.06	1.64	0.193
	Not sure	1.77	0.51	6.74	0.373
Availability of reliable internet connection in the hospital	Inadequate access	0.22	0.01	6.14	0.311
	Others	0.33	0.01	8.90	0.451
Access to scientific databases	Yes	1.77	0.59	5.21	0.299
Availability of adequate printers for printing	No enough resource	0.40	0.02	10.58	0.527
	No resources	0.12	0.003	3.55	0.169
Status of critical care unit's workload	Ratio 1:2 and below	3.47	1.18	10.8	0.025
Hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.002	0.000013	0.03	0.016
Source of Information on tracheostomy guidelines at the critical care	Information from colleagues	0.75	0.11	4.90	0.756
	Information from doctors	0.90	0.22	4.53	0.887
Format of evidence based tracheostomy care guidelines available in the critical care unit	Videos, Research papers, Published working documents	2.68	0.89	9.22	0.091
Mechanism to cover nurses when an unintended risk occurs from tracheostomy care	No	0.28	0.03	1.57	0.173
	Not sure	0.95	0.28	3.52	0.939
Availability of necessary equipment and supplies	No	0.65	0.16	2.14	0.277

Table 4. Multivariate Analysis between Health System Factors with Adherence to Tracheostomy Care Guidelines

Health system factor	Category	AOR	95% CI		P-Val
			Lower	Upper	
Status of critical care unit's workload	1:2 ratio and below	2.74	0.82	9.56	0.101
Awareness of hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.21	0.05	0.73	0.019

Several aspects of health systems factors that were thought to affect the adherence of nurses to tracheostomy care guidelines were assessed as shown in table 3. There was a significant association between workload and adherence level to tracheostomy care guidelines (OR 3.47; 95% CI: 1.18-10.8 P=0.025). Nurses who agreed a workload ratio of 1:2 and below was attained in the unit were 3.47 times likely to adhere compared to those who said the ratio was above 1:2.

There was also a significant association between adherence level to tracheostomy care guidelines and awareness of hospital management strategies regarding tracheostomy care guidelines (OR 0.002; 95% CI: 0.000013-0.03; P=0.016). Nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware of the management strategies.

Adjusting for other factors using binary logistic regression in the multivariate analysis between health system factors with adherence to tracheostomy care guidelines, nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware. (AOR 0.21; 95% CI: 0.05-0.73; P=0.019). Table 4 gives the analysis during multivariate analysis between health system factors with adherence to tracheostomy care guidelines.

4. Discussion

On observation majority of the nurses did not adhere to tracheostomy care guidelines. This finding is different from a study done in Canada by Leddy who established majority of the nurses followed tracheostomy care guidelines. In this study pre-oxygenation prior to performing suctioning was performed by 26.6% of the nurses while in Leddy's study it was performed by 60% of the sample size. Use of a closed system suction was performed by none of the nurses in this study while in Leddy's study it was performed by 99% of the nurses [8,9]. These observations might have been influenced by different levels of technology and types of work equipments.

Awareness of mechanisms by the hospital to cover nurses when an unintended risk occurs from adopting tracheostomy care guidelines was not associated with adherence to tracheostomy care guidelines. This is in contrast with Thomas in the USA who found adoption of a care bundle on

tracheostomy care that had mechanisms of protection against tracheostomy related ulcers led to adherence [10,11]. The differences from the two studies could be attributed to many number of litigation because of patient awareness in the developed USA as compared to Kenya.

In this study a ratio of 1:2 and below in the critical care unit was significantly associated with adherence to tracheostomy care guidelines. This is similar to other studies which find a work ratio of 1:2 and below is associated with adherence. In this study nurses who were not aware that hospital management strategies and activities regarding tracheostomy care guidelines exist were less likely to adhere to tracheostomy care guidelines. This is similar to other studies which established awareness of organizational management support among the nurses led to adherence [12,13]. These findings imply hospitals which are staffed adequately and also disseminate policies to their staff are likely to practice tracheostomy care which follows current guidelines.

5. Conclusions

Overall based on the results majority of the nurses in the critical care unit did not adhere to tracheostomy care guidelines when observed. The health system factor associated with adherence to the guidelines was awareness of hospital management strategies or activities regarding tracheostomy care. Nurses who were aware of the hospital management strategies and activities regarding tracheostomy care guidelines were more likely to adhere to the guidelines compared to those who were not aware. Furthermore the nurses reported they did not know of mechanisms by the hospital to cover them when unintended risks occur from applying new tracheostomy care guidelines.

6. Recommendations

The study recommends that nurses in critical care units to undergo refresher training on tracheostomy care periodically to update practice to current guidelines. Hospital policies on application of new guidelines and mechanisms to cover nurses when risks occur from application of the guidelines should be made aware to nurses.

ACKNOWLEDGEMENTS

The authors of this study would wish to acknowledge the

staff at the national referral hospital who participated in this study. Their support is greatly indebted.

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Appendix XI: Objective 2 Manuscript Publication

East African Medical Journal Vol. 98 No. 9 September 2021

NURSE RELATED FACTORS ASSOCIATED WITH ADHERENCE TO TRACHEOSTOMY CARE GUIDELINES AMONG CRITICAL CARE NURSES AT KENYATTA NATIONAL HOSPITAL

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NURSE RELATED FACTORS ASSOCIATED WITH ADHERENCE TO TRACHEOSTOMY CARE GUIDELINES AMONG CRITICAL CARE NURSES AT KENYATTA NATIONAL HOSPITAL

N. O. Ochoki, M. A. Kyalo and E. G. Mwangi

ABSTRACT

Objective: To establish nurse related factors associated with adherence to tracheostomy care guidelines among critical care nurses in Kenyatta National Hospital.

Design: Analytical cross-sectional

Setting: Kenyatta National Hospital Critical care unit

Subjects: Critical care unit nurses

Main outcome measures: Adherence level to tracheostomy care guidelines and Nurse related factors affecting adherence to tracheostomy care guidelines.

Results: A total of 79 nurses were involved in the study. The mean age of the nurses was 39.1 years. Assessment for adherence to tracheostomy care guidelines using an observational checklist revealed that 18 nurses (95% CI: 14.1% to 33.6%) adhered to the guidelines while 61 nurses (95% CI: 66.4% to 85.9%) did not. Additionally, 43(54.4%) nurses who formed a majority had positive attitude towards tracheostomy care audit. Among the nursing factors associated with adherence, knowledge of the nurses on tracheostomy care guidelines was significantly associated with adherence (OR 3.45; 95% CI: 1.03-12.11; P=0.026). Nurses who were knowledgeable on tracheostomy care guidelines were three times likely to adhere to the guidelines than those who were not.

Conclusion: Majority of the nurses did not adhere to tracheostomy care guidelines on observation. Additionally, most of the nurses had positive attitude towards the tracheostomy care guidelines and knowledge of tracheostomy care guidelines among the nurses was associated with adherence to the guidelines.

INTRODUCTION

Tracheostomy placement is indicated for acute respiratory failure and for traumatic or neurologic insults which leads to airway or mechanical ventilation support. Tracheostomy care is a routine procedure done in critical care units. This care should be performed through adhering to evidence based tracheostomy care guidelines. Globally adherence to tracheostomy care guidelines differs considerably among nurses and it is affected by various factors¹.

Evidence based tracheostomy care guidelines give information on frequency of changing stoma dressing, techniques of suctioning and amount of pressure to be used for suctioning. The type of humidifying systems to be applied and regulation of tracheostomy cuff pressures are also important parts of care. The guidelines also give information on the process of weaning after successful ventilatory support².

In Kenya the ministry of health collaborates with various institutions to publish such guidelines. In the absence of national guidelines, hospitals or qualified health workers can develop the guidelines based on scientific evidence. There is not enough information on adherence level to tracheostomy care guidelines in the country or factors affecting the adherence level. Studies from Sudan have established the importance of all stakeholders in provision of healthcare to work with the government to facilitate adherence to the guidelines and establish factors affecting adherence³.

For adherence of tracheostomy care guidelines to be optimal critical care unit nurses must have the requisite characteristics. Nurses should be adequately prepared from training and at their workplaces to adequately follow the guidelines⁴.

MATERIALS AND METHODS

Study design, setting and population: This was an analytical cross-sectional study. It was carried out at the general intensive care unit in Kenyatta National Hospital located in Nairobi Kenya. This is the largest teaching and referral hospital in East and central Africa. The study population was small and thus the researcher carried out a census that included a target population of 79 critical care unit nurses. The study therefore did not involve sampling. The inclusion criteria for this study were all nurses stationed at the general intensive care unit. The exclusion criteria included student trainees who are normally not routinely involved in provision of tracheostomy care.

Data collection and procedures: A similar coded self-administered questionnaire and observational checklist for each participant was used to collect data. Observation on adherence to tracheostomy care guidelines was done when nurses were performing tracheostomy care. To eliminate biasness nurses were observed without their knowledge. The guidelines for adherence were adopted from scientific databases such as PubMed and Cinahl published across various platforms for use including government websites⁵. Knowledge of the guidelines was assessed using a set of 17 questions derived from the evidence-based protocols adopted in the study. Data on attitude was collected through filling a structured questionnaire. Pre-testing of the data collection tools was done with ten nurses at the neurological intensive care unit in Kenyatta National Hospital to ensure validity. Data was then collected from 8th September 2020 to 30th November 2020.

Data analysis: Data analysis was performed using Rstudio version 1.4.1103. Descriptive

Statistics was used to describe frequencies, means and percentages of adherence level and nurse related factors affecting adherence. Adherence to tracheostomy care guidelines was dichotomized with a cut off of 80 %⁵. A cut off of 75% was used while assessing knowledge⁷. Fishers test and Chi-square test were used to test for association between nurse related factors and observed adherence level to tracheostomy care guidelines. The threshold for Statistical significance in the study was set at a P value of < 0.05 with a 95% confidence interval. Odds ratios were also generated.

Ethical considerations: This study was given clearance by Kenyatta National Hospital-University of Nairobi ethical review committee under registration P198/03/2020 after submission of the proposal. The National Commission of Science, technology and information in Kenya also gave a research license to conduct the study under registration NACOSTI/P/20/6590. All the information in the study was held in strict confidentiality

through assigning codes to the questionnaires. Signed informed consent was gained from the participants to collect data and no harm was present during the study period. Directives by the Kenyan government on prevention of transmission of COVID-19 during the study were also followed.

RESULTS

Socio-Demographic Characteristics:

The study participants consisted of 79 nurses stationed at the critical care unit. Mean age of the participants was 39.1 years and a mean experience of 13.3 years. A total of 23 (29.1 %) nurses were male while 56 (70.9 %) were female. Majority of the nurses 60 (75.9%) had trained up to higher national diploma level. In relation to specialty training, 70 (88.6 %) nurses had been trained on critical care nursing while 9(11.4%) had no specialized training in critical care. In terms of cadre, senior nursing officers were the majority at 39(49.4%).

Table 1
Socio-demographic characteristics of the nurses

Socio - Demographics	Characteristic	n (%)
Gender	Male	23 (29.1)
	Female	56 (70.9)
Education	Diploma	3 (3.8)
	Higher Diploma	60 (75.9)
	Degree	14 (17.7)
	Masters	2 (2.6)
Specialty Training	Critical care nursing	70 (88.6)
	Not trained on critical care	9 (11.4)
Cadre	Nursing Officer III	6 (7.6)
	Nursing Officer II	21 (26.6)
	Nursing Officer I	8 (10.1)
	Senior Nursing Officer	39 (49.4)
	Assistant Chief Nursing Officer	5 (6.3)
Age	Years Mean(\pm SD)	39.1 (7.1)
Experience	Years Mean(\pm SD)	13.3 (6.8)
	Total	79

n= number of respondents, %= percentage of respondents, SD= standard deviation

Adherence to Tracheostomy Care Guidelines:

An observational checklist was used to find out the observed adherence level towards tracheostomy care guidelines among the

nurses. The nurses were observed whether they were following the guidelines when performing tracheostomy care. The table below illustrates the findings on observation

Table 2
Observation of tracheostomy care guidelines among nurses

Guideline	Performed n (%)	Not Performed n (%)
Clinical assessment of the airway for patency	79 (100.0)	0 (0.0)
Suctioning when clinically indicated	31 (39.2)	48 (60.8)
Applying aseptic technique when performing tracheostomy suctioning	78 (98.7)	1 (1.3)
Using closed system catheter for suctioning patients on mechanical ventilation	0 (0.0)	79 (100.0)
Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter	5 (6.3)	74 (93.7)
Maintaining suctioning pressure between 100mmHg-120mmHg	3 (3.8)	76 (96.2)
Suctioning for less than 15 seconds	40 (50.6)	39 (49.4)
Pre oxygenate prior to performing suctioning	21 (26.6)	58 (73.4)
Instilling normal saline routinely to liquefy secretion	76 (96.2)	3 (3.8)
Humidifying air using a humidifier system or heat moisture exchange filter	78 (98.7)	1 (1.3)
Referring swallowing difficulties to speech and language therapists for Screening	9 (11.4)	70 (88.6)
Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise	6 (7.6%)	73(92.4%)
Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction	8 (10.1)	71 (89.9)
Changing the stoma dressing and tapes daily or whenever it has been soiled	70 (88.6)	9 (11.4)
Planning and clearly documenting weaning, while evaluating the decision with other health care team members	34 (43.0)	45 (57.0)
Carrying out weaning gradually	78 (98.7)	1 (1.3)

n=number of respondents, %= percentage of respondents

A score of 1 was awarded for each of the 16 interventions that was done by the nurses and a score of zero for each intervention not done. The maximum attainable score from the 16 observed items was therefore 16. This was used to compute the percentage score on

observed adherence for each of the nurses. Percentage adherence score was then dichotomized with a cut off of 80 % based on the model of adherence to therapeutic regimens by Haynes (1976). A total of 18 (22.8%; 95% CI 14.1% to 33.6%) nurses adhered

to the guidelines while more than three quarters (77.2%; 95% CI: 66.4% to 85.9%) of the nurses did not adhere. Figure 1 below shows the adherence level.



Figure 1: Adherence to tracheostomy care guidelines

Knowledge of Tracheostomy Care Guidelines among the Nurses:

A set of evidence-based tracheostomy care guidelines questions was used to test knowledge of the tracheostomy care

guidelines. A total of 26 (32.9%; 95% CI 22.7% to 44.4%) nurses were knowledgeable on tracheostomy care guidelines while 53 (67.1%; 95% CI: 55.6% to 77.3%) were not knowledgeable.



Figure 2: Knowledge of tracheostomy care guidelines among the nurses

Attitude towards Tracheostomy Care Guidelines among the Nurses:

Majority of the nurses had positive attitude towards tracheostomy care guidelines. On the aspect of workload and tracheostomy care, 55 (69.5%) nurses had a positive attitude while on tracheostomy care audit 43 (54.4%) nurses

were positive. Additionally on spending time searching for tracheostomy care guidelines 71 (89.9%) nurses were positive about it whereas 54 (68.4%) nurses were positive on adapting to new tracheostomy care guidelines. *Bivariate Analysis between Nurse Related Factors with Adherence to Tracheostomy Care Guidelines:*

Table 3
Bivariate analysis between nurse related factors with adherence to tracheostomy care guidelines

	Category	Adherence		OR (95% CI)	P Value
		No (n = 61)	Yes (n = 18)		
SOCIO-DEMOGRAPHIC FEATURES					
Gender	Male	19 (23.0)	4 (22.2)	1.57 (0.42, 7.45)	0.564
	Female	42 (77.0)	14 (77.8)		
Education	Cert, Dip, H. Dip	47 (77.0)	16 (88.9)	0.42 (0.04, 2.18)	0.338
	Degree, Masters	14 (23.0)	2 (11.1)		
Training	Critical Care Nursing	54 (88.5)	16 (88.9)	0.96 (0.09, 5.79)	1.000
	No CCN Training	7 (11.5)	2 (11.1)		
Cadre	Nursing Officers I, II & III	28 (45.9)	7 (38.9)	1.33 (0.41, 4.63)	0.788
	Senior Nursing Officer	33 (54.1)	11 (61.1)		
Age	Mean in years (Std Dev)	38.8 (7.4)	40.1 (6.0)	1.03 (0.95, 1.11)	0.500
	Experience	Mean in years (Std Dev)	12.7 (6.5)		
KNOWLEDGE					
Knowledge	Knowledgeable	16 (22.2)	10 (55.6)	3.45(1.03,12.11)	0.026
	Not knowledgeable	45 (73.8)	8 (44.4)		
ATTITUDE					
Workload	Neutral	3 (4.9)	1 (5.6)	6.33 (0.21, 94.44)	0.232
	Negative	39 (63.9)	16 (88.9)		
Tracheostomy care Audit	Positive	19 (31.1)	1 (5.6)	7.79 (1.42, 45.85)	0.054
	Neutral	8 (13.1)	1 (5.6)		
	Negative	32 (52.5)	11 (61.1)	1.03 (0.84, 1.27)	0.749
	Positive	21 (34.4)	6 (33.3)		
Time to search for evidence based tracheostomy care guidelines	Neutral	3 (4.9)	0 (0.0)	0.82 (0.44, 1.52)	0.521
	Negative	54 (88.5)	17 (94.4)		
Adoption of new tracheostomy care guidelines	Positive	4 (6.6)	1 (5.6)	1.04 (0.70, 1.54)	0.842
	Neutral	13 (21.3)	0 (0.0)		
	Negative	37 (60.7)	17 (94.4)	1.26 (0.97, 1.63)	0.078
	Positive	11 (18.0)	1 (5.6)		

OR Odds ratio, CI= confidence interval, P= probability, n= number of participants

The results of the bivariate analysis show that, there was no significant association between socio-demographic characteristics and attitude of the nurses with adherence to the tracheostomy care guidelines. There was however a statistically significant association

between adherence and knowledge (OR 3.45; CI: 1.03-12.11; P=0.026). Nurses who were knowledgeable on tracheostomy care guidelines were 3.45 times more likely to adhere to tracheostomy care guidelines than those who were not knowledgeable.

DISCUSSION

In this study majority of the nurses did not adhere to tracheostomy care guidelines on observation. This finding does not support that of a study conducted by Mosazade in Iran who also established majority of the nurses adhered to tracheostomy care guidelines when observed. In this study pre-oxygenation prior to performing suctioning was performed by 26.6% of the nurses while in Mosazade's it was performed by more than half of the sample size. Use of a closed system suction was performed by none of the nurses in this study while in Mosazade's study it was performed by 85.7% of the nurses⁸. These observations might have been influenced by different levels of technology and types of work equipments.

This study revealed that age of the nurses does not affect adherence to tracheostomy care guidelines. This finding supports a study done previously in Kenya by Barako who established age is not a significant factor to application of guidelines. In terms of training this study showed no association between specialized critical care training and adherence to tracheostomy care guidelines which is in contrast to findings by Nizam in Ireland who found critical care training was associated with adherence to tracheostomy care guidelines. There was no association between years of experience among the cadres of nurses and adherence to tracheostomy care guidelines. Pritchett in USA got contrary findings where experienced cadre of senior nursing officers were significantly associated to compliance to

tracheostomy care guidelines^{9, 10, 11}. This could have been contributed by differences in use of research-based evidence in specialized training in the different settings. A culture of not following guidelines by experienced nurses because of lack of routine audits may have also contributed to non-adherence in this study. Majority of the nurses were not knowledgeable on tracheostomy care guidelines. This finding is consistent to that by Dhaliwal from India who found 43% of nurses were knowledgeable while 57% were not knowledgeable. Knowledge of tracheostomy care guidelines was significantly associated with adherence to tracheostomy care guidelines in this study. This finding is also similar to that by Dhaliwal who established a positive correlation between knowledge and adherence¹². This demonstrates knowledge provides the rationale to guide practice in the correct way.

Nurses in this study reported to have positive attitude on workload and tracheostomy care audit. That finding does not support a study conducted in Kazakhstan by Pulatova who established nurses had negative attitude¹³. This difference might have been due to the manner in which audits and employment of nurses is done in the two countries. If victimization is present in audits negative attitudes will likely develop. Similarly, employment without considering nurse to patient ratios will likely lead to negative attitudes.

CONCLUSION

Overall based on the results most nurses in the critical care unit did not adhere to tracheostomy care guidelines when observed. The nurse related factor associated to adherence was knowledge on tracheostomy care guidelines. Knowledgeable nurses were

more likely to adhere to the guidelines than those who were not. Furthermore, majority of the nurses had positive attitude towards adherence to tracheostomy care guidelines. They viewed tracheostomy care audit, sufficient workload and adopting new tracheostomy care guidelines as good strategies leading to adherence to the guidelines.

RECOMMENDATIONS

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The study recommends that nurses should be trained on tracheostomy care guidelines so that their practice is up to date on the current evidence. The guidelines should then be made available in the critical care units. Knowledge of the guidelines can be learned in a problem-based manner through seminars. Positive attitude towards the guidelines among the nurses be maintained through behavior reinforcement by unit in charge through recognition and award of the nurses as patient's champions.

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