EVALUATION OF NURSES' PRACTICE ON UTILIZATION OF VENTILATOR-ASSOCIATED PNEUMONIA CARE BUNDLE IN CRITICALCARE UNIT AT KENYATTA NATIONAL HOSPITAL

BY:

JOAN KATUKU KALOVWE

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DECLARATION

I, Joan Kalovwe declare that this study on Evaluation of nurses' practice on utilization of ventilator-associated pneumonia in critical care unit Kenyatta national hospital is my original work and has never been presented for an academic award in any other University or institution of higher learning.

Name: Joan Katuku Kalovwe

Signature …………………………………………...   Date………………………

CERTIFICATE OF APPROVAL

We the undersigned certify that, this research has been submitted for the degree of Masters in Science nursing (Critical care nursing), of the University of Nairobi under our supervision and approval.

DR. JAMES MWAURA, PhD

SENIOR LECTURER

SCHOOL OF NURSING SCIENCES

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF NAIROBI

Signature …………. Date………….

MRS. THERESA ODERO,

MScN, DAN, RN, RMPG, DIP

SENIOR LECTURER SCHOOL OF NURSING

SCHOOL OF NURSING SCIENCES

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF NAIROBI

Signature ………………………   Date………

DEDICATION

I dedicate this work to my family; My parents Mr. and Mrs. Kalovwe Muthembwa, my spouse Mr. Bernard Nzalu for the financial support and daughters: Joyyie and Grace, for the support, understanding and words of encouragement throughout the study period. Special thanks to Grace for keeping me company during the early hours of morning.

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LIST OF ABBREVIATIONS AND ACYRONMS

CAUTI: Catheter-associated urinary tract infection

CCU: Critical care unit

CDC: Center for disease control

CLABSI: Central-line associated blood stream infection

DVT: Deep vein thrombosis

HAIs: Hospital acquired infections

HDU: High dependence unit

HOB: Head of bed

ICU: Intensive care unit

IHI: Institute of healthcare improvement

IMV: Invasive mechanical ventilation

KNH: Kenyatta national hospital

OHC: Oral hygiene care

PUD: Peptic ulcer prophylaxis

RASS: Richmond agitation sedation scale

SRMD: Stress-related mucosal damage

VAP: Ventilator associated pneumonia

VCB: Ventilator care bundle

VCBS: Ventilator care bundles

OPERATIONAL DEFINITIONS

A strategy: is a detailed plan of achieving success in a certain situation

Care bundle: A set of 3-5 evidence-based interventions that when executed collectively improve clinical outcome.

Elements of sepsis care bundle: The components of sepsis bundle; measure lactate levels, draw blood for culture and sensitivity before initiating antibiotics, correct hypotension with crystalloids, administer vasopressors for refractory hypotension, maintain glycaemic control, maintain mean inspiratory pressure less than 30cmH2o.

Elements of VAP bundle: The components of VAP bundle; elevate head of bed to 30-45 degrees, sedation vacation, deep venous thrombosis prophylaxis, Peptic ulcer prophylaxis.

Hospital- acquired infections: Infections acquired during the period a patient is in the hospital that were absent on admission.

Incidence: New cases of a certain attribute in a population over a given period of time.

Prevalence: The proportion of a population who has a specific characteristic in a given period of time.

Ventilator-associated pneumonia (VAP): A nosocomial pneumonia acquired by patients on mechanical ventilation

ABSTRACT

Background: Mechanical ventilation is a supportive therapy for majority of critically-ill patients in critical care unit either through an endotracheal tube or tracheostomy. This therapy causes airway contamination and micro aspiration predisposing to development of ventilator-associated pneumonia (VAP). Globally, incidence is on the rise and VAP has been linked with longer hospital stay, increased health cost, high mortality and morbidity. In order to optimize patient safety and reduce incidences of hospital- acquired infections (HAIs), care bundle modality was developed by the institute of healthcare improvement (IHI). The elements of the VAP care bundle are nursing care interventions and that, nurses are charged with the responsibility of their implementation during routine care. Implementation of VAP care bundle approach, coupled with complete adherence, has been associated with decreased cases of VAP, improved clinical outcome and quality of life. It has been observed that, in order to ensure adherence to VAP bundle, an implementation strategy such as education is paramount.

Study objective: To evaluate nurses' practice on utilization of ventilator-associated pneumonia (VAP) care bundle in critical care unit (CCU) of Kenyatta National Hospital (KNH).

Significance of the study: The knowledge generated from the study will be used to improve nursing practice, to review the institutional protocol and form basis for future research.

Study methodology: This was a cross-sectional descriptive study design. Systematic random sampling was employed where a total of 82 nurses were recruited. A self-administered structured questionnaire and an observation checklist were used to collect data. Statistical Package for Social Sciences (SPSS) version 26 was used to analyze data.

RESULTS: The study revealed that nurses utilized the VAP bundle elements, but some elements were well practiced than others. On the part of knowledge of nurses on VAP bundles, it was realized that all of the respondents were aware of the VAP bundles, 96.3% (n=77) were aware of the elements of the VAP bundle, 88.8% (n=71) of the respondents affirmed to utilizing VAP bundle in their units while only 38.3% (n=31) stated that they are audited on the utilization of VAP bundle.

The most commonly used strategy for implementing VAP care bundle was continuous practice education (CPE) 85% (n=68) of the respondents, use of bed site checklist at 68.8% (n=55), and use of training at 59% (n=47). Compliance with utilization of VAP care bundle as reported by nurses was rated at 100% compliance with oral hygiene care, head of the bed to 30 to 45 degrees

was 98.8% while DVT and PUD had 93% compliance, the least being daily assessment of readiness to extubate at 44%. Conversely, observed utilization of the VAP care bundle revealed a gap in utilization of some of bundle elements. There was no statistically significant association between reported practice of VAP care bundle by nurses and observed practice of VAP bundle utilization by the researcher, (r =-0.020 to 0.081, p=0.477 to 0.945).

Conclusion

Nurses at CCU-KNH utilized VAP care bundle with some of the elements being performed better than others. A few of nurses cited lack of current updates on clinical guidelines, as a factor which contributed to low utilization. There was lack of frequent audits on VAP care bundle utilization.

Nurses compiled to implementation of VAP care bundle, although did not achieve the desired implementation rate recommended by IHI, due to limited resources and knowledge.

There was no statistically significant relationship between reported practice of VAP care bundle by nurses and observed practice of VAP bundle utilization.

1.1.INTRODUCTION

Clinical guidelines form a substantial part of management protocol in all health delivery services. In order to offer accessible quality services, care bundles were introduced to standardize care and improve outcomes. Utilization of care bundles in intensive care unit has shown reduction in rates of mortality and desirable quality of life for survivors.

Care bundles are simple evidenced-based interventions performed collectively to offer quality services. There are various bundles of care depending on which condition is being managed such as: bundles for the prevention of central line-associated bloodstream infections (CLABSI), bundle for the prevention of catheter-associated urinary tract infections (CAUTI), bundle for the prevention of ventilator-associated pneumonia (VAP), sepsis bundle and bundle for skin care. Each of this bundle has elements which for this case are the interventions implemented by healthcare team to individual patient.

The care bundle approach was introduced in clinical practice to prevent sepsis and it showed desirable outcomes leading to innovation of a variety of others. This approach is adopted in critical care units worldwide as part of clinical guideline. This study seeks to evaluate nurses' practice on utilization of VAP care bundles because VAP has been a threat in clinical medicine as it highly contributes to mortality and morbidity in intensive care units (ICU).

1.2.Background

Patients with critical illness are prone to hospital -acquired infections (HAIs) due to the state of illness, multiple invasive devices, antibiotic use and the pathogenicity of intensive care environment. VAP is a common and leading hospital-acquired infection as well as a leading cause of pneumonia in ICU, which is attributed to high morbidity and mortality, prolonged hospital stays and increased medical cost (Tabaeian, Yazdannik, and Abbasi, Hsu C, Chen Y,2017).

Center for disease control (CDC) defines Ventilator-associated pneumonia (VAP) as pneumonia occurring 48 hours after commencing mechanical ventilation is the most occurring infection in ICUs with incidence rates of 9% to 68%, with mortality rate of up to 55 %(Bird et al., 2010).In order to prevent VAP and improve outcome of patients suffering from serious ailment, Institute of healthcare improvement (IHI), introduced the approach of care bundles to

offer efficacy care and improve clinical outcomes in intensive care unit, (Resar et al., 2015), several studies have also proven the effectiveness of this modality of care, (Chun et al., 2013,Patel V. et al.,2011,Obeid A. et al.,2014).

Care bundles are simple sets of evidence-based practices that are executed together to improve the fidelity of health service and achieve good prognosis. They comprise three to five evidence-based care practices performed collectively to achieve quality service, (Deborah et al., 2016). They are more effective as compared to the implementation of single intervention, (Wasserman S. et al., 2018).These care bundles are applied to all eligible patients and provides the following benefits; ensure consistency of care processes in hospital settings, act as clinical guidelines for practice as compared to individual procedures and finally, are used to measure standards of care, (Berenholtz et al., 2012).Various care bundles are practiced in intensive care units globally such as: bundles for the CLABSI, CAUTI, VAP, sepsis and skin care bundle.

This study aims at investigating the VAP care bundle because VAP is the commonest HAIs in clinical settings. The components of VAP bundle consists of the following: head elevation to 30-45 degrees, sedation interruptions and daily examination of readiness to remove endotracheal tube, peptic ulcer disease prophylaxis, chlorhexidine oral care and deep vein thrombosis prophylaxis, (Napolitano &Whip, 2009). These form nursing care interventions of patient undergoing artificial ventilation and critical care nurses are mandated for their implementation as they form part of routine nursing care.

However, situations have been noted where the VAP bundle has been adopted in clinical practice, but VAP incidences continue to be on the rise. Non-adherence to the bundle approach, complexity of the bundle elements and lack of implementation strategies have been observed as hindrances to the application of the bundles, (Liu Kai et al., 2018, Gilhooly et al., 2019, Ramani et al., 2019). Review and evaluation of this bundle approach is significant to identify gaps in knowledge and clinical practices to enable leaders find solutions. This study is aimed at investigating the nurses' practice on utilization of VAP bundle of care, determine implementation strategies used and evaluate compliance among critical care nurses, at CCU-KNH.

1.3.Statement of Problem

Majority of critically-ill patients admitted at CCU are on mechanical ventilation either invasive mechanical ventilation (IMV) through an endotracheal or tracheostomy tube or noninvasive

mechanical ventilation (NIMV). IMV is associated with risk of HAIs.The presence of an artificial airway, coupled with other risk factors predisposes these patients to infections of which VAP is the commonest form among mechanically ventilated patients, (MagillS.et al., 2014, Chawla R. 2008). VAP is a major cause of nosocomial infections encountered in critical care settings. It occurs when microbial pathogens are aspirated through the tracheal tube cuff and into the lungs with subsequent contamination and impairment of patient's defense mechanisms can be prevented through application of VAP care bundles and critical care nurses are tasked with the responsibility of implementing these interventions since they form part of routine nursing care services.

Ventilator-associated pneumonia is major health problem experienced by ICU patients globally and it possess the following threats: morbidity and mortality, high health care cost and long duration of mechanical ventilation; with lengthen ICU stay, (Sonika et al., 2019).VAP care approach has been adopted in clinical practice since 2005, but noncompliance to this intervention among healthcare providers has resulted to poor clinical outcomes, (Luolan et al., 2018).

VAP incidence rates are currently on the rise in intensive care settings for example a study demonstrated that,1 to 4 cases per 1000 ventilator days is experienced in developed countries and up to 13 cases per 1000 ventilator days in developing countries (Tao, L. et al., 2012).However, several studies have also indicated the success of VAP bundle utilization in reducing VAP incidences, (Eom, et al., 2014,Shitrit, et al., 2015, Lim, et al., 2015,Resar, et al., 2005 &Wip, and Napolitano, 2009).

In the USA, nosocomial pneumonia affects 250,000 acute care patients annually accounting for 18% of all nosocomial infections, (Siika et al., 2015). A metanalysis study done in Sub-Saharan Africa, (Zambia and Uganda) showed the incidence of nosocomial pneumonia is at 57.8%, (Kagima et al.,2018). A similar situation is being experienced in Kenyan intensive care units, for instance a study done at Aga khan university hospital showed incidence of VAP at 16% with Candida albicans being the commonest isolated microbe at 36.8%, Klebsiella pneumonia at 21.5 %, Acinetobacter baumanii at 15.8% and staphylococcus aureus, (Nkirote,2014). Non-adherence to VAP bundle approach has been observed as a hindrance to prevention of VAP, (Liu Kai et al., 2018). Gilhooly et al., (2019), noted under-utilization of VAP bundle due perceived complexity of the bundle elements thus affecting compliance.

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Additionally, absence of implementation strategy was also reported as a limitation to bundle utilization among nurses, (Ramani et al., 2019).

At KNH, which is Kenya's biggest referral hospital with 21 beds of main CCU, VAP is a common health problem experienced with an increasing trend. Waweru S. et al., (2015), observed early onset VAP rate at 28.6% and late onset VAP at 71.4%, among patients on mechanical ventilation at CCU-KNH. Kinuthia, (2009), noted VAP rate among patients on mechanical ventilation to be at 28%, while Malombe (2015), concluded that 5.63 cases per 1000 episodes there was VAP. Currently, three out of every four patients on mechanical ventilation at CCU-KNH have VAP as evidenced by clinical finding of wet chest, chest infiltrates on radiological examination, fever, leukocytosis and tracheal aspirate analysis of microbes with Klebsiella pneumonia frequently isolated, consequently leading to sepsis and septic shock.

The incidence of VAP ranges between 9% to 68% at CCU- KNH, consequently resulting to sepsis. Chadani O.et al., (2017), Suni et al., (2019), revealed inadequate knowledge on the elements of VAP bundle among nurses resulted to under-utilization.

From clinical experience, it has been observed that there is under-utilization of this care modality at CCU-KNH as evidenced by absence of a bedside VAP bundle checklist and noncompliance. Additionally, there is no study done on utilization of VAP bundle at CCU-KNH, thus the researcher seeks to evaluate the nurses' practice on utilization of VAP care bundle, determine strategies used to implement the bundle processes and how to maintain complete adherence of the bundle approach at CCU-KNH.

1.4. Research Questions

1. Do nurses in CCU-KNH practice VAP bundle effectively?
2. What strategies have been put in place to implement VAP care bundles by critical care nurses at CCU-KNH?
3. To what extent do critical care nurses at CCU-KNH, comply with application of VAP care bundle approach at CCU-KNH?
4. What is the correlation between the observed and reported practice on VAP bundle utilization at CCU-KNH?

1.5. Research Objectives

1.5.1. Broad objective

To evaluate nurses' practice on utilization of ventilator-associated pneumonia (VAP) care bundle at CCU-KNH.

1.5.2. Specific objectives

1. To assess nurses' practice on utilization of VAP care bundle at CCU-KNH
2. To determine the strategies critical care nurses, use to implement the VAP care bundle
3. To assess compliance to VAP care bundle approach by critical care nurses at CCU-KNH.
4. To evaluate the correlation between the observed and reported practice.

1.6. Hypothesis

1.6.1 Ho: There is no significant difference between observed and reported practice related to VAP bundle utilization by critical care nurses at CCU- KNH

1.6.2: Ha: There is a significant difference between observed and reported practice related to VAP bundle utilization by critical care nurses at CCU- KNH

1.7. Justification of the study

Majority of patients in critical care unit are on mechanical ventilation (MV), either invasively or non-invasively, through an endotracheal intubation or a tracheostomy. These patients are frequently predisposed to contracting VAP due to colonization of airways, micro aspiration of secretions, and suppression of cough reflex by use of sedative agents, immunosuppression associated with critical illness and antibiotic therapy. VAP is a common hospital acquired infection in critical care unit at KNH and is attributed to high rates of mortality and morbidity, increased health budget, prolonged ICU stay and lengthen duration on mechanical ventilation. As a preventive strategy, VAP bundle of care has been incorporated in management of patients on mechanical ventilation, but incidences of VAP are on an increasing trend.

Although there is no study done in Kenya on utilization of VAP care bundle among nurses, there is a concern on how the bundle elements are implemented and lack of a compliance checklist at CCU-KNH, confirms a state of under-utilization. Thus, the reason to conduct this study.

The knowledge generated from this study will enable the healthcare workers at CCU-KNH to offer quality services, improve quality of life and reduce mortality rates in compliance to KNH

mission statement. The healthcare team will adopt a compliance mechanism and compile a checklist for implementation of bundle elements in clinical practice in view of promoting best evidence-based practice.

Review of the bundle elements will contribute to reformulation of the already existing institutional protocol, provide guidelines on effective strategies for implementing VAP care bundle in critical care units at CCU-KNH.

Since there is paucity of information on utilization of VAP bundle this study will form a basis for future studies related to VAP bundle.

1.8.Significance of the Study

Findings from the study will form a basis of the current status of care offered at CCU-KNH, thus the leaders will facilitate improvement on the identified gaps. The institution will be able to review her protocols and guidelines based on the findings from this study.

CHAPTER TWO: LITERATURE REVIEW

2.1.Introduction

Ventilator-associated pneumonia is the commonest hospital-acquired infections encountered in clinical practice despite widely practiced preventive measures. It is associated with mortality and morbidity, increased length of hospital stays as well as significant health budget,(Thaqafi A, Yaseen M, Medhat L, Zahrani A, Qudsi A, Tashkandi Y, 2014).In the USA, VAP mortality rate ranges 8 to 27%, while in Sub-Saharan Africa, (Zambia and Uganda) showed the incidence of nosocomial pneumonia at 57.8%, (Kagima et al.,2018).The incidence of VAP ranges between 9% to 68% at CCU- KNH, (Siika et al.,2015 and Kinuthia 2009).VAP can be effectively prevented through establishment of clinical guidelines and protocols. VAP care bundle forms part of the clinical guidelines aimed at preventing nosocomial pneumonia among patients on mechanical ventilation. A care bundle is defined as a composition of three to five evidence-based practices executed collectively to achieve quality care than if performed, singly and show improvement over a non-structured approach, (Berenholtz et al., 2012). These evidence-based practices form part of nursing interventions and are implemented during routine nursing care.

They are used to ensure delivery of the minimum standard of care as well as act as an audit tool to assess the delivery of interventions, (Bellamy et al., 2012). Utilization of these bundles and complete compliance is associated with marked reduction in ICU-related mortality and morbidity. This study seeks to evaluate nurses' practice on utilization of VAP care bundle in critical care unit at Kenyatta national hospital. The VAP care bundle was launched in 2008 by the initiative of Patient Safety First, and has since been widely utilized in intensive care units globally, and generally accepted in clinical medicine because of its universality and reliability. Anecdotal evidence suggest that VAP incidences are on the rise despite preventive measures put in place. It has been noted that lack of a strategy to implement the bundles leads to under-utilization with associated mortality, (Ramani, 2019). Additionally, non- compliance to bundle approach and inadequate knowledge on the bundle elements contributes to ineffectiveness. The goal of this literature review is to evaluate nurses' practice on utilization VAP care bundle at CCU-KNH.

Search Engines: Pub Med, Google scholar, Hinari.Cochrane

2.2.Utilization of VAP Care Bundle

According to the institute of healthcare improvement (IHI), a bundle is an organized way of improving the care processes to offer quality service. It consists of a set of evidence-based practices of three to five interventions which are executed collectively leading to improved clinical outcomes, (Deborah et al., 2016). These evidence-based processes are clinical interventions that are individualized to certain conditions. A variety of bundles are widely accepted and applicable in ICU: VAP bundle of care, sepsis care bundle, CAUTI, CLABSI among others. The aim of this study is on utilization of VAP care bundle.

Center for Disease control and prevention has defined VAP as pneumonia that ensues more than 48 hours after receiving mechanical ventilation. It is the commonest nosocomial pneumonia associated with morbidity and mortality in CCU, leads to increased health budget and prolonged period on mechanical ventilation (MV).

VAP can be classified as early-onset occurs 48-72 hours post commencement of mechanical ventilation or late-onset VAP that occurs after 72 hours. Critical care patients are predisposed to VAP due to contamination of airways, collection and pooling of secretions, impedance of protective mucociliary function, formation of biofilm and micro-aspiration.

Additionally, invasive devices such as: vascular access, presence of a nasal/orogastric feeding tube which alters the esophageal sphincter also increase risk for VAP. In order to ensure safety of patients on mechanical ventilation, VAP preventive measures are put in place such as; hand washing, VAP bundle of care, intubation and extubation precautions. The components of VAP bundle are routine nursing care interventions implemented during nursing care services.

Napolitano L. et al., (2009) outlined the elements of VAP as: Elevation of the head of the bed (HOB) to 30-45 degrees, Sedation breaks, prophylaxis for Peptic ulcer disease and deep venous thrombosis, and finally Oral hygiene care (OHC) with antiseptic.

While taking care of the critically-ill patients, nurses are entrusted with the responsibility of implementing these interventions to prevent ventilator-associated pneumonia and other ventilator-associated events (VAEs).Urden,Stacy,Lough (5th Ed, 2006, PP.678):outlined nursing care interventions for patients on ventilator support as; maintaining patent airway by performing indicated suctioning, doing oral hygiene care and positioning of patient in semi-

recumbent position, unless contraindicated. Implementation of VAP bundle elements demonstrated desired outcomes on patients undergoing ventilatory support. Same was echoed by Bouadma and colleagues, as they observed 51% reduction on the incidence of ventilator-associated pneumonia after the introduction of a VAP care bundle. Although Martins et al., (2019), noted challenges in VAP bundle implementation among nurses, they further recommended that, VAP bundle should form part of management protocol in ICU. They recorded VAP occurrence rate of 0.3% after adoption of VAP bundle with complete adherence. Therefore, VAP bundle of care is an effective preventive strategy against HAIs.

Wen-Ping Zeng et al., (2015), in a study done at Taiwan hospital found out that, utilization of VAP care bundle is a suitable preventive strategy to reduce the incidence of VAP in a Medical ICU as well as reduce burden of healthcare costs, contributing to quality care service.

Another study on utilization of VAP bundle shown a 44.5% reduction of VAP rates, (Resar, Pronovost, Haraden, Simmonds, Rainey, Nolan,2005).While, O'Donnell et al., in a Canadian study, observed reduced incidence of VAP and low cost. They further deduced that application of the VAP bundle protocol in clinical practice is a suitable method for VAP reduction when conformity is observed. A similar outcome was observed in Spain where a prospective interventional multicenter study among patients admitted in ICU showed a reduction in VAP incidence density rate from 9.83 per 100 ventilator days to 4.34 per 1000 ventilator days, (Lerma, Martinez, Agra, 2018).While Obeid et al., did a pre-interventional and post-interventional study in a Lebanon paediatric intensive care unit (PICU) on VAP bundle utilization and observed reduced duration on mechanical ventilation from 11.42 days to 5.18 days, which also minimizes ventilator-related complications.

2.2.1. Sedation Vacation

Patients on mechanical ventilation are sedated by use of hypnotics and barbiturates to keep them calm and facilitate ventilator synchrony. These drugs alter their level of consciousness, negates the protective cough reflex, thus expose them to pooling of secretions and colonization of the tracheal lining which subsequently predispose to VAP. Hsu et al., (2017), noted effective VAP preventive measures such as; daily sedation interruptions and weaning protocols facilitates early extubation and reduce ventilator-associated events (VAEs). Therefore, they proposed that, mechanically ventilated patients should be evaluated for early extubation. Patients who are extubated early have less risk of ventilator-related complications.

According to the American Thoracic Society, (2005) recommendation, patient's readiness for weaning should be assessed by use of a standardized measurement scale such as; the Richmond agitation sedation scale (RASS). This is an assessment scale that evaluates patient's response to sedation and forms part of nursing process. Therefore, critical care nurses as they implement nursing process, also use RASS to determine patient's readiness for ventilator weaning. Utilization of RASS coupled with routine assessment also, offers guideline on care of ICU patients on sedation as nurses are able to manipulate the dosages of the sedative agents and maintain the minimal dosages/taper off sedatives as tolerated by the patients to facilitate wakefulness with minimal discomfort. Therefore, nurses' compliance to sedation vacation protocol forms an essential care for VAP prevention, (Tseng et al., 2012).

2.2.2. Head of bed elevation

Patients on mechanical ventilation should be positioned with head of bed (HOB) raised to 30-45 degrees to facilitate gravitational drainage of aspirate. This intervention prevents gastric reflux and aspiration of oropharyngeal secretions into the airways thus preventing VAP,(Boltey E., Yakusheva O. and Kelly D. Costa, 2017).Several studies have observed that placing patients in a semi recumbent position contributes to low incidence of VAP by reducing gastro - esophageal reflux and the subsequent aspiration of nasopharyngeal, oropharyngeal, and gastrointestinal secretion, (Grap, 2009, O'Keefe McCarthy et al., 2008).Additionally, Yüksel S. et al., (2020), observed the significance of head of bed elevation in optimizing patient's comfort, prevent complications and facilitate respiratory function. Critical care nurses as they offer nursing services should conform to this practice, ensure all patients on mechanical ventilation have their head of bed raised to 30-45 degrees unless contraindicated, to maintain comfort, facilitate diaphragmatic expansion and document such on a checklist. To accurately adjust the desired position, a goniometer is used. Najafi G, et al., (2017, recommends nurses should use a goniometer to adjust head of bed position to 45 degrees as compared to virtual estimate. Position inclination is crucial on respiratory mechanics; increase compliance and oxygenation, (Mezidi, M., &Guérin, C. 2018). It is recommended that a random audit will facilitate conformity to this practice as occasionally, it has been noted that HOB adjusted to 10-20 degrees which has minimal benefits.

2.2.3. Oral hygiene with antiseptic

Placement of an endotracheal/tracheostomy tube impairs the function of mucocilliary propulsion leading to pooling of secretions above the tracheal cuff which result to

Oropharyngeal colonization with subsequent formation of a biofilm. Oropharyngeal secretions are medium for pathogens and aspiration through the airways into the lung parenchyma progressively result to development of pneumonia. In addition, critically-ill patients have depressed gag and cough reflexes, which alter airway protection as well as impairing with the cleansing action of saliva, this contributes to oropharyngeal colonization. Due to presence of endotracheal and orogastric tubes, these patients are forced to stay with open mouth, predisposing them to mucus accumulation, drooling and drying up of tongue, thus rendering their oral care nurse-dependent. It therefore becomes a nursing responsibility to ensure mechanically ventilated patients have oral hygiene care (OHC) done to preserve mucosal integrity and prevent oral contamination. In view of these risk factors, assessment of oral status should be performed in critical illness as any other system assessment. It is important to perform OHC to facilitate function and prevent nosocomial infections. OHC is primarily a nursing procedure. Studies recommend OHC should be done using an antiseptic; chlorhexidine, povidone mouth wash or antimicrobial impregnated toothbrush and paste. Yusuf H. (2013), stated that effective OHC is achieved through use of toothbrush and paste followed by chlorhexidine0.12% mouth rinse. Further he recommended chlorhexidine 0.12% as superior in OHC for it showed fewer incidences of VAP as compared to routine oral care with toothbrush and paste. Critical care nurses should perform effective oral hygiene care (OHC), by use of chlorhexidine mouthwash, gel, toothbrush, or combination as dictated by institutional protocol as this is an indicator of quality nursing care, (Moustafa F, Tantawey N, Nayera, 2016). The frequency and pattern of OHC has been overemphasized to achieve meaningful benefits. There is no specific frequency for OHC, but it has been noted that the more times OHC is performed the better the outcome. This practice combined with suction of airway secretions, maintenance of cuff pressure at 20cmH2O is associated with reduced risk for VAP in these patients, (Zongdao. H, Ping,Wang, Zhang, Chen,Hellen W, Needleman, Furness S, 2013).Similarly, Hua et al., (2016) observed that, performing oral hygiene using chlorhexidine to ICU patients on IMV reduced VAP development by 40%. A metanalysis study revealed that increased frequency of oral care is associated with reduced incidences of VAP among mechanically ventilated patients, (Botley E. et al., 2017). However, a study done in Malaysia demonstrated a disassociation between knowledge on oral hygiene and actual practice of oral hygiene (Malik et al., 2018). They further, recommended that as simple as OHC is perceived, when performed effectively, it produces far-reaching benefits; less oropharyngeal colonization, fewer

incidences of VAP, low health care costs. The practice should include cleaning the oral and buccal cavities using a tooth brush and paste, followed by chlorhexidine rinse twice daily. A retrospective study done in Royal Manchester hospital revealed shortened length of ICU stay and decreased VAP incidences from 14.4 per 1000 ventilator days to 4.1 per 1000 ventilator days.

An audit to ascertain competency in this practice is important among critical care nurses for patient's OHC is an indicator of quality nursing care.

2.2.4. Prophylaxis for peptic ulcer disease and deep venous thrombosis

Prophylaxis for peptic ulcer disease (PUD) and deep venous thrombosis (DVT) are not direct VAP preventive strategies. However, it has been observed that critically -ill patients are immobile, a state fostering blood stasis which is a risk factor for DVT thus the reason for initiation of anticoagulants to prevent clot formation. Consequently, in critical illness, therapeutic interventions such as mechanical ventilation predispose ICU patients to stress-related mucosal (SRMD) damage, an erosive process of gastro-duodenal mucosa, eventually culminating to gastrointestinal bleeding. To prevent SRMD, patients admitted to critical care unit are routinely started on prophylaxis for peptic ulcer disease.

2.3. Strategies for Implementing VAP Care Bundles in Critical Care Unit

VAP is a top cause of death among patients on ventilators. In an effort to improve clinical results in critical care setting, the center for disease control and prevention (CDCP) has outlined several preventive strategies for hospital acquired infections (HAIs) to include; meticulous hand washing, decontamination of equipment and appliances, disease surveillance and utilization of VAP care bundle. VAP care bundle has been recommended as the gold standard for prevention of nosocomial pneumonia. The components of this bundle are clinical interventions implemented through a multidisciplinary approach, (Dosher et al., 2014). The strategy healthcare professionals use to implement the VAP bundle elements determines the outcome and is an indicator of quality service.

For the care bundle to achieve desired outcomes, they must be implemented through an effective strategy. A strategy is defined as a detailed plan of achieving success in a certain situation, (Cambridge English dictionary). For effective implementation of a care bundle, a strategy will ensure standardization of services, dissemination of knowledge and translation of knowledge to practice. Critical care nurses spent most of their time taking care of the critically-ill patients and therefore, are the core implementers of these bundle elements in form of nursing

care interventions. They should adopt a formal strategy on their implementation to ensure efficiency, reduce costs and promote quality of life. A common strategy is continuous nursing education which plays a significant role by equipping nurses with current knowledge on prevention of VAP as well as well as reinforce on general preventive practices such as; hand hygiene and compliance as observed by Lambert M.L. et al., (2013), Maria Parisi et al., (2016).

A study done in China by Osti C. et al., (2017), found out that, inadequate knowledge on infection prevention and lack of guidelines on best evidence-based nursing practice as a contributing factor to ventilator-associated pneumonia.

It has been noted that regular monitoring and continuous practice education (CPE) of medical and nursing staff is one of the effective strategies for impacting knowledge as well as auditing actual practice, (Coffin, Klompas, Classen, 2008). Provision of education to health care providers and frequent audit of compliance with the recommendations, commitment of the hospital management to support implementation, nomination and empowerment of local leaders of the projects in ICUs, was commended by Álvarez-Lerma Sánchez García M. (2018)

A study done in Egypt in a medical ICU revealed 54% compliance to VAP bundle through informal learning, but the team was taken through an educational session for one month. An observational study done to evaluate compliance showed a compliance rate of 64%, it was concluded that educational session was associated with reduced VAP rates. Dumbre D. (2019) noted that knowledge of nurses on ventilator care bundle for the prevention of VAP and adherence to them would reduce the risk of occurrence of VAP and decrease morbidity and mortality of mechanically ventilated patients in the ICU.

Similarly, the center of disease prevention and control (CDC) recommends training of nurses and doctors as an important strategy for sharing knowledge and clinical experience so as to improve practice and reduce VAP incidence (Matteo et al., 2016).

A study done at Taiwan noted that training of nurses resulted to decrease in VAP incidence rate from 2.5 % in 2013 to 1.0 % in 2014. Hixson et al., stated that since these elements of VAP bundle are routine nursing interventions, educating critical care nurses on how to implement the VAP elements would lead to the reduction of the VAP incidence. A similar observation was made by Alcan, and colleagues (2016), where they concluded that VAP care bundle implementation with continuous medical education prepared according to best evidence-based guidelines reduced VAP rates. Another study highlighted application of Multidisciplinary

teamwork, education and a comprehensive checklist to improve healthcare workers' compliance to VAP, (Ying-Ying Chang et al., 2015 (48) P.157).

Gilhooly et al., (2019), outlined the following implementation strategies; use of evaluation method, stakeholder relationships, education and training. Other studies highlighted additional strategies as: use of advisory boards, multidisciplinary teams (MDTs), steering committees, collaborative groups, on-going training 45% and use of audit and feedback 42%, (Lawrence et al.,2011, Hampton et al., Halter et al.,2008). A different strategy is applied in United Kingdom (UK), where critical care network is used to update nurses.

2.4. Nursing Practice and Compliance to VAP Bundle

Mechanical ventilation predisposes patients to contracting ventilator-associated pneumonia (VAP), through colonization of the previously sterile lower respiratory tract from aspiration of secretions. VAP is a common threat in critical care setting, though preventable through practice and adherence to VAP preventive measures. Center for disease control (CDC,2019), outlined the following VAP preventive measures; adherence to basic principles of infection prevention, disease surveillance and compliance to VAP bundle elements. The basic principles include; hand washing practices, environmental hygiene, cleaning and disinfection of equipment and other devices, use of aseptic technique when performing invasive procedures, and wearing of personal protective equipment when performing procedures.Additionally,VAP specific preventive measures are outlined as: elevation of head of bed, subglottic airway clearance, maintenance of cuff pressure at 20cmH2O, oral hygiene care, sedation vacation and assessment of readiness for weaning off mechanical ventilation and prophylaxis for PUD and DVT, (Hsu C, Chey Y, 2017). Such measures are part of clinical guidelines and critical care nurses and other healthcare professionals should adhere to such practices to control spread of infection and improve outcome. In order to prevent VAP and other HAIs, healthcare workers should demonstrate absolute compliance to these general measures as well as with VAP specific preventive measures.

Compliance to VAP bundle of care is achieved when there is 100%implementation of all the care interventions in clinical practice, while noncompliance is rated as none when there is omission of an element (s). Therefore, compliance is audited on a holistic approach of ''all or none'' phenomena. It is important to utilize all the VAP elements as adherence is associated with decrease in VAP incidences, low health budget, short ICU stay, few days on mechanical ventilation and better outcome, (Mohamed,2013).

A formal checklist containing all the VAP elements has been noted to facilitate adherence, achieve competency and provide data for audit. Thaqafi et al. (2014), recommended incorporation of a VAP bundle in patient care assessment, so as to enable nurses implement the five elements of VAP bundle. Saodah, S. (2019) linked nurses' compliance to level of knowledge on VAP bundle in a study done in Semarang, Indonesia, where the findings confirmed a positive association between knowledge level and compliance with a significant level of p value 0.022.

While a study done in Iran to assess nurses' compliance on implementation of VAP bundle, showed compliance rate to interventions at 56.32%, which was considered unsatisfactory. The following practices were poorly performed: hand hygiene at 24%, physical oral hygiene care, subglottic and oral suctioning at 23.3%, use of oral and nasal gastric tube at 10% and daily examination of the patient's readiness for extubation 0%. Conversely, the following practices were rated well performed: use of personal protective equipment while doing procedures at 80.3%, oral decontamination with chlorhexidine at every shift at 87.5%, elevation of head of bed (HOB) to 30–45°at 96.6%, use of disposable and sterile suctioning equipment at 89.1%, frequent change of the water container of the ventilator circuit, and refill of humidifier at84.1%. Similar study in USA, demonstrated that nurses complied to hand hygiene at 82%, gloving practice at 77%, HOB 32% and subglottic secretion clearance at 36%. In conclusion, compliance is key to VAP bundle implementation and is associated with a 50% VAP reduction, low mortality and improved outcomes, (Oliveira, Zagalo and Cavaco-Silva ,2014).

A prospective study done by Khan, R.et al., (2016), showed total bundle compliance before and after initiation of the VAP team was 90.7% and 94.2%, respectively (P <.001). The number of VAP episodes decreased from 144 during 2008-2010 to only 14 during 2011-2013 (P <.0001). The rate of VAP decreased from 8.6 per 1000 ventilator-days to 2.0 per 1000 ventilator-days (P <.0001) after implementation of the care bundle.

Other essential nursing practices in relation to VAP bundle conformity as observed by Weavind et al., (2013), include; application of a real time bedside dashboard to be integrated with nursing care to help track and monitor compliance of each element of the care bundle. Such approach was attributed to marked decrease in VAP rates, care costs and short duration of hospital stay, though not universally accepted in many clinical settings. A multicenter study carried out in six Korean University hospitals revealed that, clinical education on consistent utilization of VAP interventions improved compliance to care bundle from 41.1%

to 71.8%, (Eom et al 2011). In a clinical assessment, it was found that readiness to extubate increased significantly from around 82% to 99%. (Shu-Ju Huang et al., 2015). Thus, knowledge on VAP bundle showed improvement in patients' outcome.

Oral hygiene care should be performed frequently as required and prior to endotracheal suctioning. Moustafa et al., (2016), observed that the state of oral care is an indicator of nursing service offered. Therefore, critical care nurses should ensure oral care is done with toothbrush and paste and rinsed with chlorhexidine to avoid colonization and bacterial growth. Patients' positioning with head of bed (HOB) elevated to 30 degrees is a preventive strategy against VAP, and critical care nurses should adhere to this practice to prevent VAP among mechanically ventilated patients. Schallom et al., (2015), noted that positioning ventilated patients to 30-45 degrees head elevation, facilitated secretions drainage, prevent gastroesophageal reflux and prevent aspiration. However, Lippoldt et al. (2014), observed that elevating patient's HOB to 30 degrees was associated with risk of pressure ulcers. Thus, a controversy existed on whether to prevent VAP or pressure ulcers. Patients positioned with HOD at 30-45 degrees should be turned every 2-3 hours to prevent pressure ulcers. There is need to perform frequent audit checks to ascertain compliance to this practice, (Wolken et al., 2012).

Sedation vacation and assessment for readiness to wean off mechanical ventilation are significant VAP preventive strategies applied in critical care settings. Prolonged intubation and mechanical ventilation are associated with ventilator-associated complications. Critical care nurses are mandated with the responsibility of assessing patients' readiness for extubation during routine nursing care using the Richmond Assessment Sedation Scale (RASS). This scale offers guidelines on level of sedation and guides the critical care nurses on how to regulate sedative agents, to balance comfort and wakefulness. It is important for the nurses to have adequate knowledge and develop competency on how to use this scale.

Prophylaxis for peptic ulcer disease (PUD) and deep venous thrombosis form part of VAP bundle. Nurses should incorporate this element with general drug therapy.

2.4.1. Factors that affect compliance to care bundle

Gilhoolyet al., (2019) noted that, the elements of a bundle are too many interventions which the implementers perceived as complex. Such lead to differences in execution of the

interventions subsequently resulting to under-utilization of the VAP bundle. Therefore, frequent audits and use of a bundle checklist was recommended.

Continuous clinical training among nurses has been cited to improve compliance, (Suseelan, H, et al.,2011). The significance of these training strategies to critical care nurses and other healthcare professionals working in clinical settings is to provide the current clinical guidelines, promote learning and motivate staff. It important to develop scientific knowledge base, (Oliveira, Zagalo and Cavaco-Silva) among healthcare professionals through periodical performance evaluation and training to facilitate implementation of quality services. On the contrary, inadequate knowledge on the management of the primary diagnosis as well as the individual bundle elements was noted as a limitation to complete utilization of this approach, (Suni et al., 2019).

2.4.2. Effects of compliance to care bundle

A significant decrease of VAP in critical care setting is an indicator of quality healthcare services. Nurses should routinely carry out all the interventions of VAP bundle since complete adherence to implementation of VAP elements is associated with quality of care and improved outcomes, (Khan et al.,2016). Resar et al., and Pronovost et al., (2015), concurred with this observation when they found out that,66% VAP reduction rate was directly associated with high levels of bundle compliance. Bird et al., concluded that adoption of VAP bundle approach in clinical practice showed reduced incidence rate of VAP and hospital cost. They further recommended that this bundle is effective when there is 100% compliance.

Similarly, Chen-Hui Wang, et al., observed that, conformity to the VAP bundle resulted to a reduction of VAP from 5.98 per 1000 ventilator days to 3.03 per 1000 ventilator days, (2015).

2.5. Summary

Every patient has a right to quality healthcare as stipulated in the Kenyan constitution article (43)1a" Every person has the right to the highest attainable standards of health, which includes the right to healthcare services". It is the responsibility of healthcare workers to ensure critically-ill patients receive quality healthcare services to promote recovery and reduce mortality. However, this is hampered by some factors: inadequate resources (human and material), non-adherence to protocols and incompetency among care providers which subsequently leads to mortality, long duration on mechanical ventilation, long hospital stays and high health expenditure. Additionally, there is limited literature about nurses' practice on

utilization of VAP bundle at KNH, thus it is recommended that adoption of care bundle with complete adherence will result to quality service delivery.

2.6. **Theoretical framework**

The study applied the Donabedian model of quality assessment which has three domains; structure, process and outcome in quality service delivery.

This model assumes the existence of three significant factors in assessing quality of care; structure, process and outcome and the casual relationship among them, (Donabedian,2005).

Structure

Refers to settings and instruments of healthcare services delivery. They consist of organizational structure, staffing, equipment, qualification and institutional policy. The institution must recruit specialized critical care nurses and facilitate developing their clinical skills so as to ensure quality care to patients on mechanical ventilation.

Process

Set of activities that take place among professionals and between professionals and patients, technical and interpersonal relationships. For example; Clinical guidelines, training, checklist, pathways of care and protocols. For standard care to be delivered, healthcare professionals should utilize the clinical guidelines and protocols.

Outcome

The consequences of healthcare on individuals and society. It can be quality of life, reduced mortality, increased compliance, reduced cost and quality service. Critical care nurses should ensure critically-ill patients receive quality nursing services and prevent ventilator-associated pneumonia.

Structure ——————→	Process ——→	Outcome
Staffing	Guidelines	Quality service
Qualification	Technical care	Reduced mortality
Equipment	Protocols	Reduced Morbidity
Organizational structure	Pathways of care	Short stay in ICU
Checklist	Training	Quality of life
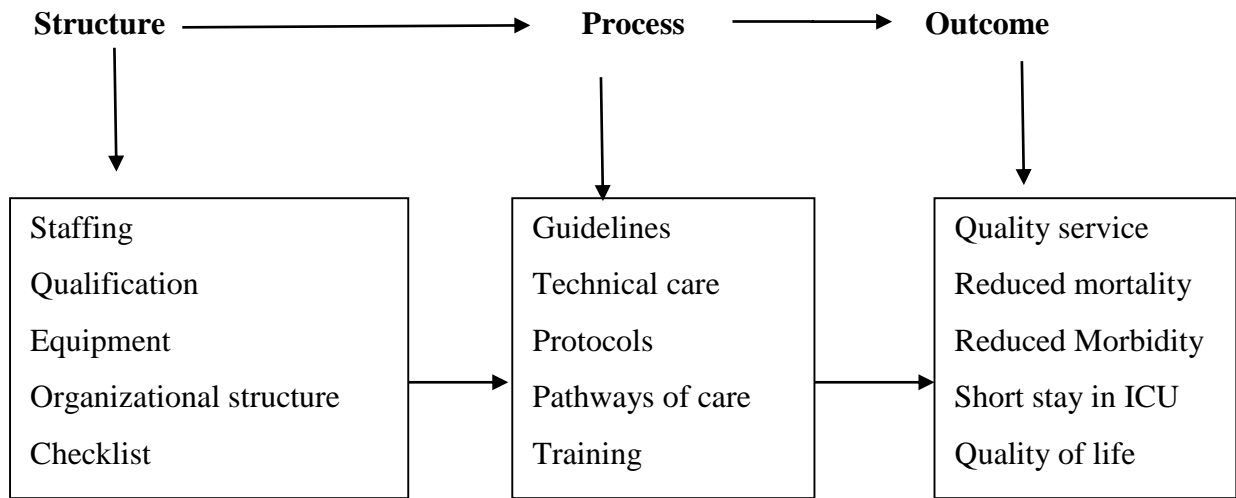
Figure 1: VAP care bundle outcome model

2.7. **Conceptual framework**

A conceptual framework depicts the relationships between variables measured in a study.

Independent variables   Dependent variables   Outcome

Age		
Gender	Utilization of VAP bundle	Low morbidity
Lack of implementation strategy	Quality of health care	Low mortality
Design of bundle elements		Increased compliance to VAP
Complexity of the bundle		Quality of life
Inadequate knowledge		

Intervening variables

| Level of experience |
| Institutional protocol |
| Education/training |

Figure 2: Theoretical framework

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This chapter describes the methodology adopted by the study in carrying out research, and the design used to achieve the study results. It also entails processes of population determination, sampling for suitable population, and data management.

3.2. Research Design

As Kothari (2004) outlines, that a study design aims at investigating the following; what the study is about, why the study is being made, what type of data is required, where can the data be found, duration of the study, techniques of data collection, methods of data presentation and analysis.

This was a cross-sectional descriptive study carried out among critical care nurses at CCU-KNH. The researcher chooses this study design because a cross-sectional study is carried out at one time.

3.3. Study Area

The study area was the main critical care unit (CCU), Kenyatta national hospital (KNH). KNH is located in Dagoreti sub-county along Ngong road, adjacent to Kenya medical training college (KMTC), Nairobi campus, and is approximately 3kilometres from city center. It is Kenya's main referral and the biggest referral hospital in East Africa, which was started the year 1901 named Kings George hospital with a bed capacity of 40, now has a bed capacity of 1800 with over 6000 members of staff.

The hospital has various departments: medicine, surgical, reproductive health and pediatrics among others. Department of medicine also has several units among them, the specialized units under which the critical care unit falls. The main critical care unit is located on first floor alongside other specialized units: Renal, Burns, Cardiology and Operating theatre. There are other satellite critical care units at Kenyatta national hospital; Cardiothoracic, Neurosurgical, Medical and Acute care. They admit patients for critical care services. A multidisciplinary team is involved in service care delivery in those units: Nurses, Doctors, Physiotherapists, Psychologists and Social workers.

Currently, the bed capacity for the main critical care unit is 21-beds, has100% bed occupancy with nursing allocation ratio of 2 nurses for every 3 patients. The number of critical care nurses working at the main critical care unit on permanent employment is 105, KNH (2020).

3.4. Target Population

Target population is the population from who the researcher obtains the sample for the study as well as generalizes the study results to them. While study population is defined as a group of individuals who possess similar characteristics, and are the study focus, (Mugenda & Mugenda, 2003). For this study, target population included the critical care nurses working at CCU on permanent terms of employment irrespective of duration of service.

A total of 105 nurses are working at main CCU.

The target population for this study included all critical care nurses at CCU on permanent employment irrespective of duration of service. A total of 105 nurses are working at main CCU.

3.5. Eligibility Criteria

3.5.1. Inclusion criteria

Study participants must fulfill all of the following inclusion criteria;

I.   Nurses working at main CCU of KNH
II. Nurses on permanent terms of employment
     This population was suitable to participate in the study because nurses on permanent terms of employment are tasked with responsibility and accountability of direct patients' care. They also play a role in mentorship and teaching nurses on temporary terms of employment and students. Thus, they are able to give information on utilization of care bundles and the standardized care in those units.
III. Nurses who voluntarily give informed consent.

3.5.2. Exclusion criteria

I.   Non-consenting nurses
II. Nurses working at CCU-KNH on permanent terms of employment but on leave.

3.6. Sample Size Determination

3.6.1. Sample size calculation

To calculate the Sample size, the researcher adopted Fischer's formular. Fishers et al., suggested that, researchers should use 50% in situation where they cannot estimate the proportion of target population who possess the desired characteristics.

n= Z2pq/d2 (if the population is greater than 10,000)

Z= the standard Normal Deviate set at 1.96 (95% confidence level)

P= prevalence, 50% (0.5)

q= 1.0-P= 1.0-0.5(0.5 is the 50% of the target population.

d= the level of statistical significance set (0.05)

Therefore: n=1.962(0.5). (0.5)/ (0.05)2

n= 1.962(0.25)/0.002

n=3.8416(0.25)/ 0.0025

n=384.16

Approximately 384(Desired sample size)

Therefore: To calculate sample size of less than 10,000

N = the estimate of the population 105,

nf= n/1+(n/N), that is nf= 384/1+(384/105),

nf= 384/4.66, therefore,

nf=82.40

=82 (Actual sample size)

3.6.2. Sampling method

Researcher used a sampling frame to realize the number of participants required for the study. In systematic random sampling, every Kth case in the population was selected. The total population is 105 nurses. The sample size was82 nurses. The sampling interval was: 105/82 which is 1.2. Because they are persons, they cannot be in point form so the researcher selected every second person to achieve the population size.

3.7. Study Instruments

The researcher administered a structured questionnaire to study subjects who filled.

Observation checklist was used to assess application of the elements VAP care bundle during nursing care.

3.8.Reliability and Validity of study instrument

Reliability is defined as the ability of a research instrument to yield same results repeatedly, while validity is the accuracy of a study instrument to measure what is intended to measure, (Haber, Wood, pp.335).

A pretest of the study instrument was done at medical CCU where eight (10%) critical care nurses were sampled, briefed of the test and a structured questionnaire administered.

3.9.Study Procedures

3.9.1. Participant recruitment and selection

Upon clearance by KNH-UON ERC, the researcher sought permission from KNH administration and CCU head of department to carry out the study. The researcher, further visited the CCU department and communicated to CCU in charge about the study and explained on how to recruit participants for the study. Then a memo was be drafted in consultation with the CCU manager and posted on the two notice boards of the CCU to create awareness among nurses. Additionally, verbal announcement was done every morning during morning report for a duration of two weeks within which the researcher recruited and selected participants for the study, as well sensitization was done through a social media platform established among nurses at CCU.Selection of the participants was done using systematic random sampling frame to enhance credibility of the data collected. Participants were selected in the clinical area. To avoid getting the same nurses on the data collection dates, the researcher made use the duty Rota.

3.9.2. Consent procedure

After selection, the researcher approached the participants during shift breaks and explained the objective of the study, procedure of data collection and expected outcomes of participation, then read through the participant sheet as the participant listened and clarified any concerns. Participants were informed that participation was voluntary. After participant had expressed understanding of the terms, then were offered a consent form to sign if in agreement. Two

copies were signed, one copy remained with the participant and the other was given to the researcher. There was no need for witness since the study possessed no harm to participants.

3.9.3. Participant participation/interview

The consenting group read and filled the questionnaire individually and consulted the researcher for any clarification of unclear information.

3.10. Data Collection and Storage

Data was collection after obtaining consent from respondents. The study participants were observed first as they offered nursing services to patients on mechanical ventilation to prevent change of practice based on the information on the questionnaire. A structured observation checklist was used to ascertain how the VAP bundle elements are implemented on patients care and the participants were observed for two encounters per shift. Secondly, the structured questionnaire was administered to the respondents to put in their responses gathered in the same hall/room or even individually as they observed social-distance due to Coronavirus disease. Alternatively, the researcher also had the questionnaire as soft copy for participants who choose to fill soft copy, were emailed to them for filling then submit. Data related to nurses' practice on utilization of the VAP bundle was collected.

3.10.1. Data management

The researcher established a manual tracking system for the data to monitor the effectiveness of the recruitment process. Data was entered in an Excel sheet. Safety of data was ensured by locking up the data in a cabinet with a password only known by the researcher and also in computer protected password to ensure confidentiality and assure anonymity. Then the data was organized and filled-up for order and safety.

Data cleaning was done by inspecting the questionnaires for completeness before being accepted for data entry. Any questionnaire that was incomplete was not included in the study, for it would have missing data. A standard entry point was established to avoid duplication, and validation was done for accuracy. Data codes were created for open-ended questions and categorical variables.

3.10.2. Data analysis and presentation

Quantitative data was analyzed using both descriptive and inferential statistics in Statistical Package for Social Sciences (SPSS IBM 26) version, to describe the distribution of, and relationship among variables. Descriptive statistics; mean, mode, median and standard

deviation were used to analysis socio-demographic data and knowledge on VAP bundle, while inferential statistics; chi-square, was used to assess the existing relationship between the reported and actual practice. The findings from the analysis found that there was statistically significant association between reported practice of VAP care bundle by nurses and observed practice of VAP bundle. A statistical level of $p<0.05$, would be considered statistically significant. The data was presented in bar graphs, charts and tabulation forms.

3.11. Ethical Considerations

The researcher sought permission from the KNH-UON ethics and research committee to conduct the study. Authorization was also obtained from Kenyatta National Hospital administration to enable the researcher carry out the study. The research was conducted according to the University's guidelines.

Autonomy; Participants voluntarily signed an informed consent prior to participation. They were informed of their obligations and the expected benefits of the study. In addition, they were not coerced or induced to participate.

Participants were allowed to ask questions and answers were provided to their satisfaction. The researcher also asked the participants questions on the information provided to ascertain their comprehension about the study before they could sign the consent forms.

Anonymity of participants was ensured by serializing and coding the structured questionnaires. No form of identification was required from participants or any markers to identify participants indicated on any questionnaires. All research tools were only accessed by the researcher. They were stored under lock and key and research information in computers under passwords.

Participants' protection: Participants were assured that no harm or risks would be encountered as they participate in the study. However, in view of the Corona virus disease pandemic, the researcher strictly adhered to the issued Covid-19 prevention guidelines during the data collection exercise including ensuring that the researcher and participants wore masks during the interviews, no hand shaking, adhering to recommended social distancing rule during interviews and ensuring that the researcher and participants sanitized adequately prior to and after participation. These measures were meant to help limit risk of Covid-19 transmission.

Justice: Participants were selected fairly to participate in the study.

3.12. Study Limitations and Delimitations

Time and money were major limitation to this study because the researcher required more time to measure outcome. Also, since the study involved assessment of nurses' practice, Hawthorne effect was anticipated and counteracted by performing the observation of practice prior to distribution of questionnaires.

3.13. Dissemination Plan

Dissemination of information is an important element in research for it contributes to generation of knowledge. The researcher will present the findings to a panel of research supervisors at UON and thereafter, submit a copy of the findings to the CCU-KNH, the UON-nursing department and even publish in peer-reviewed journals and present to scientific conferences.

CHAPTER FOUR: RESULTS

4.1. Introduction

The research was conducted to assess the utilization of ventilator-associated pneumonia (VAP) care bundle among nurses at CCU-KNH. The specific objectives that were assessed include: identification of strategies critical care nurses use to implement the VAP care bundle, the compliance to VAP care bundle by CCU nurses as well as identifying the correlation between actual performance and the reported practice related to VAP care bundle. A total of 82 questionnaires were distributed among CCU nurses at KNH. A total of 80 questionnaires were successfully returned having been effectively filled representing a 98% response rate. A total of 86 patients were observed to investigate actual performance related to VAP care bundle.

4.2. Demographic characteristics among respondents

Majority of the respondents 72.5% (n=58) were female, while 27.5% (n=22) were male, showing female nurses' dominance. In terms of age, those aged 20-29 years represented 3.8% (n=3),30-39 years 45%(n-36), 40-49 years 46.3%(n= 37)and those aged 50-59 years 5 % (n=4).The participants with higher diploma constituted the highest in terms of training, 55% (n= 44), those with diploma 2.5% (n=2), holders of bachelors 37.5% (n-30), while those with masters 3.8% (n-3).Most of the respondents, 96.3% (n=79) had special training in critical care nursing, nephrology nursing 4.1% (n=3) while peri-operative nursing 3.1% (n=1).

In assessing years of experience in critical care, those with working duration of 6-11 years 33.8% (n=27),below 5 years 32.5% (n=26), 12-17years 27.5% (n=22),18-22 years 2.5% (n=2),24-29 years 2.5% (n=2).Majority of the participants were designated as senior nursing officers 47.5% (n=38),other designations; nursing officer 2 18.8% (n=15),assistant chief nursing officer 16.3%(n=13),nursing officer 1 16.3% (n=13) and the lowest nursing officer 3 1.3% (n=1) as shown in Table 1.

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS AMONG RESPONDENTS

Variable		Frequency (n)	Percentage (%)
Gender	Male	22	27.5
	Female	58	72.5
Age	20 - 29 years	3	3.8
	30 -39 years	36	45.0
	40 - 49 years	37	46.3
	50 - 59 years	4	5.0
Education level	Certificate	1	1.3
	Diploma	2	2.5
	Higher diploma	44	55.0
	Bachelors	30	37.5
	Masters	3	3.8
Special training	Critical care nursing	79	96.3
	Nephrology nursing	3	4.1
	Peri-operative nursing	1	3.1
Years of experience	0 - 5 Years	26	32.5
	6 - 11 Years	27	33.8
	12 - 17 years	22	27.5
	18 - 23 years	2	2.5
	24 - 29 years	2	2.5
Designation	Nursing Officer III	1	1.3
	Nursing officer II	15	18.8
	Nursing officer I	13	16.3
	Senior Nursing officer	38	47.5
	Assistant Chief Nurse	13	16.3

4.2.1. Designation

Almost half of the respondents, 38(47.5%) were senior nursing officers, 13(16.3%) were Assistant chief nurses. Nursing care officer I were also 13(16.3%) as shown in Figure 3.

FIGURE 3: SOCIO-DEMOGRAPHIC CHARACTERISTICS AMONG RESPONDENTS
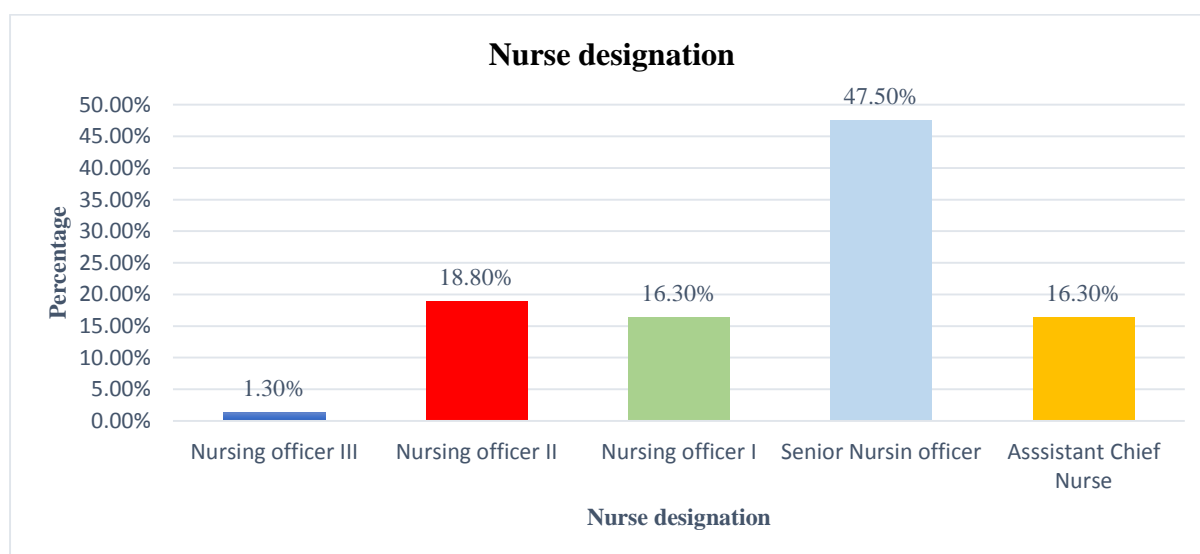
4.3. Assessment of Knowledge on VAP care bundle

The respondents were assessed on knowledge about VAP care bundle. All of the respondents were aware of the VAP bundles, 96.3% (n=77) were aware of the elements of the VAP bundle,88.8% (n=71) of the respondents affirmed to utilizing VAP bundle in their units while only38.3% (n=31) stated that they are audited on the utilization of VAP bundle in their respective units. Table 2 illustrates finding on VAP care bundle knowledge

TABLE 2:ASSESSMENT OF KNOWLEDGE ON VAP CARE BUNDLE

Description		Frequency	Percentage
Aware of VAP bundle	Yes	80	100
	No		
Knowledge of elements of VAP bundle	Yes	77	96.3
	No	3	3.7
Utilization of the VAP bundle in your Unit	Yes	71	88.8
	No	9	11.2
Audit n utilization of VAP bundle	Yes	31	38.8
	No	49	61.2

4.4. The strategies critical care nurses use to implement the VAP care bundle at CCU-KNH

The strategies employed by critical care nurses on implementing VAP care bundle at CCU were assessed,85% (n=68) of the respondents use continuous practice education (CPE), 68.8% (n=55) utilized bedside checklist while 59% (n=47) use training. Other strategies that were also identified include Online network and white boards. Continuous Practice Education and Bedside checklist were the most preferred strategies used in implementation of VAP care bundle at CCU in Kenyatta National Hospital, because they were more convenient and simpler as shown in Figure 4.
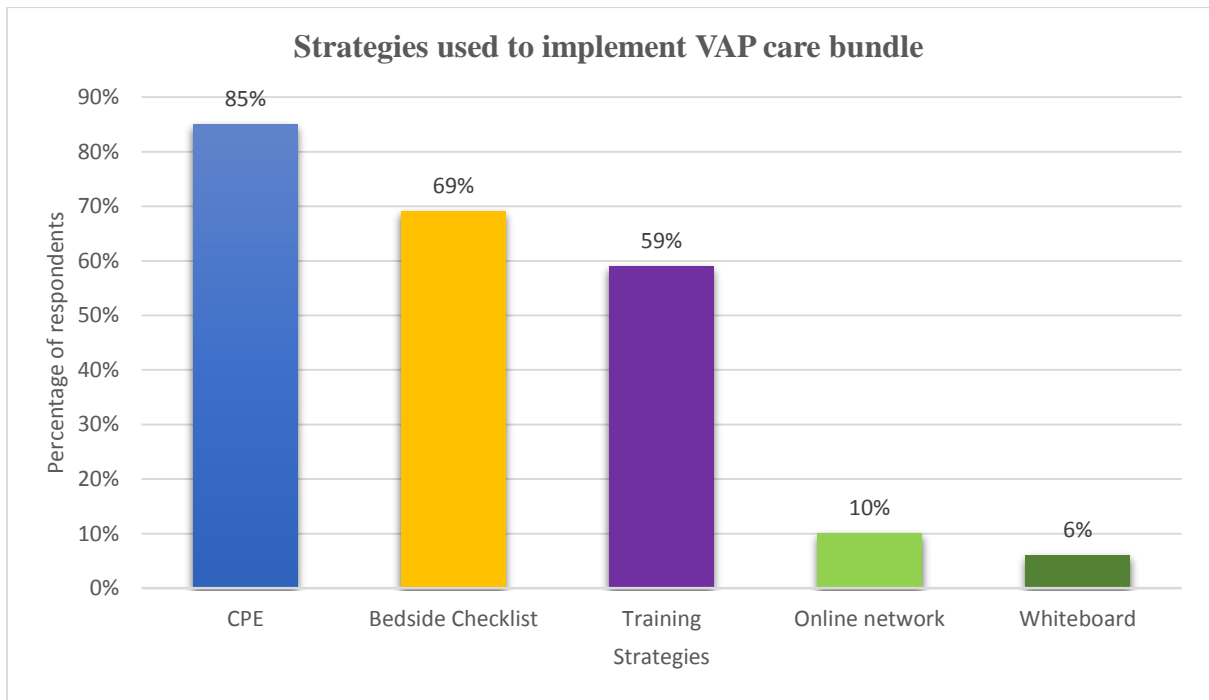
FIGURE 4: STRATEGIES USED TO IMPLEMENT VAP CARE BUNDLE

4.5. Clinical practice on VAP bundle among nurses

A Likert scale was used to assess Clinical practice on VAP bundle utilization among nurses based on the five components as shown in Table 3. Majority of the respondents strongly agreed to practice of VAP care bundle within their respective stations with more than 80% (n=65), except for the assessment of readiness to extubate which represented 68.4% (n=54).

Practice on VAP bundle	Strongly agree n (%)	Agree n (%)	Undecided n (%)	Strongly disagree n (%)	Disagree n (%)
Elevation of the head of the bed to 30-45 degrees	70(89.7%)	5 (6.4%)	2 (2.5%)	1(1.3%)	-
Daily 'sedation vacation' daily assessment of readiness to extubate	54 (68.4%)	18(22.8%)	2 (2.5%)	3 (3.8%)	2 (2.5%)
Peptic ulcer disease prophylaxis	65 (83.3%)	9 (11.5%)	3 (3.8%)	1 (1.3%)	
Deep venous thrombosis prophylaxis	68(86.1%)	8 (10.1%)	-	1 (1.3%)	2 (2.5%)
Oral care and hygiene, chlorhexidine	76(96.2%)	2 (2.5%)	-	-	1 (1.3%)

4.6. Compliance to VAP care bundle approach by critical care nurses at CCU-KNH

Compliance to all components of VAP care bundle was assessed using ''Yes'' or ''No'' approach for every specific component utilized or contraindicated, the bundle was rated as complete. Conversely, one of the components was not accomplished, then the bundle was rated incomplete. The goal of compliance was to achieve 100% when all the elements are utilized in patient care, but a score of 95% and above was considered acceptable while a score of below 95% considered unacceptable performance.

The findings were as follows; nurses reported 100% (n=80) compliance with oral hygiene care using chlorhexidine with the following frequencies reported: once per 24 hours 59.2% (n=45), ones per shift 26.3% (n=20), twice per shift 13.2% (n=10),6-hourly 1.3% (n=1).

The reported compliance with elevation of the head of the bed to 30 to 45 degrees was 98.8%(n=79) while DVT and PUD had 93% (n=75) compliance. The respondents reported 44% (n=35) compliance with daily assessment of readiness to extubate. The findings are illustrated on   Table 4.

Majority of patients were assessed for readiness to extubate, and a few nurses reported use of the following scales: Richmond Agitation Sedation Scale, Ramsay scale, spontaneous interrupted trials while some of the respondents were not sure.

Bundle criteria		Frequency	Percentage
Elevation of the head of the bed to 30 – 45 degrees	Yes	79	98.8
	No	1	1.2
Oral care and hygiene	Yes	80	100
	No	-	-
Frequency of oral hygiene care using Chlorhexidine	Once per shift	20	26.3
	Once per 24 hours	45	59.2
	Twice per shift	10	13.2
	6-hourly	1	1.3
Peptic Ulcer disease Prophylaxis	Yes	75	93.8
	No	5	6.3
Deep Venous thrombosis prophylaxis	Yes	75	93.8
	No	5	6.3
Daily assessment of readiness to extubate	Yes	35	44.3
	No	44	55.7

4.7. Observed utilization of VAP bundle among nurses

Observed utilization of care bundle was also assessed in patients to ascertain the efficacy of nurses in applying VAP care bundle on their patients as shown in Table 5. The observed findings showed that there was no 100% compliance in any of the VAP care bundle component. The highly VAP care bundle that had higher compliance level include Peptic ulcer disease prophylaxis, 98.8% compliance and elevation of the head of the bed to 30 to 45 degrees had 97.5% compliance. There was a very low compliance on oral hygiene care with 98.8% non-compliance and daily assessment of readiness to extubate with 89.5% non-compliance. There was moderate compliance on deep venous thrombosis prophylaxis which had 77% compliance.

TABLE 5:OBSERVED COMPLIANCE WITH VAP BUNDLE UTILIZATION

Bundle criteria		Frequency	Percentage
Elevation of the head of the bed to 30 – 45 degrees	Yes	78	97.5
	No	2	2.3
Oral hygiene care	Yes	1	1.2
	No	85	98.8
Peptic Ulcer disease Prophylaxis	Yes	85	98.8
	No	1	1.2
Deep Venous thrombosis prophylaxis	Yes	67	77.9
	No	19	22.1
Daily assessment of readiness to extubate	Yes	9	10.5
	No	77	89.5

4.8. The association between the observed and reported practice of VAP bundle

The study sought to determine the association between reported and observed practice.

Chi-square was used to assess the existing relationship. The findings from the analysis found that there existed no statistically significant relationship between reported practice on VAP care bundle by nurses and observed practice of VAP care bundle by the researcher on all the participants that were assessed on all the care bundle components as shown in Table 6.

TABLE 6: ASSOCIATION BETWEEN OBSERVED AND VAP CARE BUNDLE PRACTICE AMONG NURSES IN INTENSIVE CARE

VAP care bundle Practice		Observed VAP care bundle		df	chi square	p-value
		Yes	NO			
Elevation of the head	Yes	71 (97.3%)	2(2.7%)			
of the bed	No	1(100%)	0	1	0.028	0.973
Oral care and hygiene	Yes	1(1.3%)	79(98.8%)			
		1.3%	98.8%	1	0.541	0.921
Peptic ulcer disease	Yes	74(98.7%)	1(1.3%)			
	No	5(100%)	0	1	0.068	0.937
Deep venous	Yes	59 (78.9%)	16(21.3%)			
thrombosis	No	4(80%)	1(20%)	1	0.06	0.944
Daily assessment of	Yes	5(14.3%)	30(85.7%)			
readiness to extubate	No	4(9.1%)	40(90.9%)	1	0.521	0.355

4.9. Association between socio-demographic and VAP bundle utilization

The findings as shown in Table 7 showed that there was a statistically significant association between gender and VAP bundle utilization, x2 (1) = 3.847, p =0.046. Thus, male nurses were 8.6 times more likely to comply with bundle utilization, (OR = 8.64, 95%CI, 0.48 – 154.96). The findings further showed that designation was significantly associated with VAP bundle utilization, x2 (4) = 9.905, p =0.042. The results showed that, a higher nursing designation was associated with 1.65 times more likely to comply with VAP bundle utilization, (OR = 1.651, 95%CI, 0.85 – 3.22).

TABLE 7:TABLE SHOWING ASSOCIATION BETWEEN SOCIO-DEMOGRAPHIC AND VAP BUNDLE UTILIZATION

		Bundle utilization						95%CI	
		Yes	No	df	Chi-square	OR	P-value	Lower	Upper
Gender	Male	22(100%)	0						
	Female	49(84.5%)	9(15.5%)	1	3.847	8.64	0.046	0.48	154.96
Age	20 - 29 years	3(100%)	0						
	30 -39 years	33(91.7%)	3(8.3%)	3	2.108	0.69	0.55	0.24	2
	40 - 49 years	31(83.8%)	6(16.2%)						
	50 - 59 years	4(100%)	0						
Education	Certificate	1(100%)	0						
	Diploma	1(50%)	1(50%)						
	Higher diploma	42(95.5%)	2(4.5%)	4	7.462	0.495	0.113	0.168	1.46
	Bachelors	25(83.3%)	5(16.7%)						
	Masters	2(66.7%)	1(33.3%)						
Years of experience	0 - 5 Years	23(85.2%)	4(14.8%)						
	6 - 11 Years	22(84.6%)	4(15.4%)						
	12 - 17 years	21(95.5%)	1(4.5%)	4	2.26	1.753	0.688	0.742	4.142
	18 - 23 years	2(100%)	0						
	24 - 29 years	2(100%)	0						
Designation	Nursing Officer III	0	1(100%)						
	Nursing officer II	13(86.7%)	2(13.3%)						
	Nursing officer I	12(92.3%)	1(7.7%)	4	9.905	1.651	0.042	0.845	3.223
	Senior Nursing officer	33(86.8%)	5(13.2%)						
	Assistant Chief Nurse	13(100%)	0						

4.10. Association between VAP bundle Knowledge, VAP bundle audit and VAP bundle Utilization

The study also sought to assess the association between knowledge and utilization of VAP bundle among nurses, the findings showed that there was a statistically significant association between knowledge and VAP bundle utilization, x2 (1) = 24.589, p <0.001. Thus, the results showed that critical care nurses who had knowledge on VAP bundle were 77 times more likely to comply with bundle utilization, (OR = 77, 95%CI, 3.57 – 1658.9). The results also showed that there was statistically significant association between audit on VAP bundle utilization and nurses' VAP bundle utilization, x2 (1) = 6.416, p =0.009. The results identified that nurses who were audited on VAP bundle utilization were 14.7 times more likely to comply with bundle utilization, (OR = 14.7, 95%CI, 0.83 – 263.71) as shown in Table 8.

TABLE 8:VAP BUNDLE KNOWLEDGE, AUDIT AND UTILIZATION AMONG RESPONDENTS

| | | VAP bundle utilization | | Df | X^2 | OR | p-value | 95% CI | |
		Yes	No					Lower	Upper
Knowledge of VAP bundle	Yes	71(92.2%)	6(7.8%)	1	24.589	77.01	P<0.001	3.574	1658.9
	No	0	3(100%)						
Audited on utilization of VAP bundle	Yes	31(100%)	0	1	6.416	14.78	0.009	0.83	263.71
	No	40(81.6%)	9(18.4%)						

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter outlines discussion of findings, recommendations and conclusions drawn from the inquiry of the study which sought to evaluate nurses' practice on utilization of ventilator-associated pneumonia (VAP) care bundle at CCU-KNH. A cross-sectional descriptive study design was employed and systematic random sampling technique was used to select respondents. Data collection tools involved use of a questionnaire and an observation checklist. All critical care nurses on permanent employment were the study subjects for this study carried out in the month of October 2020.

5.2. DISCUSSION OF FINDINGS

5.2.1. Demographic characteristics of respondents

Among the nurses who participated in the study, majority of them were females, 72.5 percent. These findings are related to the findings from Dumbre et al., in a study conducted at Mexico which revealed that 75% of nurses working in critical care unit were females. Similarly, another study conducted in Nepal investigating VAP bundle utilization, revealed 70% of nurses were females. The higher percentage of feminine in critical care unit might be as a result of the care trait that most females possess hence are more willing to take care of the patients in need compared to male nurses.

In this study, most of the nurses were aged between 40 and 49 years 46.3%. The average age in this study however was higher contrary to other studies such as Dumbre et al., who found the average age of 30 years, while Tabaeian et al., in a study conducted in Iran found that the average age of nurses in critical care was 35 years. The difference in average age among nurses in critical care unit could be as a result of the fact that critical care nursing is a specialty nurses undertake post basic nursing training and majority of nurses prefer to practice before going back to specialize.

In this study, 55 percent of the nurses hold higher national diploma as their highest level of education. Contrary findings by Tabaeian et al., discovered majority of nurses had bachelor of science nursing as their highest qualification, while Dumbre also found that 95% of the nurses had bachelor of science nursing as their highest qualification. The difference in academic qualification attained among nurses is mainly because higher national diploma training is a common course for nurses in specialized units in Kenya health setting.

Sixty five percent of the nurses in this study had more than five years work experience. This is majorly because majority of them are aged between 40 and 49 years. This is contrary to Dumbre et al., and Tabaeian et al., who found that majority of the nurses had less than 5-year experience. This is mainly because the average age of nurses in these studies is 30 and 35 years respectively. Also, for designation of respondents senior nursing officers are the majority of nurses at CCU-KNH at 47.5 percent. This category of nurses is entrusted with responsibility of unit team leaders and mentors.

5.2.2. Nurses' utilization of VAP care bundle
The study sought to determine nurses' practice on utilization of VAP care bundle. Most of the nurses were aware of the existence of VAP care bundle and its elements.

Nurses utilized all the elements of VAP bundle, though some elements were well performed than others. Of the five elements of VAP care bundle, the following were well utilized by more than 80 percent of respondents: elevation HOB, oral hygiene care with chlorhexidine, prophylaxis for deep venous thrombosis and peptic ulcer disease while daily sedation vacation was the least performed element at 68.4 percent. These findings are contrary to those of O'Donnell and colleagues who recommend 100 percent conformity to all components of VAP bundle to significantly reduce VAP. This is attributed to lack of a formalized VAP bundle checklist incorporated in patient's care document in addition to the general nursing care plan, and explains why VAP is common among patients in CCU-KNH.

However, from seventy-seven nurses who asserted knowledge of the VAP care bundle, seventy-one of them affirmed to utilizing of the care bundle in their units. Only thirty eight percent of participants were audited on the utilization of the VAP care bundle. The low audit of the utilization of care bundle among nurses leaves room for errors and poor practice.

There was a significant association between gender, designation and VAP bundle utilization. Male nurses were 8.6 times more likely to utilize VAP care bundle (OR = 8.64, 95%CI, 0.48 – 154.96). Designation of senior nursing officer was associated with a 1.65 times chance of utilizing VAP care bundle (OR = 1.651, 95%CI, 0.85 – 3.22).

The study also revealed a strong association between knowledge and utilization of VAP care bundle, as majority of the nurses acquire critical care knowledge from their basic educational programs, or on-job training. These findings are comparable to a study conducted in Cairo by Dumbre, (2019) who found that there was a higher prevalence of nurses who knew about the

VAP care bundle although audit on utilization was not frequent and hence impeded effective bundle utilization. Similarly, Dumbre, identified a strong association between knowledge and utilization of VAP care bundle.

Similarly, Osti et al., found out that nurses' knowledge on VAP bundle played an essential role in the utilization of VAP care bundle in Critical care settings. This shows that majority of the nurses are able to translate knowledge to practice. Such findings were also observed by Lambert M.L. et al., (2013), Maria Parisi et al., (2016). The study also identified that there was poor audit on nurses' utilization of VAP care bundle.

5.2.3. The strategies critical care nurses use to implement the VAP care bundle at CCU-KNH

Strategies used in implementation of care bundle were also assessed. The results showed that eighty five percent of the respondents used continuous practice education followed by bedside checklist. These are the most common strategies of implementation of VAP care bundle. These findings are analogous to Álvarez-Lerma and García in a study conducted in Spain which showed education to health provide and frequent clinical audits as key to provision of quality care. Such sentiments were also echoed by Khan et al., in a study conducted in Saudi Arabia which revealed that continuous assessment of nurse practice and bedside assessment remain essential strategies in VAP bundle implementation. Similarly, Coffin, Klompas, Classen, (2008) recommended CPE as an effective strategy although they further suggested frequent monitoring and regular audits.

Alcan, and colleagues (2016), concluded that VAP care bundle implementation with continuous medical education prepared on best evidence-based practice reduced VAP rates. However, the findings from this study also showed that some of the nurses working in critical care did not have knowledge of the VAP care bundle implementation and this calls for training of all nurses on adherence to current guidelines and protocols governing clinical practice.

5.2.4. Compliance to VAP care bundle

The study findings revealed that nurses reported 100% compliance with oral hygiene care with more than half of the respondent using chlorhexidine once per 24 hours. The hand hygiene was the most complied to VAP care bundle mainly because it's the cornerstone of all infection control. These findings are comparable to Dumbre, (2019) who found that compliance to oral

care and hand hygiene was 100%. However, Mady, (2014) found that compliance with oral care and hand hygiene was 87.5%.

Compliance with head elevation in this study was ninety eight percent. These findings are similar to those from a study conducted in Saudi Arabia which found that compliance with head elevation was 95.2%, (Mady, 2014). Contrary findings were reported by Rello et al., (2013), of 50%compliance with maintaining head elevation. This was attributed to lack of training on VAP bundle utilization among nurses in ICU.

The significance of HOB elevation was also echoed by Yüksel S. et al., (2020), who stated that HOB elevation enhances patient's comfort, prevents complications and facilitates respiratory function. Lack of adjustable ICU beds was reported as a limitation to this intervention as nurses would erroneously estimate positioning and this directly contribute to the incidences of VAP observed at CCU-KNH. To accurately achieve30-45 degrees HOB elevation, nurses should use a goniometer as suggested by Najafi G, et al., (2017).

Compliance to DVT and PUD interventions in this study was ninety three percent. The results further found that there was very low compliance with daily assessment of readiness to extubate. Some of the nurses asserted that they were not sure of the key elements to assess when seeking to extubate a patient. These findings are comparable to Hellyer et al., who found that very few nurses in critical care comply with daily assessment of readiness to extubate among patients on ventilator machines. This is explained by the increasing incidences of VAP in CCU-KNH.

5.2.5. Assessment of the association between practice and observed

Assessment of the association between practice and observed VAP bundle utilization showed that there was no significant association between observed and actual practice of VAP care bundle. There are no published studies that have offered a comparative understanding between observed and nursing compliance with VAP care bundle. However, independent studies have shown reduced compliance in observed patients lower than reported by nurses in critical care units. A study conducted in Brazil by Parisi et al., (2016) found that there was low VAP bundle utilization in patients who were observed. Similarly, Bird et al., (2010), found lower VAP bundle utilization. However, the difference could be as a result of sampling bias or observer bias.

5.3. CONCLUSION

Nurses at CCU-KNH utilized VAP care bundle with some of the elements being performed better than others. A few of nurses cited lack of current updates on clinical guidelines, a factor which contributed to low utilization

It was also observed that lack of frequent audits on VAP care bundle utilization contributed to under performance.

The findings revealed that continuous practice education and bedside checklists were the common strategies used to share knowledge on VAP care bundle utilization, but there was lack of record on whether all nurses attend the sessions.

Nurses compiled to implementation of VAP care bundle, although did not achieve the desired implementation rate recommended by IHI, due to limited resources and knowledge.

The study found out no statistically significant relationship between reported practice of VAP care bundle by nurses and observed practice of VAP bundle and therefore fail to reject the null hypothesis.

5.4. RECOMMENDATIONS

- Nurses at CCU-KNH, should be sensitized on VAP care bundle components at frequent intervals to keep them updated with current evidence-based practice.
- The Unit manager should formulate an audit plan to monitor implementation of VAP care bundle elements.
- There is need to have a VAP care bundle checklist for all patients to remind primary nurses on adherence while rendering care to these patients.
- The hospital management should make sure all essential supplies are provided as well as adjustable beds to improve quality of care.

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APPENDIX 1: TIME SCHEDULE AND WORK PLAN

Activity	Sept 2019 - Feb 2020	February to August2020	September 2020	October 2020	Nov 2020	Dec 2020
Proposal development and school approval	■					
Ethics approval		■				
Resubmission of proposal			■			
Pretesting and data collection				■		
Data analysis and presentation					■	
Report submission and thesis Defence					■	
Final report writing and dissemination						■

APPENDIX: 2 PARTICIPANT INFORMATION AND CONSENT FORM

Title of the study: Evaluation of nurses' practice on utilization of ventilator-associated pneumonia care bundle at the critical care unit (CCU), Kenyatta national hospital.

Principal investigator and institutional affiliation: Joan Katuku Kalovwe, UON Mscn student

Co-investigators and institutional affiliation: Dr. James Mwaura, Senior lecturer UON, Mrs. Teresa Odero, Senior lecturer, UON

Introduction

My name is Joan Kalovwe, a student at the University of Nairobi pursuing masters in Science nursing, critical care nursing. I take this opportunity to invite you to participate in my study titled: Utilization of ventilator-associated pneumonia care bundle at the critical care unit (CCU), Kenyatta national hospital.

The aim of this information is to familiarize you with the details pertaining to the study that will enable you make an informed decision regarding participation. You are free to ask questions to clarify any of the aspects we will discuss in this information and consent form. The researcher will also ask you questions regarding the study before you sign the consent form to ascertain your comprehension of the information provided.

Background: The purpose of this study is to evaluate how nurses utilize the ventilator-associated pneumonia care bundle at the CCU and identify gaps in practice.

Participation: Participation in the study will entail answering questions which will be filled by the interviewer in the structured questionnaire. You will not be subjected to any invasive procedure. The study involves approximately 82 nurses.

Benefits: There is no direct monetary benefit in participating in this study. However, the results of the study will be useful in facilitating the understanding of how to improve service delivery at the CCU.

Risks: There are no economic or physical risks while participating in the study. However, due to the time taken in responding to question, you will take a longer time than usual at your work place. Also, during the interview, some questions will require you to disclose some personal information that might trigger some negative feelings and possibly anxiety. If this happens, the researcher will offer reassurance and refer you to the hospital counselor. Participants

protection: Participants will be assured that no harm or risks will be encountered as they participate in the study. However, in view of the Corona virus disease pandemic, the researcher will strictly adhere to the issued Covid-19 prevention guidelines during the data collection exercise including ensuring that the researcher and participants wear masks during the interviews, no hand shaking, adhering to recommended social distancing rule during interviews and ensuring that the researcher and participants sanitize adequately prior to and after participation. These measures will help limit risk of Covid-19 transmission.

Confidentiality: Confidentiality will be maintained and the information you provide will only be used for the intended purpose of the study. In addition, your name will not be required on any forms or used during publication of the final report thus ensuring your anonymity. All materials used during the study will be under lock and key and only the personnel involved in this study will have access to them. Electronic files will be saved on password and fire-wall protected computers.

Voluntary Participation: Participation in this study is voluntary. Refusal to take part will not attract any penalty.

Witness will not be indicated for this study, since participants are professionals who are fluent in English.

Compensation: There is no compensation for participating in the study.

Contact Persons

If you have any questions or concerns pertaining this study please feel free to contact the following persons;

Principal investigator; Joan Kalovwe, Box 1278-00515, Mobile number: .0723811283.

Lead supervisor; Dr. James Mwaura, Senior lecturer, School of nursing Sciences, University of Nairobi, Box; 196-00202, mobile number: 0722790202.

Kenyatta national hospital/University of Nairobi ethics and research review committee, Box 20723-00202, Nairobi, Telephone number; 726300-9.

APPENDIX 3: PARTICIPANT'S STATEMENT

I have read this consent form and understood the information it contains. My role as a study participant has been clearly explained and my questions have been answered. My decision to take part in the study is voluntary and not by coercion. I can withdraw from the study at any time if I no longer feel like participating and I can withdraw without any explanation. I understand that my personal details will be kept private and confidential. I hereby consent to participate in the study as has been explained to me.

Participant name: _____signature_____

Date _____

APPENDIX 4: STRUCTURED QUESTIONNAIRE

DATE…….

Instructions: please tick in the appropriate boxes/circle the best choice

PART A

Socio-demographic data

1.Gender…

    a) Male   ☐

    b)   Female   ☐

2. Age

    a) 20-29 years ☐

    b) 30-39 years ☐

    c) 40-49 years ☐

    d) 50-59 years ☐

3. What is your highest level of education?

    a) Certificate

    b) Diploma

    c) Higher diploma

    d) Bachelors

    e) Master

    f) Others…specify…

4. Special training: -

    a) Critical care nursing

    b) Nephrology nursing

    c) Perioperative nursing

    d) Accident and emergency nursing

    e) Others…...specify….

    f) None

5. Years of experience in critical care nursing: -

a) 0-5years

b) 6-11years

c) 12-17 years

d) 18-23 years

e) 24-29 years

6. Designation: -

a) Nursing officer 111   f) Others…...Specify………

b) Nursing officer 11

c) Nursing officer1

d) Senior nursing office

e) Assistant Chief nursing officer

PART B

Assessment of knowledge VAP bundles

Instruction: Tick in as appropriate, circle the best choice

7. General knowledge about VAP

Description	Yes	No
Are you aware of VAP bundle?		
Do you know the elements of VAP bundle?		
Do you utilize the VAP bundle in your unit?		
Are you audited on utilization of VAP bundle?		

8.(a) What strategies do you apply to implement the VAP bundles of care? (Tick as many as appropriate)

i.   Continuous practice Education (CPE)

ii. Training

iii. Bedside checklist

iv. White boards

v.   Online network

vi.   Others…...specify……

(b) Of the above strategies, which is the most preferred in you unit and why?.........

9. To what extent do you agree with the following clinical practice?

Practice on VAP bundle	Strongly agree	Agree	Undecided	Strongly disagree	Disagree
Elevation of the head of the bed to 30-45 degrees					
Daily 'sedation vacation' daily assessment of readiness to extubate					
Peptic ulcer disease prophylaxis					
Deep venous thrombosis prophylaxis					
Oral care and hygiene, chlorhexidine					

10. How frequent do you perform oral care using chlorhexidine?

   a) Once per shift   e) Others………Specify……………
   b) Once per 24-hours
   c) Twice per shift

d) 6-hourly

11.a) Do you assess patient's readiness for extubation? YES ☐   NO ☐

    b) If YES which sedation scale do you use……...

12.a) Do you practice the following elements of VAP?

Bundle criteria   Yes   No

Elevation of the head of the bed to 30-45 degrees

Daily 'sedation vacation' daily assessment of readiness to extubate

Peptic ulcer disease prophylaxis

Deep venous thrombosis prophylaxis

Oral care and hygiene, chlorhexidine

APPENDIX 5: OBSERVATION CHECKLIST

TITLE: EVALUATION OF NURSES' PRACTICE ON UTILIZATION OF VENTILATOR-ASSOCIATED PNEUMONIA (VAP) BUNDLE AT CCU-KNH

DATE………… TIME……...

A score of 95% is considered acceptable while that of less than 95% is unacceptable

BUNDLE	DATE:					
VAP	ELEMENTS					
	Head of bed elevation	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	Is the head of bed elevated to at least 30 degrees?	N/A	N/A	N/A	N/A	N/A
	Oral care hygiene	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	Oropharyngeal contamination cleaned with chlorhexidine every 4 hours	N/A	N/A	N/A	N/A	N/A
	PUD prophylaxis	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	Does patient have PUD prophylaxis orders?	N/A	N/A	N/A	N/A	N/A
	DVT PROPHYLAXIS	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	Does the patient have DVT prophylaxis orders?	N/A	N/A	N/A	N/A	N/A
	Discussion on readiness to extubate/wean	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
		N/A	N/A	N/A	N/A	N/A
	YES: When element is discussed					
	NO: When element NOT discussed					

PUP-peptic ulcer prophylaxis, **DVT-**Deep venous thrombosis prophylaxis

APPENDIX 6: ADOPTED VENTILATOR-ASSOCIATED PNEUMONIA BUNDLES

DATES										
TIME	06.00	10.00	14.00	18.00	22.00	02.00	06.00	10.00	14.00	18.00
Head of bed elevation										
A) Neuro patients 30 degrees										
B) Non-Neuro patients 45										
Daily sedation vacation										
Sedation score at 8AM										
No tube condensation										
Oral care with chlorohexidine 4 hourly										
Peptic ulcer prophylaxis										
DVT prophylaxis										

APPENDIX 7: LETTER OF APPROVAL FROM KNH-UON/ERC

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

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

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

Ref: KNH-ERC/A/333

25th September   2020

Joan Katuku Kalovwe
Reg. No.H56/11490/2018
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Joan

RESEARCH PROPOSAL – EVALUATION OF NURSES' PRACTICE ON UTILIZATION OF VENTILATOR – ASSOCIATED PNEUMONIA CARE BUNDLE IN CRITICAL CARE UNIT AT KENYATTA NATIONAL HOSPITAL   (P114/02/2020)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 25th   September   2020 – 24th September 2021.

This approval is subject to compliance with the following requirements:

a. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d. Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
g. Submission of an *executive summary* report within 90 days upon completion of the study.
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.
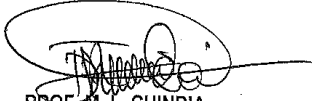
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For more details consult the KNH- UoN ERC website<u>http://www.erc.uonbi.ac.ke</u>

Yours sincerely,

PROF. M. L. CHINDIA
<u>SECRETARY, KNH-UoN ERC</u>

c.c.   The Principal, College of Health Sciences, UoN
        The Senior Director, CS, KNH
        The Chairperson, KNH- UoN ERC
        The Assistant Director, Health Information, KNH
        The Director, School of Nursing Sciences, UoN
        Supervisors: Dr. James Mwaura, School of Nursing Sciences, UoN
                     Mrs. Theresa Odero, School of Nursing Sciences,UoN

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APPENDIX 8: STUDY REGISTRATION CERTIFICATE

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
   JOAN   KATUKU   KALOVWE

2. Email address: kalovwes@yahoo.com   Tel No. 0723811283

3. Contact person (if different from PI)... N/A

4. Email address: ....   Tel No. ....

5. Study Title
   Evaluation of Nurses' Practice on utilization of
   Ventilator-associated Pneumonia Care bundle in
   Critical Care Unit - KNH.

6. Department where the study will be conducted ...... Main Critical Care Unit
   (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. Momanyi .... Signature .... Date 06/10/2020

9. KNH UoN Ethics Research Committee approved study number __P114/02/2020__
   (Please attach copy of ERC approval)

10. I __Joan Kahuku Kalovwe__ commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Research and Programs.

    Signature................................ Date __6/10/2020__

11. Study Registration number (Dept/Number/Year)_____ CCU _____/ 184 / 2020
    (To be completed by Research and Programs Department)

12. Research and Program Stamp _____

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

Version 2: August, 2014

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