KNOWLEDGE AND PRACTICE OF INTENSIVE CARE NURSES ON PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM, TANZANIA

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MSc Nursing (Critical Care and Trauma) Dissertation

Muhimbili University of Health and Allied Sciences

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By

Ally Tatu Said

A Dissertation/ Thesis Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master of Nursing (Critical Care and Trauma) of Muhimbili University of Health and Allied Sciences".

November, 2012

CERTIFICATION

The undersigned certify that she has read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation titled **Knowledge and practice of Intensive Care Nurses on prevention of ventilator associated pneumonia at Muhimbili National Hospital, Dar es Salaam, Tanzania** in partial fulfillment of the requirements for the degree of masters of Critical care and Trauma Nursing .

……

Dr. Columba K. Mbekenga. Bsc. Nursing, MPH, PhD

(Supervisor)

Date ……..

DECLARATION

I, Ally Tatu Said, declare that this dissertation report is my own original work. It is being submitted for the Degree of Master of Science in Nursing in the MUHAS. It has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature ……

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DEDICATION

This work is dedicated to all ICU nurses and other ICU health care workers.

ABSTRACT

Background- A cross-sectional and observational study was conducted among Intensive care (ICU) nurses at Muhimbili National Hospital (MNH), to identify knowledge and practice of ICU nurses on prevention of Ventilator Associated Pneumonia (VAP).

Materials and methods- Knowledge of 118 nurses working in ICU such as Main , Cardiac , Acute pediatric ICUs , emergency medicine department and highly dependent unit at MNH were tested by using a close ended questionnaire, 30 nurses among 118 were tested for knowledge and practice by using observational checklist. Information letters, consent forms and questionnaires were handed to ICU nurses by researcher assistants. Data coded and entered into SPSS version 16.0 for descriptive and inferential statistics.

Results- Of ICU nurses, 95 (80.5%) were women, 64 (54.2%) had either diploma or Advanced diploma in Nursing, 105 (90%) had no ICU training, 80 (67.8%) were working in ICU for less than 10 years, knowledge scored and their levels were as follows: 64 (54.2%) scored 100% - 70% excellent, 19 (16.1%) scored between 69% - 60% very good, 23(19.5%) scored between 59% - 50% good, 10(8.5%) scored 49% - 40% average and 2 (1.7) scored between 39% - 0% poor. No association between knowledge and years of working experience (p- value 0.34), ICU training (p- value 0.64) and level of education (p- value 0.55). ICU nurses' practice on prevention of VAP was statistically associated with education level (p- value 0.03) but not associated with ICU training (p- value 0.53) and years of work experience (p- value 0.64). On observation large proportion (100 %) of ICU nurses did not wash hands before entering ICU, 83.3% washed hands before and 66.7% after patients contact. Of ICU nurses (66.7%) observed to wash hands after contact with a source of microorganisms. During ETS large proportion of ICU nurses (83.3%) use sterile gloves, though hand washing before and after suctioning, maintaining of environment and equipment cleanness was poor. During oral care (90%) of ICU nurses use clean gloves, 80% clean mouth using toothbrush or gauze moistened with mouth wash and 73% clean equipment.

Conclusion- ICU nurses' knowledge on VAP prevention was adequate but their practice was found to be poor. No significant association between ICU training, level of education, years of working experience and knowledge. Practice of ICU nurses on VAP prevention was statistically associated with education level but not with ICU training and years of working experience. Hand washing, environment and equipment cleanness during ETS and oral care was inadequate therefore knowledge of ICU nurses on VAP prevention does not necessarily reflect adequate practical skills.

Recommendations- ICU nurses need to be encouraged to translate knowledge into practice, ICU environment and facility should enable nurses in translation, adoption of acceptable guidelines on evidence based medicine practice is recommended. Similar studies with large sample size in other hospitals which provide critical care in Tanzania is recommended.

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LIST OF ABREVIATIONS

AACCN	-	AMERICAN ASSOCIATION OF CRITICAL CARE NURSE
APCU	-	ACUTE PAEDIATRIC CARE UNIT
ETT	-	ENDOTRACHEAL TUBE
ETS/ETTS	-	ENDOTRACHEAL TUBE SUCTIONING
HAI	-	HEALTH ACQUIRED INFECTION
HCW	-	HEALTH CARE WORKERS
HOB	-	HEAD OF THE BED
ICU	-	INTENSIVE CARE UNIT
MNH	-	MUHIMBILI NATIONAL HOSPITAL
MOHSW	-	MINISTRY OF HEALTH AND SOCIAL WELFARE
MUHAS	-	MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
SPSS	-	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
TNMC	-	TANZANIA NURSES AND MIDWIFERY COUNCIL
VAP	-	VENTILATOR ASSOCIATED PNEUMONIA
WHO	-	WORLD HEALTH ORGANIZATION

DEFINITION OF THE OPERATIONAL TERMS

Intensive care unit, A special area in a hospital, where critically ill patients or highly dependent patient, who need close and frequent observation, can be cared for by qualified and special trained staff working under the best possible condition.

Intensive care nurse, Any nurse working in general ICU, Cardiac ICU, theatre, emergency medicine unit, APCU and Highly dependent unit (Ward 1) at Muhimbili national hospital who is able to work in ICU.

Ventilator associated pneumonia, is a nosocomial pneumonia in a patient on mechanical ventilator support by endotracheal tube or tracheostomy for more than 48 hours with signs and symptoms of pneumonia.

Knowledge, a theoretical understanding of measures to prevent ventilator associated pneumonia, according to the current study a score of 50% and above is considered adequate.

Practice, an implementation of measures to prevent ventilator associated pneumonia, according to the current study a score of 50% and above is considered adequate.

ICU training, this is a specialized / formal ICU training for nurses working under the best possible condition to care dependent patient who need close and frequent observation.

CHAPTER ONE

INTRODUCTION

BACKGROUND OF THE STUDY

Ventilator associated pneumonia (VAP) is defined as a type of pneumonia in a patient receiving mechanical ventilation that was not present at the time of admission to hospital or that occurs 48 hours after intubation and mechanical ventilation. It is characterized by a new or a progressive pulmonary infiltrate, fever, leukocytosis and purulent trachea-bronchial secretions.[1, 2] It carries a high mortality rate ranging 6% - 68% and may be as high as 74% in high risk populations, indicating a serious health hazard among ventilated patients. [3]

Intubation and mechanical ventilation both increase the risk of bacterial pulmonary infection because the invasive endotracheal tube allows direct entry of bacteria into the lower respiratory tract since the tube is located in the trachea. Bacterial colonization in the respiratory tract is further facilitated by the absence of the cough reflex and excessive mucus secretion in the mechanically ventilated patients.[4]

Prolonged ventilation increases the risk of VAP, increases hospital stay which dramatically increases mortality rates. The frequency of VAP in the ICUs is high and VAP's negative impact on patient outcomes and resource utilization is huge.[5] At the Muhimbili National Hospital the incidence of ventilator support ranges from 20 - 40 patients a week a (short term ventilation) to patients who undergo major surgery, with about 15 patients ventilated for a period of more than three days (long term ventilation) in a month indicating a high use of ventilator support. About 40 patients were admitted in general ICU from 1st April-1st May 2012, 20 patients among them were mechanically ventilated and 1 case of VAP diagnosed (Data obtained from ICU report book 2012).

The hospital-wide prevalence of VAP was 1.7% and 2.9% in studies conducted in Algeria and in Senegal, respectively.[6,7] In another study from Algeria, the cumulative incidence of VAP in the neonatal ICU was 2.4%.[8] No microbiology data were reported in these studies. One Senegalese study conducted in an ICU find that, the proportion of ventilated patients affected by VAP was 50%.[9]

VAP is one of the most common infections acquired by adults and children in ICU, Society for Healthcare Epidemiology of America/Infectious Diseases Society of America report 10%-20% of patients undergoing ventilation in America developed VAP.[10]This broad range may reflects the disparity in diagnostic criteria and differences between populations in disease severity Quantitative culture sampling of endotracheal aspirates may optimizes the diagnosis and management of hospital-acquired pneumonia including VAP.

Advanced diagnosis and early management of possible complications may contribute to low incidence while lower number of cases and lack of adequate nursing staff (which should ideally be 1:1) may adversely affect the quality of care given to the patients may be the reasons of increased incidence,[8] even though VAP is a serious problem in developed countries the lowest incidences in developing countries may be contributed by inadequate knowledge and awareness about the problem which can cause the disease not to be well addressed

Strategies have been created in an attempt to find a solution to the problem of VAP in the world; these strategies incorporate a number of evidence based strategies proved in the literature to decrease VAP and increase positive patient's outcomes. There are 21 strategies for prevention of VAP and these are divided into 10 physical strategies, three positional strategies and eight pharmacological strategies. [11, 12]

The physical strategies include: Route of endotracheal intubation, Systematic search for maxillary sinusitis, Frequency of ventilator circuit changes, Airway humidification: type of humidifier, Airway humidification: frequency of humidifier changes, Endotracheal suctioning system: closed vs. open endotracheal suctioning system: frequency of change, Subglottic secretion drainage, Timing of tracheostomy and Use of bacterial filters.
The positional strategies include: Kinetic bed therapy, Semi recumbent positioning and prone positioning.

The pharmacological strategies are: Prophylactic aerosolized antibiotics, Prophylactic nasal antibiotics, Prophylactic intravenous antibiotics, Prophylactic topical/ topical plus intravenous antibiotics, Oral decontamination with chlorhexidine, Oral decontamination with povidone – iodine, Oral decontamination with iseganan and Prevention of maxillary sinusitis.
The guidelines which incorporate all the above strategies were created by a multidisciplinary panel composed of intensivists, infectious disease specialists, intensive care nurses, an infection control nurse, an intensive care unit (ICU) pharmacist and respiratory therapist as well as a representative from the Canadian Patient Safety Institute.

ICU nurses are in the best position to put the above strategies into practice as they are at the patient's bedside 24 hours a day and therefore they play an important role in the prevention of VAP.[2] Nevertheless nurses need to have an awareness of the problem as well as knowledge on the above prevention strategies so as to adhere to such practices. Skilled and knowledgeable nurses are extremely important and needed to make appropriate decisions in patient care and minimize risks to patients. ICU Nurses knowledge should bring confidence to make appropriate decisions and prevent poor outcomes in the recovery of mechanically ventilated patients.[13]

PROBLEM STATEMENT

Ventilator-associated pneumonia (VAP) is known to be one of the most important infections acquired in Intensive Care Units (ICUs), [10,14,15,16] with an incidence of 6-68%, and a high morbidity-mortality rate and an increase in healthcare costs.[5] VAP is a problem in ICU and dramatically increases morbidity and mortality rates on mechanically ventilated patients. It is among the most common infectious complication among patients admitted to ICU.[17]

When VAP occurs, it prolongs the ICU length of stay, ultimately increasing hospital stay and the risk of death in critically ill patients. VAP is also associated with an increased duration of mechanical ventilation and increased health care costs due to an increased ICU and hospital length of stay.[18] VAP prolongs the length of stay by up to 50 days, and increase the duration of mechanical ventilation by 5 to 7 days which generates substantial extra cost of care.[2]The prevention and control of VAP in ICU is said to depend on the education and sensitization of ICU staff members towards the problem and on the application of measures to prevent its occurrence.[18] Similarly since ventilator support is directly related to critical care and its outcomes, improvements in ventilator support is required to be understood in order to improve Emergency and Critical Care.[19]

Although VAP is a serious problem found in ICU in developed countries, the exact magnitude as well as intensity in developing countries is not clear It is therefore reasonable querying the situation while the rate of VAP in countries with well equipped ICU, good number of ICU experts and advanced medications have an incidence rate of between 6% - 68%.[5]Since VAP is preventable and prevention of VAP have been shown internationally to reduce its incidence.[21] This study underscore the importance of identifying the current Knowledge and practice on the prevention of VAP among the ICU nurses and find if it is a factor which contributes to non recognition of the cases hence low rate.

STATEMENT OF PURPOSE

This study identifies the intensive care nurses' knowledge and practice on prevention of VAP in intensive care units at MNH. Recommendations made for nursing practice, education and further research which will contribute to the quality of care and improvement of critical patient's outcome.

RESEARCH QUESTIONS

1. Do intensive care nurses have adequate knowledge on prevention of VAP?
2. Are intensive care nurses practicing preventive measures of VAP?
3. Is there association between level of education, ICU training, years of experience and knowledge of intensive care nurses on prevention of VAP?

BROAD OBJECTIVE

To identify intensive care nurses knowledge and practice on prevention of VAP at Muhimbili National Hospital.

SPECIFIC OBJECTIVES

1. To identify the level of intensive care nurses' knowledge on prevention of VAP at Muhimbili National Hospital.
2. To describe intensive care nurses' practice on prevention of VAP at Muhimbili National Hospital.
3. To establish if there is any association between years of working experience, education level, ICU training and knowledge of intensive care nurses on prevention of VAP at Muhimbili National Hospital.

CONCEPTUAL FRAMEWORK

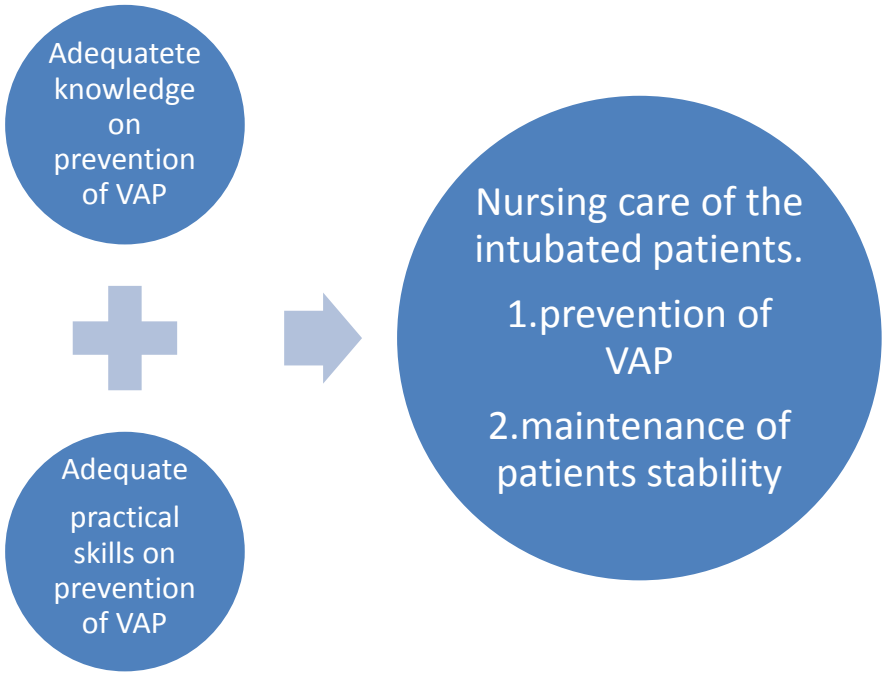
The organizing framework for this study is a synthesis of an Intervention Theory. 1n 1982 Neuman proposed that nurses assist clients in retaining, attaining, and maintaining optimal stability by implementing prevention measures to decrease risk factors that allow stressors to invade the clients' defense system.[22]

Neuman's system model provides a comprehensive flexible holistic and system based perspective for nursing practice. Neuman's model focuses on the response of the client's system to actual or potential environmental stressors and the use of primary, secondary and tertiary nursing prevention intervention for retention, attainment, and maintenance of optimal client health status.[22]

Neuman's theory would support that one of many nursing intentions is to assist ICU patients by implementing effective VAP prevention measures. This framework was appropriate for the study because it provide guidance and support necessary during the literature review, development of study tool and discussion of the results.

In this study primary prevention was taken into account where nursing intervention and knowledge of what they intervene to prevent VAP occurrence to patients was assessed. Furthermore, nursing practices in relation to VAP prevention were assessed include hand washing, ETT suctioning and oral hygiene.

Figure 1; THE NEUMAN'S HEALTH CARE SYSTEM MODEL (1982)



CHAPTER TWO

LITERATURE REVIEW

A review of the research showed four main concepts that led to the utilization of a change theory, which blended with the concept of prevention to guide this study. The primary concepts are presented in the following literature summaries and include knowledge for the prevention of VAP, the strategies for the prevention of VAP and effect of education on nurses' knowledge, VAP rates and implementation of guidelines by health care providers. An overview of the conceptual framework and literature review was described.

Ventilator associated pneumonia is among three upper most infection occurring in health facilities commonly known as hospital acquired infection (HAI), prevalence varied between 2.5% and 14.8% in Algeria.[6] Burkina Faso,[7] Senegal [7] and the United Republic of Tanzania.[7] a study from Burkina Faso on HAI prevalence among surgical patients reported surgical site infection as being the most common type, followed by urinary tract infection and VAP.[7]

The hospital-wide prevalence of VAP was 1.7% and 2.9% in studies conducted in Algeria and in Senegal, respectively.[6, 7] In another study from Algeria, the cumulative incidence of ventilator associated pneumonia in the neonatal ICU was 2.4%.[8] No microbiology data were reported in these studies. One Senegalese study conducted in an ICU find that, the proportion of ventilated patients affected by VAP was 50%.[9]

VAP is one of the most common infections acquired by adults and children in ICU, Society for Healthcare Epidemiology of America/Infectious Diseases Society of America reported 10%-20% of patients undergoing ventilation in America developed VAP.[10]

The Centers for Disease Control (CDC) established recommended guidelines to decrease the risk of VAP. It is these best practice interventions that nurses should follow when caring for mechanically ventilated patients. The 2003 CDC guidelines reported that 63% of admitted patients in the ICU have oral colonization associated with a pathogen resulting from VAP .[17] The CDC provided a set of seven guidelines to reduce risks related to hand washing, wearing gloves, suctioning, elevated head of bed (HOB), education, oral hygiene program, and use of antiseptic rinse. Studies suggested that best practices for reducing VAP were not consistently implemented.

RISK FACTORS FOR VAP

Although any patient with an endotracheal tube in place for more than 48 hours is at risk for VAP, certain patients are at higher risk. The risk factors for VAP can be divided into 3 categories: host related, device related, and personnel related. Host-related risk factors include preexisting conditions such as immunosuppression, chronic obstructive lung disease, and acute respiratory distress syndrome. Other host-related factors include patients' body positioning, level of consciousness, number of intubations, and medications, including sedative agents and antibiotics. Bacterial contamination of endotracheal secretions was higher in patients in the supine position than in patients in the semi-recumbent position.[23] Whether due to a pathophysiological process, medication, or injury, decreased level of consciousness resulting in the loss of the cough and gag reflexes contributes to the risk of aspiration and therefore increased risk for VAP.[24] Re-intubation and subsequent aspiration can increase the likelihood of VAP 6-fold.[25]

Device-related risk factors include the endotracheal tube, the ventilator circuit, and the presence of a nasogastric or an orogastric tube. Secretions pool above the cuff of an endotracheal tube, and low cuff pressures can lead to microaspiration and/or leakage of bacteria around the cuff into the trachea.[26] Nasogastric and orogastric tubes disrupt the gastroesophageal sphincter, leading to reflux and an increased risk for VAP. The question of whether placement of nasogastric or orogastric tubes distal to the pylorus decreases the risk of aspiration and VAP remains unanswered.[26] The results of studies on the relationship between use of small-bore feeding tubes and the incidence of VAP have been inconclusive.[14]

The Centers for Disease Control and Prevention makes no recommendations about routine use of postpyloric feeding tubes or small-bore feeding tubes, because these issues remain controversial and further research is needed.[27] Improper hand washing resulting in the cross-contamination of patients is the biggest personnel-related risk factor for VAP. Patients who are intubated and receiving mechanical ventilation often need interventions such as suctioning or manipulation of the ventilator circuit. These interventions increase the likelihood of cross-contamination between patients if healthcare staffs do not use proper hand-washing techniques. Failure to wash hands and change gloves between contaminated patients has been associated with an increased incidence of VAP.[28,29]

STRATEGIES AND EQUIPMENTS NECESSARY TO PREVENT VAP

Strategies have been created in an attempt to find a solution to the problem of VAP. These strategies incorporate a number of evidence based strategies proved in the literature to decrease VAP and increase positive patients' outcomes. There are 21 strategies for prevention of VAP and these are divided into 10 physical strategies, three positional strategies and eight pharmacological strategies. [11,12]

The physical strategies include: Route of endotracheal intubation, Systematic search for maxillary sinusitis, frequency of ventilator circuit changes, type of humidifier, airway humidification: frequency of humidifier changes, endotracheal suctioning system: closed vs. open endotracheal suctioning system: frequency of change, subglottic secretion drainage, Timing of tracheostomy and Use of bacterial filters.
The positional strategies include: Kinetic bed therapy, Semi recumbent positioning and prone positioning.

The pharmacological strategies are: Prophylactic aerosolized antibiotics, Prophylactic nasal antibiotics, Prophylactic intravenous antibiotics, Prophylactic topical/ topical plus intravenous antibiotics, Oral decontamination with chlorhexidine, Oral decontamination with povidone – iodine, Oral decontamination with iseganan and Prevention of maxillary sinusitis. The guidelines which incorporate all the above strategies were created by a multidisciplinary panel composed of intensivists, infectious disease specialists, intensive care nurses, infection control nurses, ICU pharmacists and respiratory therapists as well as representatives from the Canadian Patient Safety Institute.

ICU NURSES' KNOWLEDGE AND PRACTICE ON PREVENTION OF VAP

ICU nurses have been found to be in the best position to put knowledge into practice as they are at the patient's bedside 24 hours daily providing nursing care and therefore play an important role in the prevention of VAP.[30] Nevertheless nurses need to have an awareness of the problem as well as knowledge so as to adhere to such practices.
Various measures to prevent VAP have been reported in the literature, however there are very few data concerning nurses' knowledge on VAP prevention and the level of their practice, as well as factors that may influence their application at the bedside, lack of knowledge may be a barrier to practice.[7, 31]

If nurses do not have enough knowledge on measures proven to decrease VAP rates they may not have the necessary confidence to take action and make decisions regarding such practices. Patient recovery may be delayed and increased risks of complications from mechanical ventilation such as VAP, which are risks that can be prevented.[11] Most nurses practice nursing according to what they learned in nursing school as well as their experiences in practice. If one takes into consideration the number of changes that occur in nursing practice on a regular basis, it is essential to keep updated and have knowledge of the best current practice.[7] The prevention and control of VAP in ICU are dependent on the education and sensitization of ICU staff members towards the problem and on the availability of equipment necessary for controlling cross infection between environment, health provider and patients .[32]

In one of the study the questionnaire was distributed to 855 nurses during the annual congress of the Flemish Society for Critical Care Nurses. Of the 855 participants, 638 completed the questionnaire. Most respondents were females (n = 472; 74.0%); about one quarter 9 (n = 153; 24.0%) had < 1 year of ICU experience, 111 (17.4%) 1 -5 years, 100 (15.7%) 6 – 10 years, and 274 (43.0%) > 10 years. A degree in emergency and critical care was held by 68% (n = 437) of respondents.

The average score was 3.7 on nine questions. No substantial differences were found between males and females. Nurses with < 1 year experience performed worse than nurses with > 1 year experience. Nurses holding the degree had significantly better scores than those not holding it. Linear regression analysis identified years of experience and degree to be independently associated with better knowledge.[13]

Study done in South Africa show that, Of the 83 participants, 18 (21.69%; CI 95% 13.4% ; 32.1%) achieved a pass mark of 70% on the multiple choice part of the questionnaire and were considered to have adequate knowledge on the evidence based guidelines for prevention of VAP. The mean score of participants was 4.25 (SD 1.537 CI 95% 3.92; 4.59) on nine questions.[18]

In a study among European intensive care nurses, [9] on knowledge levels on the evidence based guidelines for prevention of VAP, low scores were found amongst European ICU nurses' knowledge for prevention of VAP, the average score in the European study was 4.06 on nine questions (45.1%). ICU nurses lack knowledge on prevention of VAP and awareness about VAP prevention strategies was low, this implies, the need for education based on current evidence.

SIGNIFICANCE OF THE STUDY

This study provides baseline information on ICU nurses' knowledge level and practice on prevention of VAP. It will provide strong body of scientific knowledge which will ensure the highest standards of nursing care practice. This can be achieved through adherence to the evidence based guidelines for prevention of ventilator associated pneumonia, ultimately improving patients' outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities.

CHAPTER THREE

METHODOLOGY

STUDY DESIGN

Descriptive cross-sectional and observational design applied. A descriptive cross-sectional design is used where more information required in a particular field through the provision of a picture of the phenomenon as it occur naturally.[33]Knowledge and practice of ICU nurses on VAP prevention was assessed. Each subject was assessed at a single time in the study period. It consumed minimal time to obtain association between ICU nurse years of experience and training with their knowledge on prevention of VAP.

Observational design was used to gain insight into what was happening in practice. Observational study involved the collection of data that specify the behaviors/ practices or events selected for observation and are conducted in participants' natural environments.[34] Direct observation was potentially a more comprehensive method to ascertain how nurses performed in real situations and to identify differences, if any, in practice.

SETTING

The study was conducted in different ICUs at Muhimbili National Hospital. located in Dar es Salaam one of the largest city of Tanzania with about 1,500 bed capacity. Main ICU and Cardiac ICU were used in both questionnaire and observation part because participants are involved directly in patients care for long period, availability of ventilator machines where patients are ventilated, nurses in Acute pediatric care unit (APCU), theatre, emergency medicine department and highly dependent unit during the current study spend little time with ventilated patients but they are supposed to be aware of the VAP preventive strategies therefore involved in answering questionnaire.

POPULATION

Polit and Beck describe the study population as "the entire aggregation of cases in which a researcher is interested in.[33] In this study the researcher is interested in nurses working in critical care unit at Muhimbili National Hospital where by a total of about 132 nurses work in ICU. ICU nurses involved in this study because they are in first line of defense in preventing bacterial colonization of the oropharynx and the gastrointestinal tract during routine nursing care delivered to patients like oral care, ETT suctioning, patient positioning and alike. Nurses also spend much of their working hours with patients compared to other health care cadres.

SAMPLE SIZE

The sample size for the study is calculated using Kish Leslie formula[33] as follows

$N= Z^2 (P (1-P)/C^2$

Where: N = Sample size

Z = Standard normal deviation of 1.96 corresponding to 95% confidence interval

P= prevalence rate = 0.22, taken from a study done in South Africa[18]on knowledge of ICU nurses on prevention of VAP.

C = is a degree of accuracy of the results (marginal error), set at 0.07

Thus: $N = \frac{(1.96)^2 \times 0.22 (1-0.22)}{(0.07)^2} = 136$

To adjust for non responses 10% of the calculated sample size was added to the N as follows: 136 x 0.1=13.6 then 136 + 13.6 = 150 Therefore N= 150 nurses Hence the minimum sample size required for this study was 150 nurses. The researcher was able to interview only 118 out of 132 eligible participants.

SAMPLING PROCEDURE

A duty roster containing morning, afternoon and night shift was used in handing out a questionnaire to ICU nurses daily. However there are few ICU nurses and therefore all ICU nurses who met the criteria were included in this study.
Convenience sampling used to obtain participants involved in observational study. Only Main ICU and Coronary ICU were involved in observational part.

INCLUSION CRITERIA

1. Trained nurses registered by Tanzania Nurses and Midwives Council.
2. Working experience in ICU for three months and above as probation period was over and an ICU nurse was fully responsible to care for patients.
3. Trained nurses who consented to participate in the study.

EXCLUSION CRITERIA

1. Trained nurses who did not consented to participate in the study.
2. All nurses who were not at work place during data collection period like those in full time school schedule and those on leave.

DATA COLLECTION TOOL

The close ended questionnaire consist of section A with 4 questions on demographic information and section C with 20 questions which measure knowledge, Some of the questions were adopted from a reliable questionnaire developed by Vandijick[29] and some are developed by a researcher with the help of ICU experts. Items one through twenty were modified and/or created for the purpose of this study to reflect VAP prevention strategies.

The questionnaire comprises eight validated questions; other questions added were formulated by the researcher with the help of literatures and ICU experts. Unvalidated questions that were added contributed to having enough questions for determining nurse's knowledge. Four experts reviewed the items to determine if all questions were clearly worded and would not be misinterpreted.

Experts included a, 2 ICU nurse specialist, the ICU respiratory therapist, and a registered nurse who has worked in the ICU for more than 10 years. The viewpoints of the panel were considered, and items one through twenty were revised. After reviewing the revised wording, the panel agreed the items were clearly written. As a result some questions were omitted, some added and others rephrased.

An observational checklist developed by the researcher to find nurses' practice on hand washing, endotracheal suctioning and oral care as performed during the care of patients on mechanical ventilator guided by Centers for Disease Control and Prevention [27]

DATA COLLECTION

Before data collection a pilot study was done to 4 ICU nurses on items in a questionnaire and observational schedule to identify practical or local problems that might potentially affect the research process. Data was collected from 12th July to 17th July 2012 where good rapport was maintained in the whole period of data collection. A close ended questionnaire with information letter and a consent form attached to it was handed out by two research assistants to ICU nurses. A code number was used in a place of participant name. Participants were told to sign the consent form.

The questionnaires were in English because all nurses in Tanzania are trained using English language. Even though some of the items in the questionnaire were not clear to few participants, questionnaires were filled in the presence of two well trained research assistants and participants were free to ask questions or clarification. Research assistants included a, registered nurse and a medical doctor. Questionnaires were filled in working hours; Consent forms and filled questionnaires were placed into sealed envelopes by the research assistant and taken from each unit daily.

Each participant observed for about 3 hours, the time was selected randomly where by the researcher stay around ICU. Within 3 hours nurses were expected to care patients in observed items. Observed participants were conveniently selected and were aware that they were being observed. Those who refused to be observed were not involved in observation part. Observation of 30 participants out of the studied 118 participants was made after saturation of the participants practice.

ETHICAL CONSIDERATIONS

The ethical clearance was sought and granted from the MUHAS institutional review board (APPENDIX IV). Permission to conduct the study was sought from the MNH management (APPENDIX V). Participants were well informed and signed a consent form (Appendix III). Participation in the study was voluntary and no harm was expected during participation. For confidentiality a code number and signature were used instead of a participant's name.

DATA ANALYSIS

Descriptive statistics were used to interpret the demographic data: age, sex, years working in ICU and training. SPSS version 16 was the statistical programme used to analyze the data. Data received from research assistance daily then cleaned and coded by the researcher. Frequency distributions, pie chart and cross-tables were used to provide an overall and coherent presentation and description of data. Multivariate regression tests were used to express the magnitude and direction of the association between education level, years working in ICU, ICU training and intensive care nurses' knowledge on prevention of VAP. Correct choices were cycled by participants; participants who selected a correct choice from a certain item were considered to have knowledge on that item. Participants who selected wrong choice from a certain item were considered to have no knowledge on that item.

Table 1; The levels of knowledge/ practice were classified as follows:

PERCENTAGES	LEVEL
100% - 70%	Excellent
69% - 60%	very good
59% - 50%	Good
49% - 40%	Average
39% - 0%	Poor

All items on the observational checklist were weighted with the digits 0 and 1. Weighting (1) represented adherence to accepted ICU nurse practice employed to prevent VAP. 0 represented non adherence to accepted ICU nurse practice employed to prevent VAP. The above weight were converted into % ranging from 0 – 100 %.

DISSEMINATION

Result of this study will be disseminated in each unit which participated in this study, school of nursing MUHAS, MUHAS library and MNH administration. Further, the results will be published in nursing journals and presented in scientific conference. Also Ministry of health and social welfare (MOHSW) will access a copy of dissertation report.

RELIABILITY AND VALIDITY

The modified questionnaires were handed to three ICU nurse experts to assess content validity of the questionnaire; nurse experts involved in validation were excluded in the current study. Nursing relevance of all items were assessed by scoring the items on a scale of 1 to 3: 1 = not relevant; 2 = relevant, but not necessary; 3 = absolutely necessary.

The questionnaire comprises eight validated questions, other questions formulated by the researcher with the help of ICU experts so as to measure knowledge in various perspectives. To ensure face validity it was discussed if the questionnaire is clearly worded, well explained and if it addresses what it meant to address; knowledge and practice of ICU nurses on prevention of VAP. To evaluate the level of difficulty of the questionnaire ICU nurse experts were asked to answer the questionnaire and the proportion of respondents answered the questions correctly was assessed. Reliability was maintained by ensuring consistency and accurate record of data. Observation was done only by the researcher so as to ensure consistency in scoring the observed practice and avoid bias.

LIMITATIONS OF THE STUDY

The current study was conducted in ICUs of MNH, had few number of participants and short duration of observations, therefore findings may not be representative of the general population of ICU nurses in Tanzania. This may threatens the external validity of the findings hence another research on this area with large sample size is required.

Observation, like other methods has its own limitations and ethical implications. One of the main problems is the effect of the 'observer' on the 'observed'. This is referred to as the Hawthorne effect and is an important threat to the validity of observational research, whereby participants' awareness of being in a study may cause them to change their practice.[34]

However literature suggests that the change of behavior is usually temporary, where there is a tendency for the observed to become used to the presence of the observer and continue to perform their activities according to their normal day to day practice.[35] Therefore the Hawthorne effect may not have affected the study findings.

CHAPTER FOUR

SUMMARY OF RESULTS AND FINDINGS

GENERAL CHARACTERISTICS OF THE STUDY POPULATION

One hundred and eighteen ICU nurses were recruited and all completed the study, about 64(54.2%) had either diploma or Advanced diploma in Nursing, majority of ICU nurses 105 (88.9%) had no intensive care training, and 80 (67.8 %) were working in ICU for less than 10 years.

Table 2: Proportion of ICU nurse according to their demographic characteristics

	Number	Percent
GENDER		
Women	95	80.5
Men	23	19.5
EDUCATION		
Certificate	42	35.6
Diploma	64	54.2
Degree	12	10.2
ICU TRAINING		
Yes	13	11.0
No	105	88.9
YEARS OF EXPERIENCE		
<1year	16	13.6
1-5 years	30	25.4
6-10 years	34	28.8
>10 years	38	32.2

LEVEL OF KNOWLEDGE AMONG ICU NURSES

The knowledge scored and their levels were as follows: of the ICU nurses 54.2% scored 100% - 70% leveled excellent, 16.1% scored between 69% - 60% leveled very good, 19.5% scored between 59% - 50% leveled good, 8.5% scored 49% - 40% leveled average and 1.7 scored between 39% - 0% leveled poor.

Table 3; Knowledge among Nurses working in Critical Care

Level	Number	Percent
Excellent	64	54.2
Very Good	19	16.1
Good	23	19.5
Average	10	8.5
Poor	2	1.7

FACTORS ASSOCIATED WITH KNOWLEDGE

Adjusting for education, ICU training and years of experience in a multivariate logistic regression model reveal the following results; Correlation between level of education, ICU training, years of ICU working experience and knowledge of ICU. No significant difference in knowledge between participants with different education level as found (p = 0.55), ICU training as found (p = 0.64) and between participants with different years of ICU working experience (p = 0.34) Table 3

Table 4; Factors associated with knowledge

FACTOR	NUMBER	P VALUE
EDUCATION LEVEL		
Certificate	42	
Diploma or Degree	76	0.55
ICU TRAINING		
Yes	13	
No	105	0.64
YEARS OF EXPERIENCE		
≤ 5 years	46	
≥ 6 years	72	0.34

P values from a multivariate logistic model

FACTORS ASSOCIATED WITH PRACTICE

Adjusting for level of education, ICU training and years of ICU working experience in a multivariate logistic regression model reveal the following results; Correlation between level of education, ICU training, years of working experience and practice of ICU nurses on prevention of VAP, there is no significant difference in practice between ICU nurses with different ICU training as found (p = 0.53) and years of working experience as found (p = 0.62). Significant difference in practice was found between ICU nurses with different education level (p = 0.03)

Table 5; Factors associated with practice

FACTOR	NUMBER	P VALUE
EDUCATION LEVEL		
Certificate	9	
Diploma or Degree	21	0.03
ICU TRAINING		
Yes	3	
No	27	0.53
YEARS OF WORK EXPERIENCE		
≤ 5 years	9	
≥ 6 years	21	0.62

P values from a multivariate logistic model

HAND WASHING PRACTICE

Large proportion (100%) of nurses observed not wash their hands before entering ICU, 83.3% wash their hands before and 66.7% after patient contact. Large proportion of nurses (66.7%) observed to wash their hands after contact with a source of microorganism it was also found that the use of alcohol rub was very minimal (30%).

Table 6; Hand washing practice of nurses expressed in percentages and number values.

Hand washing	**Yes**	**No**
Hand washing before entering ICU	0(0%)	30(100%)
Before patient contact	5(16.7%)	25(83.3%)
After patient contact	10(33.3%)	20(66.7%)
After contact with a source of microorganisms	20(66.7%)	10(33.3%)
Use of alcohol rub	9(30%)	21(70%)

SUCTIONING FROM THE ETT / TRACHEOSTOMY

Large proportion (83.3%) of nurses wears sterile gloves though small proportion practice hand washing (33.3%) before and (30%) after suctioning.

Table 7; ETS practice of nurses expressed in percentages and number values.

Suctioning from the ETT/tracheotomy	**Yes**	**No**
Hand washing before suctioning	10 (33.3%)	20 (66.7%)
Wear sterile gloves	25 (83.3%)	5(16.7%)
Prepare sterile equipments required during suctioning	15(50%)	15(50%)
Insuring environmental cleanness	8 (26.7%)	22(73.3%)
Insert the catheter into the ETT gently by using aseptic technique	20 (66.7%)	10 (33.3%)
Discard suction tube immediately after one single use	15(50%)	15(50%)
Hand washing after suctioning	9 (30%)	21(70%)

ORAL CARE PRACTICE

Large proportion (90%) of nurses wear clean gloves, (80%) clean patients mouth using toothbrush or gauze moistened with mouth wash and (73.3%) clean equipment and returns it to its proper place while small proportion (27%) of nurses applies water soluble jelly to patients' lips.

Table 8; Oral care practices of nurses expressed in percentages and number values.

Oral care	**Yes**	**No**
Hand washing before oral care	10 (33.3%)	20(66.7%)
Apply clean gloves	27(90%)	3 (10%)
Position a patient in a semi recumbent	9 (30%)	21(70%)
Clean mouth using toothbrush or gauze moistened with mouth wash	24 (80%)	6(20%)
Rinse mouth with a clean swab	18 (60%)	12(40%)
Suction secretions as they accumulate, if necessary	15(50%)	15(50%)
Apply water soluble jelly to patients lips	8 (26.7%)	22 (73.3%)
Clean equipment and return it to its proper place	22 (73.3%)	8 (26.7%)
Hand washing after oral care	13 (43.3%)	17(56.7%)

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

One hundred and eighteen ICU nurses were recruited and all completed the study, about 64(54.2%) had either diploma or Advanced diploma in Nursing, majority of ICU nurses 105 (88.9%) had no intensive care training, and 80 (67.8 %) were working in ICU for less than 10 years**.** Lack of knowledge is said to be a barrier to practice[7] **,**the knowledge scored and their levels were as follows: 64 (54.2%) scored 100% - 70% excellent, 19 (16.1%) scored between 69% - 60% very good, 23(19.5%) scored between 59% - 50% good, 10(8.5%) scored 49% - 40% average and 2 (1.7) scored between 39% - 0% poor.

Nurses working in ICUs of the three hospitals included in the study done in South Africa only (23%) have adequate knowledge on the evidence based guidelines for prevention of VAP.[14] One hundred and eighteen ICU nurses were recruited and all completed the study, about 64(54.2%) had either diploma or Advanced diploma in Nursing, majority of ICU nurses 105 (88.9%) had no intensive care training, and 80 (67.8 %) were working in ICU for less than 10 years. Data collection tool in these two studies differ as the current tool have 20 items which measures knowledge while the south African study tool comprises of only 9 items this can contribute to the discrepancy in the findings.

The current study found that ICU nurses knowledge on prevention of VAP is statistically not associated with ICU training, level of education and years of experience –p value > 0.05. This is similar with the findings of the global European study, [14] and similarly to the study done in South Africa which indicate that there is no association between the level of knowledge, ICU training, years of experience and knowledge on prevention of VAP.[18]

Data from an Italian study carried out at Cisanello Hospital indicated that nurses tend to apply measures automatically by simply following protocols and instructions given by physicians or colleagues without being fully aware of what and why they actually do.[13] This differ from the current study where large number 89.83% of ICU nurses have knowledge and are aware of what they are supposed to do but their practice on VAP preventive strategies were found not widely applied by nurses in a recommended manner, this can be due to shortage of ICU nurses and lack of enough equipment therefore application of recommended practice during nursing intervention requires not only adequate knowledge but other associated factors have to be well addressed.

In MNH continuous education and sensitization of ICU staff members toward infection control including VAP control is done through different education program, journal clubs, seminars, case presentation and other means which target on quality care improvement. However limited availability of equipment necessary for controlling cross infection between environment, health provider and patients, delay in restoring destroyed equipments like water tap hinders the adherence to adequate practice.

HAND WASHING PRACTICE

Hand washing practice of nurses during their routine activities was expressed in percentages and number values hand washing before and after suctioning and oral care was excluded in this part as each had been taking place on its own specified observations. In this study, it was found that of the 30 nurses observed, none washed hands before entering the intensive care unit, only 5 (16.7%) had washed their hands before and 10(33.3%) after contacting a patient; and 20 (66.7%) of these nurses, washed their hands after contacting with a source of microorganism like body fluid, 9 (30%) used antiseptic solution (chlorhexidine) or alcohol-based hand hygiene products after washing their hands.

The current study report no nurse observed to wash hands before entering ICU. While it is recommended for health care workers including nurses to wash hands before entering intensive care unit.[36] The observer associate absence of a tap and reagent for hand rub in the inlet door as a factor which hinder hand washing before entering ICU**;** researcher perceives that dryness, irritation and fissures caused by soap or alcohol-based products may contribute to poor compliance to hand washing. It therefore suggested that the use of waterless alcohol gels may improve the hand hygiene of health care workers because these gels are less damaging to the skin and they efficiently and effectively remove transient flora from the hands.[36] Hands should be washed in contact with patients, the materials around them and the secretions from the patient, and before and after invasive procedures whether or not gloves are used or changed.

Findings observed in the current study shows hand washing before patient contact was 33.3% and after patient contact was 66.7%.With the application of multimodal intervention practices on nosocomial infection to the health workers, hand hygiene compliance was reported to increase from 40% to 53% before patient contact and from 39% to 59% after patient contact.[37] In another study it was reported that hand washing rates were only 23% before patient contact and 48% after patient contact.[38] Similar findings of a study done to HCW found that among HCWs, hand hygiene applications before patient contact were significantly worse than hand hygiene applications after patient contact.[39]

Hand washing hygiene is a cheap and primary infection control procedure therefore the researcher is suggesting the measure for improvement by continuous education during hand over of the shifts, seminar and posters, ensuring the availability of adequate hand washing utilities like soap, water taps, drying tissues and reducing work load by improving nurse to patient ratio.

SUCTIONING FROM THE ETT / TRACHEOSTOMY (TABLE 3)

Of the 30 nurses 10 (33%) wash hands before endotracheal suctioning (ETS), 20 (66.7%) maintain the sterility of the suction catheter until its insertion into the airway. Twenty five (83.3%) wear sterile gloves during suctioning. Only 10 (33.3%) participants washed their hands before performing ETS in contrast to 9 (30%) after performing ETS. Only 8 (26.7%) maintain cleanness of patient environment.

In ICU infections are among the most common complications affecting ICU patients due to poor adherence to aseptic procedure like ETT suctioning.[40]Application of aseptic technique in suctioning practices and hand washing before and after such procedures is strongly emphasized in the literature.[41] Twenty (67%) participants in the current study were not observed to wash hands before ETS procedure. Nurses observed not wash their hands before ETS as expected because of the time it takes out of a busy work schedule particularly, in high-demand situations, such as emergency, under busy working conditions and at times of overcrowding or understaffing. Notably, however, large number 25(83.3%) of participants in our study were observed to wear sterile gloves. This may suggest a perception among nurses that wearing gloves and using a 'non-touch' aseptic technique when inserting the suction catheter negates the need for frequent hand washing yet the literature clearly suggests that gloves do not replace the need for hand washing.[42] These findings support earlier studies that report moderate and even low levels of adherence to recommended ETS procedure.[33,41,43]

ORAL CARE

The oral care practice observed was hand washing before 10 (33.3%) and hand washing after 13 (43.3%) oral care to a patient, 3 (10%) nurses fail to wear clean gloves during oral care, 9 (30%) nurses position a patient in a semi recumbent position during oral care. 24 (80%) use tooth brush or gauze moistened with either tooth paste or mouth wash antiseptics solution, 18 (60%) rinse patient mouth with clean swab,15(50%) do suctioning of secretions as they accumulate during the oral care, 8 (26.7%) apply water soluble jelly and 22 (73.3%) clean equipment and return it in a proper place.

In oral care protocol for intubated patients in GICU and CICU at MNH, using a toothbrush with toothpaste, brushing with a swab, using mouth wash or oral rinse solution, suctioning the oral secretions after oral care and assessing the oral cavity were not clearly stated. The AACN guidelines recommend brushing the teeth twice a day, swabbing the mouth every 2 to 4 hours, and suctioning the oral cavity frequently as per need in order to minimize colonization of endotracheal microbes.[44]

Although the American Dental Association has no standards for the orally intubated patient, tooth brushing with toothpaste is recommended twice a day and swabbing the mouth every 2 to 4 hours, [44] and this practice is now included in the AACN's oral care protocol. [45] However in the current study observer find using a toothbrush can be inadequate due to time-consuming and difficultness in manipulation of the endotracheal tube which limits access to the oral cavity and causes fear of potential dislodgement of the tube.

Oral suctioning and rinsing is indicated to prevent aspiration of oral care solutions during oral care.[2] In the current study 15(50%) of the nurses did suctioning of the oral cavity after tooth brush and 18 (60%) rinse patient mouth with clean swab while a patient positioned in a semi recumbent position to prevent back flow of oral secretion.

Oral suctioning and semi recumbent positioning of the patient prevent aspiration which can cause VAP therefore nurses are expected to apply these measures to patients if no contraindication like in patients with head injury.

In the current study observations, the researcher or author is in thought that the use of gloves replaced hand washing process this resulted in high expenditure of glove it also create a sense of internal stigma to patients as some nurses observed to wear gloves during feeding a patient this couldn't be a case if nurses adhere to proper hand washing practice.

CONCLUSION

The current study revealed adequate ICU nurses' knowledge on VAP preventive strategies but through observation of their practice result into different findings. No significant association found between ICU training, level of education, years of working experience and knowledge. Practice of ICU nurses on prevention of VAP was found to be statistically associated with education level but not statistically associated with ICU training and years of working experience.

This study revealed adequate ICU nurses' knowledge on VAP preventive strategies but knowledge did not reflect in their practice. Hand washing, environment and equipment cleanness during ETS and oral care was observed to be inadequate therefore knowledge of the ICU nurses on VAP preventive strategies does not necessarily reflect adequate practical skills, but knowledge remains the first step toward the implementation of the VAP preventive strategies.

RECOMMENDATIONS

ICU nurses need to be encouraged to translate their knowledge into practice, ICU environment should enable a nurse to translate knowledge into practice by ensuring availability of facilities like hand washing sinks, soap and disinfectants for cleaning and disinfecting equipments, adoption of acceptable guidelines based on evidence based medicine practice is also recommended.

Motivation of opinion leaders amongst nurses in the units should be done to promote their colleagues in putting guidelines for prevention of VAP into- practice. Learning resources such as articles, journals and electronic resources such as computers and internet should be made accessible in the units for staff members.

Similar study is recommended to include large sample size in other hospitals which provide care for critically ill patients in Tanzania, further research on factors affecting implementation of VAP prevention strategies is recommended.

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APPENDIX I

OBSERVATION CHECKLIST

Gender: Female/ Male. **Education level _ Code no _ ICU training - yes/no**

Years of work experience as a critical care nurse? _ Less than 1year _ 1-5 years _ 6-10 years _ more than 10 years_

Start time of observations_ End time of observations_

Observational check list on ICU nurses practice on Prevention of VAP.

PREVENTION PRACTICE	**YES**	**NO**
Hand washing		
Hand washing before entering ICU		
Before patient contact		
After patient contact		
After contact with a source of microorganisms		
Use of alcohol rub		
Suctioning from the ETT/tracheotomy		
Hand washing before suctioning		
Wear gloves		
Prepare sterile equipments required during suctioning		
Insuring environmental cleanness		
Insert the catheter into the ETT gently by using aseptic technique		
Discard suction tube immediately after one single use		
Measure the amount and characteristics of secretion		
Hand washing after suctioning		
Documentation		

Oral care		
Hand washing before oral care		
Apply clean gloves		
Position a patient in a semi recumbent		
Clean mouth using toothbrush or gauze moistened with mouth wash and water		
Rinse mouth with a clean swab		
Suction secretions as they accumulate, if necessary		
Apply water soluble jelly to patients lips		
Clean equipment and return it to its proper place		
Hand washing after oral care		
Documentation		
TOTAL SCORE / 100		

APPENDIX II

QUESTIONNAIRE

ICU nurses knowledge on Prevention of Ventilator Associated Pneumonia
Cycle the correct choice
Gender: Female Male. **Education level** **Code no _ICU** **Training - yes/no**

Years of work experience as a critical care nurse? _ <1year _ 1-5 years _ 6-10 years _ >10 years

1. **Which route is best recommended when intubating a patient**
    a. Oral intubation is recommended
    b. Nasal intubation is recommended
    c. Both routes of intubation are recommended
    d. I do not know
2. **The recommended route of intubation in Qn. 1 decrease the risk of VAP because**
    a. It is associated with sinusitis
    b. It is not associated with sinusitis
    c. Both routes of intubation are associated with sinusitis
    d. I don't know
3. **A nurse is required to dispose a suction catheter**
    a. immediately after one single use
    b. can be cleaned and used twice
    c. can be used without being cleaned
    d. I don't know

4. **It is recommended to change humidifiers**
    a. Every 2-7 days (or whenever necessary).
    b. Every day (or whenever necessary).
    c. Every month (or whenever necessary).
    d. I do not know.
5. **Insertion of the suction catheter into the Endotracheal tube**
    a. Is a sterile procedure
    b. Is a clean procedure
    c. Can be a clean or a sterile procedure
    d. I do not know.
6. **Dusting of respiratory and bedside equipment with antiseptic should be done**
    a. Every shift and whenever soiled.
    b. Whenever soiled.
    c. Weekly.
    d. I do not know
7. **Head of the bed elevation should be ranging from**
    a. 0-15 degree
    b. 15-30 degrees.
    c. 30-45 degrees.
    d. I do not know.
8. **A nurse caring a ventilated patient is required to wear sterile gloves during**
    a. 0ral suctioning
    b. ETT suctioning
    c. Oral and ETT suctioning
    d. I do not know.

9. A nurse caring a ventilated patient is required to wash hands

a. Before oral and ETT suctioning
b. After oral and ETT suctioning
c. Before and after oral / ETT suctioning
d. I don't know.

10. It is recommended to perform Oral care by using a swab moistened with mouth wash and water

a. once in a shift
b. every 4 to 6 hours and whenever necessary
c. whenever necessary
d. I do not know.

11. Prolonged use of Stress ulcer prophylaxis to a ventilated patient

a. Not to be used for patients who are at high risk of developing a stress ulcer.
b. May increase the colonization density of the aero digestive tract.
c. Routine stress ulcer prophylaxis does not influence the risk of VAP.
d. I don't know.

12. Maintenance of a high nurse to patient ratio in critical care setting is associated with

a. increased risk for VAP
b. decreased risk for VAP
c. does not influence the risk for VAP
d. I don't know

13. Continuous education to ICU nurses on prevention of nosocomial infection is associated with

a. Increased rates of VAP
b. Decreased rates of VAP
c. Does not influence the rates VAP
d. I don't know

14. It is recommended to perform chest physiotherapy due to the following reason

a. Chest physiotherapy reduce the risk for VAP
b. Chest physiotherapy increase the risk for VAP
c. Does not influence the risk for VAP
d. I do not know

15. Adjustable vs. non-adjustable beds

a. Adjustable beds increase the risk for VAP
b. Adjustable beds reduce the risk for VAP
c. Adjustable beds have no influence upon the risk for VAP
d. I don't know

16. ETT suctioning should be done to patient

a. Routinely to every shift.
b. As needed.
c. It should be done through ETT only.
d. I do not know.

17. Early weaning

a. Early weaning reduce the risk for VAP
b. Early weaning increase the risk for VAP
c. Early weaning do not influence the risk for VAP
d. I don't know

18. Over feeding a ventilated patient is associated with

a. increased the risk for VAP
b. decreased the risk for VAP
c. do not influence the risk for VAP
d. I don't know

19. During the care of ventilated patient maintenance of adequate cuff pressure

- **a.** Is important because it decrease the risk for VAP
- **b.** Can increase the risk for VAP
- **c.** Do not influence the risk for VAP
- **d.** I don't know

20. Unplanned extubation is associated with increased risk of aspiration therefore

- **a.** Increase the risk for VAP
- **b.** Decrease the risk for VAP
- **c.** Do not influence the risk for VAP
- **d.** I don't know

APPENDIX III

INFORMED CONSENT



MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS

ID-NO

Consent to Participate in a project about ICU nurses Knowledge and practice on Prevention of Ventilator-Associated Pneumonia at Muhimbili National Hospital.

Greetings! My name is **Tatu Said Ally**. I am a student nurse working on a dissertation with the objective of identifying ICU nurses Knowledge and practice on Prevention of Ventilator-Associated Pneumonia.

Purpose of the Study

One hundred and eighteen (118) trained nurses working in ICU will be enrolled to identify intensive care nurses' knowledge and practice on prevention of ventilator associated pneumonia.

What Participation Involves

If you agree to join the study, you will be asked to answer 24 questions. The questionnaires consist of section A with 4 questions on demographic information and section B with 20 questions on VAP prevention strategies.

Confidentiality

All information collected on forms will be entered into computers with only the study identification number. All information that will be collected from you will be protected. The study will not include details that directly identify you, such as your name. Only a participant identification number will be used in the survey. Only a small number of researchers will have direct access to the survey. If the results of the current study will be published or presented in a scientific meeting, names and other information that might identify you will not be used.

Risks

The research team does not expect that any harm will happen to you because of joining this study.

Rights to Withdraw and Alternatives

Taking part in this study is completely your choice. You are free to skip any question if you feel uncomfortable to disclose information. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate, or withdrawal from the study, will not involve penalty or loss of **any** benefits to which you are otherwise entitled.

Benefits

There are no direct benefits to you; however the research team hope that the results of the study will provide valuable information regarding intensive care nurses' knowledge and practice on prevention of ventilator associated pneumonia. And help to focus on nursing education and training as well as continuing development of intensive care nurses

In Case of Injury

We do not anticipate that any harm will occur to you as a result of participation in this study.

Who to Contact

If you ever have questions about this study, you should contact the principle investigator **Tatu Said Ally**, RN **(0718416174**) Muhimbili University of Health and Allied Sciences, P.O.Box 65001, Dar es Salaam). If you ever have questions about your rights as a participant, you may call **Prof. M. Aboud**, Director of Research and Publications at MUHAS, P.O. Box 65001, Dar es Salaam. Tel: 2150302-6.

Signature:

Do you agree to participate?

Participant agrees …… Participant does NOT agree ……..

I, _____ have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant _____

Signature of the research _____Date_____

APPENDIX IV

ETHICAL CLEARANCE

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR-ES-SALAAM
TANZANIA
Telefax: 255-022-2150465
Telegrams: UNIVMED

E-MAIL dpgs@muhas.ac.tz
TEL: (255-022)-2150302-6 Ext. 207
Direct line: 2151378

Ref. No. MU/PGS/SAEC/Vol. VI/

23rd June, 2012

Dr. Tatu Said Ally
M.Med. Critical Care and Trauma,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "KNOWLEDGE AND PRACTICE OF INTENSIVE CARE NURSES OF PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AT MUHIMBILI NATIONAL HOSPITAL"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has on behalf of the Senate approved ethical clearance for the above-mentioned study.

Thus ethical clearance is granted and you may proceed with the planned study.

Please liaise with bursar's office to get your research fund.

Prof. Z. Premji
DIRECTOR, POSTGRADUATE STUDIES

/emm

c.c. Vice Chancellor, MUHAS
c.c. Deputy Vice Chancellor – ARC, MUHAS
c.c. Dean, School of Nursing - MUHAS

APPENDIX V

MUHIMBILI NATIONAL HOSPITAL PERMISSION LETTER

MUHIMBILI NATIONAL HOSPITAL

Cables: "MUHIMBILI"
Telephones: 255-22-2151367-9
FAX: 255-22-2150234
Web: www.mnh.or.tz

Postal Address:
P.O. Box 65000
DAR ES SALAAM
Tanzania

In reply please quote:
Ref:

9th July 2012

TO WHOM IT MAY CONCERN
MUHIMBILI NATIONAL HOSPITAL

RE: RESEARCH CLEARANCE NO 210 2012/2013

Name of Researcher	**TATU SAID ALLY**
Research Title	KNOWELEDGE AND PRACTICE OF INTENSIVE CARE NURSES FOR PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AT MUHIMBILI NATIONAL HOSPITAL
Type of Research	DESCRIPTIVE CROSSECTIONAL AND OBSERVATIONAL STUDY DESIGN
Valid Between	**JULY 2012 TO AUGUST 2012**

The above named has been allowed to conduct the stated research.

Please accord him/her and his/her assistants the necessary assistance/cooperation.

Sincerely,

Dr. H.F. Swai
DIRECTOR OF MEDICAL SERVICES

DIRECTOR OF CLINICAL SERVICES
P. O. Box 65000
DAR ES SALAAM
MUHIMBILI NATIONAL HOSPITAL