"A STUDY TO ASSESS THE EFFECTIVENESS OF VENTILATOR BUNDLE ON PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AMONG PATIENTS ON MECHANICAL VENTILATOR AT SELECTED HOSPITALS, ERODE"

By

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Dissertation submitted to

The Tamilnadu Dr.M.G.R. Medical University, Chennai,

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Master of Science

In

Medical Surgical Nursing (Critical Care Nursing)

under the guidance of

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A dissertation submitted to
The Tamil Nadu Dr. M.G.R. Medical University, Chennai
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Degree of Master of Science in Nursing.

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This is to certify that the dissertation entitled **" A STUDY TO ASSESS THE EFFECTIVENESS OF VENTILATOR BUNDLE ON PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AMONG PATIENTS ON MECHANICAL VENTILATOR AT SELECTED HOSPITALS, ERODE"** is a bonafide research work done by **Mr.T.KUDIYARASU** under the guidance of **Mrs.R.GOWRI**, **M.Sc(N),** Associate Professor, HOD of Medical Surgical Nursing of Anbu College of Nursing.

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Lord, you are my God; I will honour you and praise your name. You have done amazing things; You have faithful carried out, the plan you made long ago.

-Isaiah

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ABSTRACT

Statement of the Problem:

A study to assess the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals, Erode was conducted by as a partial fulfillment of the requirements for the degree of Master of Science in Nursing at Anbu College of Nursing, Komarapalayam affiliated to the Tamilnadu Dr.M.G.R. Medical University, Chennai.

Objectives:

1. To assess the ventilator associated pneumonia among patients on mechanical ventilator in experimental and control group.
2. To evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator in experimental group and control group.
3. To associate the post test score on prevention of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables in experimental and control group.

Methodology:

The research approach was used for the study was quantitative evaluative approach and the research design was Quasi experimental post test only design. 40 patients on mechanical ventilator in that 20 patients in experimental and 20 patients in control group were selected for this study by using non probability convenience sampling techniques. Data was collected with the help of semi structured interview schedule. Descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (chi-square test).

Major findings of the study:

The findings revealed that in experimental group 6(30%) of them were in 21-30 years and in control group 7(35%) of them were between 51- 60 years of age. Majority of the patients in experimental 14(70%) and control 15(75%) group were male. Most of the patients in experimental 9(45%) and control group 7(35%) were ventilated due to CNS Disease problems.

Most of the patients had undergone 2^{nd} hourly suctioning in experimental group 12(60%) where as in control group 8(40%) patients had undergone 3^{rd} hourly suctioning. Half of the patients in experimental 10(50%) and control group 11(55%) had the history of smoking habit. During the post test, in experimental group 5(25%) patients did not develop infection, 11(55%) patients had mild infection and 4(20%) patients have severe infection. In control group 7(35%) patients had mild infection and 13(65%) patients had severe infection. In experimental group the post test mean score was 1.7±1.04 and in control group the post test mean score was 2.95±1.76. The mean difference was 31.

The calculated 't' value was 5.20 which was greater than the table value 2.02, significant at $p \leq 0.05$ level. Hence the research hypothesis H_1 was retained. There was no association in experimental and control group on prevention of ventilator associated pneumonia with their selected demographic variables. This shows that the ventilator bundle was effective in preventing the ventilator associated pneumonia among patients on mechanical ventilator.

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VAP	Ventilator Associated Pneumonia
CPIS	Clinical Pulmonary Infection Score
ABG	Arterial Blood Gas
ICU	Intensive Care Unit
SICU	Surgical Intensive Care Unit
IMCU	Intensive Medical Care Unit
ARDS	Acute Respiratory Distress Syndrome
COPD	Chronic Obstructive Pulmonary Disease
ETT	Endotracheal Tube
CDC	Centre for Disease Control And Prevention
WHO	World Health Organisation
NHSH	National Healthcare Safety Network
CNS	Central Nervous System

CHAPTER – I

INTRODUCTION

CHAPTER – I

INTRODUCTION

"The prevention of disease today is one of the most important factors in line of human endeavor."

- Charles Mayo

Chaurasia, 2002, Our body needs a constant supply of oxygen to support the body's metabolism. Respiration is one of the processes needed for survival and also provides the necessary energy for carrying on all essential life processes. It is the process by which an organism exchanges gases with its environment. The respiratory tract is the path of air from the nose to the lungs. It is divided into two sections: Upper Respiratory Tract and the Lower Respiratory Tract. Included in the upper respiratory tract are the Nostrils, Nasal Cavities, Pharynx, Epiglottis, and the Larynx. The lower respiratory tract consists of the Trachea, Bronchi, Bronchioles, and the Lungs. The organs of the respiratory system make sure that oxygen enters our bodies and carbon dioxide leaves our bodies. The respiratory system plays a vital role in the inhalation and exhalation of respiratory gases in the human body.

Dong L, 2009, The respiratory system allows for the inhalation of gases such as oxygen in the air which can then be transported by the blood around the body to supply tissues and cells, and the exhalation of waste gases such as carbon dioxide into the air. The goals of the respiration are to provide oxygen to tissues and to remove carbon dioxide. The physiology of respiration involves the following three process: 1) ventilation, or the movement of air between the atmosphere and the alveoli 2) diffusion of oxygen and carbon dioxide between the pulmonary capillaries and the alveoli and 3) transport of oxygen and carbon dioxide in the blood to and from the

cells. During ventilation, the movement of air into the lungs is known as inhalation and the movement of air out of the lungs is known as exhalation.

Vangilder C A, 2006, Lung and breathing problems are common and 5th leading cause of death in world wide. In India, the respiratory disorder stands in the 3rd place including chronic obstructive pulmonary disorders, asthma, pneumonia, tuberculosis, interstitial lung diseases etc. When a patient is unable to maintain a patent airway, adequate gas exchange or both, more invasive support with intubation and mechanical ventilation is needed to save the life of patient. Mechanical ventilation is a method to mechanically assist or replace spontaneous breathing. It is also the process of a using of an apparatus to facilitate the transport of oxygen and carbon dioxide between the atmosphere and the alveoli for the purpose of enhancing pulmonary gas exchange. Roman physician **Galen** has been the first to describe the mechanical ventilation. Mechanical ventilation is indicated when the patient's spontaneous ventilation is inadequate to maintain life. It is indicated for physiologic and clinical reasons. Physiologic objectives include supporting cardio pulmonary gas exchange, increasing lung volume and reducing work of breathing.

Marton A E, 2002, Clinical objectives include reversing hypoxemia and acute respiratory acidosis, relieving respiratory distress, preventing or reversing atelectasis and respiratory muscle fatigue, permitting sedation, reducing intra cranial pressure and stabilizing the chest wall. Mechanical ventilation is also required to control the patient’s respiration during surgery or during treatment of severe head injury, to oxygenate the blood when the patient’s ventilator efforts are inadequate. This involve a machine called mechanical ventilator. A mechanical ventilator is a breathing device that can maintain ventilation and oxygen delivery for a prolonged period of time.

Madiha Ashraf, 2006, Mechanical ventilation has become the most commonly used mode of life support in medicine today. Mechanical ventilation is often a life saving, but like other interventions, it is not without complications. Physiologic complications associated with mechanical ventilation include ventilator induced lung injury, cardiovascular compromise, gastrointestinal disturbances, pneumothorax and the most importantly ventilator associated pneumonia. Pneumonia is the second most common nosocomial infection in the world and is a leading cause of death due to hospital acquired infections. Patients in the intensive care unit (ICU) are at risk for dying not only from their critical illness but also from secondary processes such as nosocomial infection. Hospital Acquired Pneumonia is the second most common nosocomial infection in critically ill patients, affecting 27% of all critically ill patients. Ventilator associated pneumonia (VAP) is a form of nosocomial pneumonia that occurs in patients receiving mechanical ventilation of within 48 hrs.

Kirsten LM, 2010, Risk factors for VAP are multiple and are divided into those that are modifiable and those that are non modifiable. Modifiable factors include the supine position, gastric over distension, improper suctioning, pooling of the secretion, contamination of ventilator circuits, frequent patient transfers, instillation of normal saline, understaffing, non-conformance to hand washing protocol, indiscriminate use of antibiotics, and lack of training in VAP prevention and low pressure of the endotracheal tube (ETT) cuff. Nonmodifiable factors include male gender, age over 60 years, acute respiratory distress syndrome, multiple organ failure, coma, chronic obstructive pulmonary disease, tracheostomy, re-intubation, neurosurgery and cranial trauma. The onset of VAP can be divided into 2 types: early onset and late onset. Early onset VAP occurs within 48 hours to 96 hours after intubation and is associated with antibiotic – susceptible organisms. Late onset VAP

occurs more than 96 hours after intubation and is associated with antibiotic resistant bacteria.

Kunnis & Puntillo, 2003, The pathogenesis of VAP involves the colonization of bacteria at the aero-digestive tract and aspiration of secretions from the upper respiratory tracts into the lower airways. In a healthy person, the bodies own flora can help to prevent the colonization of bacteria and virulent pathogens in the oropharynx. The presence of an endotracheal tube allows for the direct entry of bacteria into the lower respiratory tract, preventing the normal host defenses which include filtration and humidification of air in the upper airway, epiglottis and cough reflexes, and ciliary transport action. It has been found that the colonization of bacteria occurs as early as 12 hours after intubation, beginning from the oropharynx, then in the stomach and finally in the endotracheal tube. Aspiration of colonized intestinal and oropharynx secretions is also a significant source of infective pathogens in the lungs.

Martin J, 2006, Early onset pneumonia is usually caused by Staphylococcus aureus, Haemophilus influenza and Streptococcus pneumonia, and late onset pneumonia is caused by Methicillin Resistant Staphylococcus Aureus, Pseudomonas aeruginosa, and Acinetobacter or enterobacter. Traditional signs and symptoms of VAP are chest X-ray showing new or progressive diffuse infiltrate which is not attributable to any other causes, onset of purulent sputum, fever greater than $38.5\ ^{0}$ C, leukocytosis, and positive sputum or blood cultures. VAP is directly related to diagnostic, interventional or therapeutic procedures a patient undergoes in hospital, and are also influenced by the bacteriological flora prevailing within a particular unit or hospital.

Sangeet Narang, 2005, Preventing VAP is one of the important safety issues in critically ill patients receiving mechanical ventilation. The American Association

of Critical-Care Nurses (AACN) recommended steps for reducing the incidence of VAP and these steps are based on the best-practice guidelines for patients receiving mechanical ventilation called the “ventilator bundle”. Implementing ventilator bundle has been strongly advocated in ventilated patients, who are at risk for developing ventilator associated pneumonia. The ventilator bundle is being promoted to prevent adverse events in ventilated patients including ventilator-associated pneumonia (VAP).

Compliance with the Ventilator Bundle is defined as the percentage of intensive care patients on mechanical ventilation for whom all five of the elements of the Ventilator Bundle are documented on daily goals sheets and/or elsewhere in the medical record.

A cluster of four evidenced based safety measures that decrease the risk to patients of mechanical ventilation while in theintensive care unit. The elements of the bundle may include elevating the head of the patient's bed, administering medications to prevent deep venous thrombosis, administering medications to reduce the incidence of GI bleeding, andgiving the ventilated patient periodic intermissions from sedation.

IHI developed the concept of “bundles” to help health care providers more reliably deliver the best possible care for patients undergoing particular treatments with inherent risks. A bundle is a structured way of improving the processes of care and patient outcomes: a small, straightforward set of evidence-based practices- generally three to five - that, when performed collectively and reliably, have been proven to improve patient outcomes. The power of a bundle comes from the body of science behind it and the method of execution: with complete consistency. It’s not that the changes in a bundle are new; they’re well established best practices, but they’re

often not performed uniformly, making treatment unreliable, at times idiosyncratic. A bundle ties the changes together into a package of interventions that people know must be followed for every patient, every single time.

Need for the Study:

Beth Augustyn, 2007, Intensive care units have come to represent the most frequently identifiable source of nosocomial infection within hospital, with the infection rates and rate of antimicrobial resistance several fold greater than General hospital settings. VAP is considered the most common nosocomial infection in the intensive care unit (ICU) and is also a major threat to the recovery of patients receiving mechanical ventilation. According to The National Nosocomial Infection Surveillance Program the incidence of VAP is 7.6 cases per 1000 patient ventilator days. The number of VAP cases per 1000 ventilator days, is the standard measure for surveillance by the CDC and are outlined in CDC guidelines. The incidence of VAP ranges from 28-32% in patients receiving mechanical ventilation. The presence of VAP increases hospital stay by an average of 7–9 days per patient. The risk of VAP is highest early in the course of hospital stay, and is estimated to be 3%/day during the first 5 days of ventilation, 2%/day during days 5–10 of ventilation and 1%/day after this.

Muscudere, 2008, Hospital mortality of ventilated patients who developed VAP is 46% compared to 32% for ventilated patients who do not develop VAP. . In India it affects 9-27% of intubated patients and doubles the risk of mortality as compared with similar patients without VAP. It is estimated that the prevention of one VAP could result in a minimum cost saving of 14,000 per patient. The number of adult cases of VAP is estimated to be 4,000 per year, resulting in approximately 230 deaths, 17,000 ICU days and 46 million in healthcare costs. The most common

pathogens responsible for developing VAP were Staphylococcus Aureus, Streptococcus Pneumoniae, Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumonia, Hemophilus Influenzae and Acinetobacter species.

Sujatha Sistlaet, et.al, 2007, A prospective study was done to determine the incidence and the risk factors for development of VAP in critically ill adult patients admitted in different intensive care units (ICUs) of Jawaharlal Institute of Post-graduate Medical Education and Research (JIPMER), Pondicherry, India. All patients with mechanical ventilation within 48 hrs are included in this study. The incidence of VAP rate was 60.2%. In this study 58.3% of the cases were late-onset VAP, while 41.7% were early-onset VAP. Emergency intubation and intravenous sedatives were found to be the specific risk factors for early onset VAP, while tracheostomy and re-intubation were the independent predictors of late-onset VAP. The study concludes that knowledge of these risk factors may be useful in implementing simple and effective preventive measures including non-invasive ventilation, precaution during emergency intubation and minimizing the occurrence of reintubation will be helpful for the prevention of VAP.

Chandrakant C, et.al., 2009, A prospective study was conducted to find out the incidence of VAP and to identify the most prevalent pathogens causing VAP in ICU of Narayana Medical College and General Hospital, Nellore. The inclusion criteria include all the patients receiving mechanical ventilation within 24 hrs and VAP was identified by using CPIS. Out of the 100 patients studied, 29 were found to have VAP. Among these patients, 32% were reported to have hypertension, 29% were reported to have diabetes and 12% had both diabetes and hypertension. The study found that Gram negative organisms were predominant among the isolates accounting for 89%. The rest were found to be gram positive organisms. Among gram negative

organisms, Pseudomonas species, Klebsiella species and E.coli were responsible for highest number of VAP infection.

Joshy M Easow, 2011, VAP is always associated with increase in morbidity and mortality, hospital length of stay and costs. VAP can develop at any time during ventilation, but occurs more often in the first few days after intubation. This is because the intubation process itself contributes to the development of VAP. Although VAP has multiple risk factors, many nursing interventions can reduce the incidence of occurrence of VAP. The concept of ventilator bundle is based on the fact that delivering evidence-based interventions reliably and consistently will improve patient care. A bundle is a collection of several evidence-based practices which should be implemented together on a daily basis. The use of 'bundles' has grown in popularity throughout health care due to the quality improvement movement.

Lawrence P, 2008, Ventilator bundle prevent the occurrence of VAP through the implementation of simple, low cost preventive measures. The VAP prevention bundle is now become a central component of most critical care patient safety programme. The key components included in ventilator bundle are proper hand washing, head of bed elevation to 30° to 40°, peptic ulcer disease (PUD) prophylaxis, deep vein thrombosis (DVT) prophylaxis, daily ventilator weaning assessment, daily sedation vacation, maintaining the ET tube cuff pressure, oral care with chlorhexidine mouth wash, closed system suctioning & turning the patient at least every 3 hours. Interventions to prevent VAP begin at the time of intubation and should be continued until extubation.

Deven Juneja, et.al, 2011, An experimental study was conducted in Max Super Speciality Hospital, New Delhi to find out the effect of the ventilator bundle in reducing the risk of ventilator associated pneumonia. Inclusive criteria are all patients

admitted to intensive care for 48 hrs. A four-element ventilator bundle, consisting of head-of-bed elevation, oral chlorhexidine gel, sedation holds and a closed system suctioning was implemented. Compared to the pre intervention period, there was a significant reduction in ventilator- associated pneumonia in the post intervention period ($p < .001$). The study shows that rates of Methicillin-Resistant Staphylococcus Aureus has also decreased (10% to 3.6%; $p < .001$). The results shows that implementation of a ventilator-associated pneumonia prevention bundle was associated with a statistically significant reduction in ventilator-associated pneumonia.

(Dr. Saramma P, 2009, A Quasi experimental post assessment study was done in neuro surgical department of SCTIMST, Trivandrum for assessing the effectiveness of selective ventilator bundle in reducing the ventilator bundle among the mechanically ventilated patients. The selective interventions include alchoholic hand rub, semi- recumbent position, chlorhexidine mouth wash and maintaining the ET tube cuff pressure at 20 cm. The study reveals that the VAP rate was high in the control group (12.3%) than in the intervention group (3.1%). It was also observed that S.aureus, Klebsiella, Pseudomonas, E.Coli and Streptococci were the causative organisms. The study concludes that preventive protocols were effective in reducing the VAP among Neuro surgical patients.

Kirsten L, 2010, Nurses are the first line of defense in preventing the VAP. The researcher found that together with other health care providers, nurses play a key role in preventing VAP because, many of the interventions are part of routine nursing care. Prevention is better than cure is probably more appropriate as concerned to VAP because of the fact that it is a well preventable disease and a proper approach decreases the hospital stay, cost, morbidity and mortality.

Statement of the Problem:

A study to assess the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals, Erode.

Objectives:

1. To assess the ventilator associated pneumonia among patients on mechanical ventilator in experimental and control group.
2. To evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator in experimental group and control group.
3. To associate the post test score on prevention of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables in experimental and control group.

Operational Definitions:

Effectiveness:

It refers to statistically significant reduction in the occurrence of ventilator associated pneumonia by using the ventilator bundle.

Ventilator Bundle:

It is a package of evidence based interventions that include the elevation of patients' head of bed to 30 degree, changing the position of patient every 3 hourly and providing closed system suctioning.

Ventilator Associated Pneumonia:

A nosocomial pneumonia that develops at least 48 hours after initiation of mechanical ventilation.

Mechanical ventilator:

It is a machine for helping the patients to breathe, when they are unable to breathe sufficiently on their own.

Assumptions:

1. The patients on mechanical ventilator are more prone to get ventilator associated pneumonia because of accumulation of mucus secretion in the trachea.
2. Ventilator bundle may prevent the occurence of ventilator associated pneumonia among patients on mechanical ventilator.

Hypotheses:

H_1: There will be significant difference in post test score on prevention of ventilator associated pneumonia among patients on mechanical ventilator in experimental and control group at $p \leq 0.05$ level.

H_2: There will be significant association between post test score on prevention of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables in experimental group and control group at $p \leq 0.05$ level.

Delimitations:

1. The study is limited to patients on mechanical ventilator.
2. Data collection period is limited to 4 weeks.
3. Sample size is limited to 40.

Projected Outcome:

1. The study would help the nurses to understand the importance of prevention of ventilator associated pneumonia.

2. The study would provide an opportunity for the nurses to use the ventilator bundle in the ICUs for preventing ventilator associated pneumonia and improve the health status of the patients on mechanical ventilator.

Conceptual Frame Work:

Conceptual framework presents logically constructed concepts to provide general explanation of relationship between the concepts of research study. The present study is based on the concept of application of ventilator bundle to the patients on mechanical ventilator. The investigator adopted Widenbach's Helping Art Of Clinical Nursing Theory (1964). This theory has 3 steps which include:

Step – I: Identifying the need for help.

Step – II: Ministering the needed help

Step – III: Validating that the need for help was met.

This theory consists of 3 factors central purpose, prescription & realities.

Step –I: Identifying the need for help:

This involves determining the need for help. The investigator identified the need for preventing the ventilator associated pneumonia among mechanically ventilated patients.

Step – II: Ministering the needed help:

This refers to the provision of requiring helps for the identified need. It has 2 components:

1) Prescription
2) Realities

Prescription:

It involves the plan of care to achieve the purpose. This include the routine nursing care such as providing ventilator care including elevating the head of the bed

to 30 degree, changing the position of the patient every 3 hourly and providing closed system suctioning in experimental group.

Realities:

It refers to the factors that come into play in a situation involving nursing actions in the particular situation. It includes:

Agent:

The investigator is the agent.

Recipient:

Recipient is the patients on mechanical ventilator.

Goal:

Prevention of ventilator associated pneumonia.

Means & Activities:

Elevation of head of bed to 30 degree, changing the position of the patient every 3 hourly & closed system suctioning.

Framework:

Be Well Hospital & Erode Emergency & Critical care Hospital, Erode.

Step –III: Validating that the need for help was met:

It involves the evaluation of plan of care provided to the client. This is accomplished by means of posttest assessment of Ventilator Associated Pneumonia by Modified Clinical Pulmonary Infection Score.

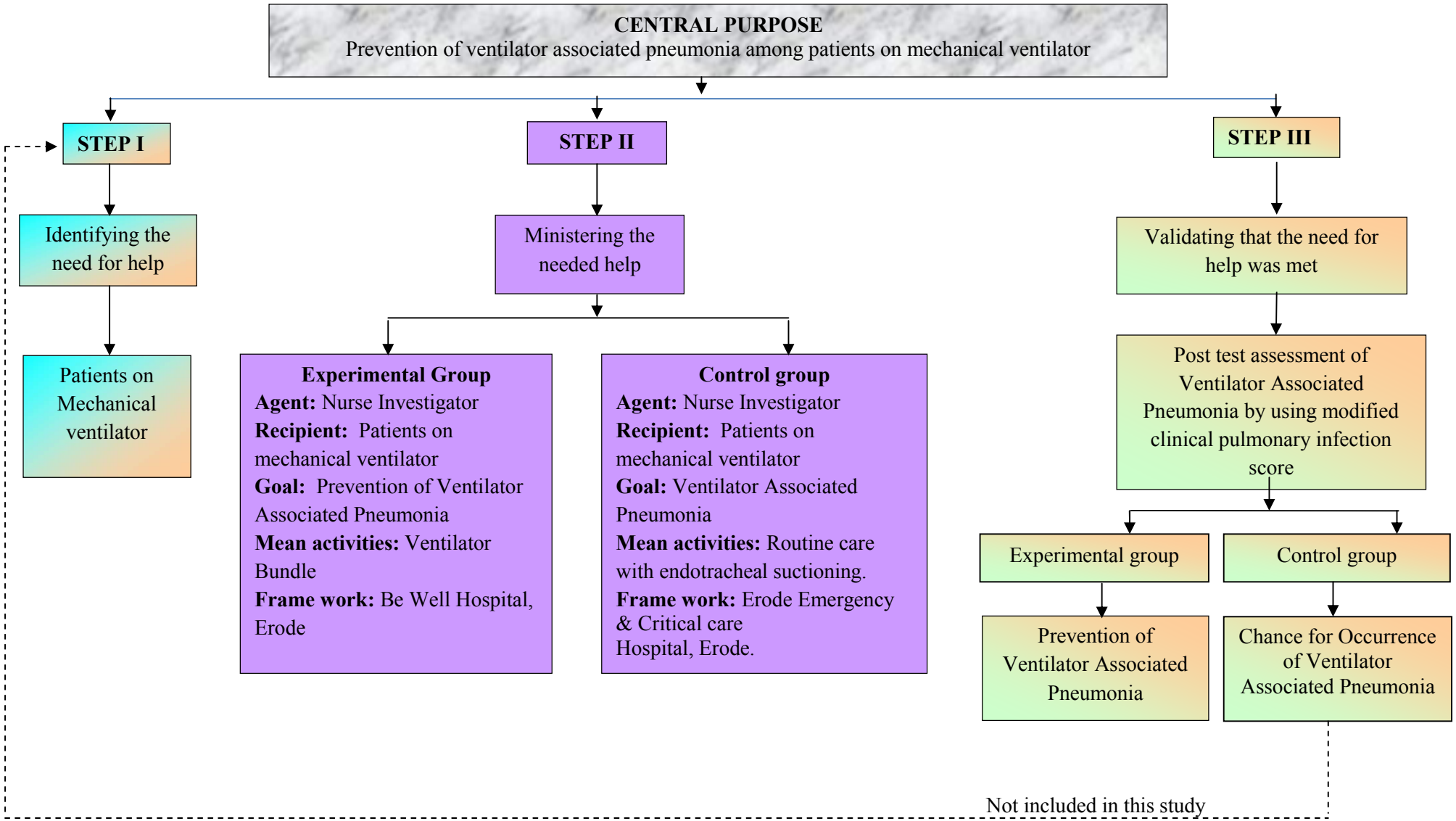


Figure-1.1: Conceptual Framework based on Widenbach's Helping Art of Clinical Nursing Theory (1964) Regarding Ventilator Bundle on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator

Summary:

This chapter dealt with introduction, need for the study, statement of the problem, objectives, operational definition, assumption, delimitation, projected outcomes and conceptual framework.

CHAPTER –II

REVIEW OF LITERATURE

CHAPTER - II

REVIEW OF LITERATURE

Review of literature is a summary of current theoretical and scientific knowledge and scientific knowledge about particular problem, which includes what is known and not known about the problem. **(H. M. Cooper, 1988)**

A literature review is a body of text that aims to review the critical points of knowledge on a particular topic of research. **(ANA, 2000)**

Review of literature is an essential step in research process. It is an account of what is already known about a particular phenomenon. It provides bases for further investigation, justify the need for study, throws light on the flexibility of study, reveals constraints of data collection and relates the findings from the study of another with a hope to establish a comprehensive study of scientific knowledge in a professional discipline, from which valid theories developed.

It also helps to lay the foundation for the study and also inspire new research ideas. Nursing research may be considered as a continuing process in which knowledge gained from earlier studies is an integral part of research in general. It assists on interpreting study findings and on developing implication and recommendation. It also provides a solid background for a research study.

Review of literature is related to,

1. Ventilator associated pneumonia.
2. Effectiveness of Ventilator bundle on prevention of Ventilator Associated Pneumonia.

1. Review related to ventilator associated pneumonia:

M.V.Pravin Charles, et.al, 2013, A prospective study was conducted at a tertiary care teaching hospital in Mahatma Gandhi Medical College and Research

Institute, Pondicherry for finding out the incidence and risk factors associated with VAP. Patients who were on mechanical ventilation (MV) were monitored at frequent intervals for development of VAP using clinical pulmonary infection score. The results showed that out of the 76 patients, 18 (23.7%) developed VAP during their ICU stay. The incidence of VAP was 53.25 per 1,000 ventilator days. About 94% of VAP cases occurred within the first week of MV. Early-onset and late-onset VAP was observed in 72.2% and 27.8% cases respectively. Pseudomonas aeruginosa (33.3%) was the most common organism isolated from VAP patients. It was followed by Klebsiella pneumoniae (20.8%), Staphylococcus aureus (8.3%), Candida albicans (8.3%), Escherichia coli (8.3%), and Acinetobacter baumannii (4.2%).

Yogesh Harde, et.al, 2013, A prospective study was done by Jawaharlal Institute of Post Graduate Medical Education and Research (JIPMER) Hospital in Pondicherry, to determine the incidence and the risk factors for development of VAP among mechanically ventilated patients. In this study the incidence of VAP was 30.67 and 15.87 in the two different ICUs and 58.3% of the cases were early -onset VAP, while 41.7% were late -onset VAP. The study identifies the risk factors for VAP include impaired consciousness, improper suctioning, tracheostomy, re-intubation, emergency intubation, and nasogastric tube feeding. The most common organism was Acinetobactor Baumanni, followed by Enterobacteracae. Early VAP was caused by Enterobacteracae and Acinetobactor causing late VAP. The study concluded that CPIS score can be a fairly good method to diagnose VAP in critically ill patients, when used reasonably and at the same time can help to restrict unnecessary antibiotic use.

Vishal B Shete, et. al, 2011, A retrospective study was done in BJ Medical College and Sassoon General Hospital, Pune, Maharashtra, to find out the incidence

of Acinetobacter infection in VAP cases, and to determine the antimicrobial susceptibility pattern of Acinetobacter. An incidence of 11.6% of Acinetobacter VAP cases was recorded. Various underlying conditions like head injury, cerebral hemorrhage and chronic obstructive pulmonary disease (COPD) were found to be associated with Acinetobacter VAP. The study concluded that Ventilator-Associated Pneumonia (VAP) is mainly due to the multi-drug resistant (MDR) bacterias mainly, Acinetobacter species which is one of the most dreadful complications, occurring in the critical care setting.

Asoka Gunaratne, et.al, 2010, A descriptive study was conducted in ICU of KLE'S Jawaharlal Nehru Medical College and Research Centre, Belgaum, Karnataka to ascertain the incidence of ventilator associated pneumonia in the intensive care unit. All patients, who were admitted to ICU and who stayed there for more than 48hrs were studied. Infections were identified on clinical parameters such as fever and on laboratory investigations such as full count, CRP and cultures. The study showed that out of 82 patients 68(82.9%) were ventilated and 26 of them had an underlying pathology related to an infection of VAP. A total of 20(29.4%) patients of this ventilated group subsequently developed a lower respiratory tract infection. The main nosocomial infection was ventilator associated pneumonia and had an incidence of 21.9%. The most prevalent organisms were mixed gram negative bacilli acinetobactor species. The study concluded that the nosocomial infections are a cause of increased mortality and morbidity in the intensive care unit.

Sílvio G Monteiro, et.al, 2010, An analytical descriptive prospective cohort study was performed in an ICU of GS Medical College and KEM Hospital, Parel, Mumbai. The aim of the study was to identify the clinical and epidemiological aspect associated with VAP, to develop the effective prophylactic and therapeutic strategies

aiming to decrease the incidence of VAP-associated mortality rates. The inclusion criteria are all patients hospitalized in the ICU with invasive mechanical ventilation of within 24 hrs. The data was analyzed from thirty-three patients admitted in the ICU. The study reveals that frequency of VAP was 26.2% in patients admitted to invasive mechanical ventilation for at least 48 hours, and death occurred in 78.8% of cases. The most commonly found bacteria were Pseudomonas aeruginosa, Acinetobacter spp*.,* and Enterobacteria *and* also found a frequency of 54.5% of multiresistant bacteria associated with VAP.

Thomas Roding, et. al, 2010, A randomized control study was conducted in an intensive care unit (ICU) of a tertiary care centre in CMC Hospital, Ludhiana. The aim of the study was to critically review the incidence and outcome, identify various risk factors and conclude specific measures that should be undertaken to prevent VAP. A total of 100 patients who were kept on mechanical ventilator were randomly selected. Cases included were patients of both sexes who were kept on mechanical ventilator for more than 48 h, having the age of >15 years. Patients who died or developed pneumonia within 48 h or those who were admitted with pneumonia at the time of admission and patients of ARDS (Acute Respiratory Distress Syndrome) were excluded from the study. The level of significance was set at $P<0.05$. It was found that 37 patients developed VAP. The Declining ratio of partial pressure to inspired fraction of oxygen (PaO_2/FiO_2 ratio) was found to be the earliest indicator of VAP. The most common organism isolated was Pseudomonas. The mortality of patients of the non-VAP group was found to be 41% while that of VAP patients was 54%.

Thomas Benet, et.al, 2009, A surveillance-based study was conducted in 11 ICUs of Lyon hospitals (France) to estimate early-onset VAP occurrence in ICUs within 48 hours after admission. The inclusion criteria were: 1) first ICU admission,

2) not admitted from hospital, 3) neither intubated nor tracheotomized at the time of ICU admission, 4) intubated or tracheotomized during the first 24 hours after ICU admission. Patients admitted from other wards or undergoing tracheal intubation or tracheotomy or antibiotics prior to ICU admission were excluded.VAP was defined according to the following: Chest X-rays exhibiting lung infiltrates; Temperature > 38°C or leukocyte count > 12,000/mm^3 or < 4,000/mm^3; low oxyhemoglobin saturation, or increased pulmonary oxygen consumption; A total of 175 patients were included in the surveillance in 11 ICUs over the study period. As a whole, 62 (45.2%) were newly hospitalized patients without immediate previous hospital stay, 69 (47.8%), and 92 (83.8%) were exposed to mechanical ventilation on the first day of ICU stay. A total of 35 (10.8%) patients developed VAP within the first 5 days of ICU stay.

Arindam Dev, et.al, 2009, A prospective study was done in Kasthurba Medical College, Manipal to assess the incidence of VAP caused by multidrug-resistant organisms in the multidisciplinary intensive care unit (MICU). The inclusion criteria were patients undergoing mechanical ventilation (MV) for >48 h. Endotracheal aspirates (ETA) were collected from patients with suspected VAP, and quantitative cultures were performed on all samples. VAP was diagnosed by the growth of pathogenic organism $\geq 10^5$ cfu/ml. The study found that most incidence of VAP was found to be 45.4% among the mechanically ventilated patients, out of which 47.7% had early-onset (<5 days MV) VAP and 52.3% had late-onset (>5 days MV) VAP. Multiresistant bacteria, mainly Acinetobacter spp. (47.9%) and Pseudomonas aeruginosa *(27%),* were commonly isolated pathogens in both types of VAP. The study concluded that high incidence (45.4%) of VAP and the potential multidrug-

resistant organisms are the real threat to the intensive care unit and also emphasize on use of antimicrobial therapy.

Panwar Raskshit, et.al, 2009, A prospective cohort study was conducted in medical critical care unit (CCU) of a tertiary-care teaching hospital of Sir J. J. Group of Government Hospitals, Mumbai, India. The study aims to identify the various risk factors and the common microbial flora associated with VAP. The VAP was diagnosed by using the clinical pulmonary infection score (CPIS). The study cohort comprised of 51 CCU patients with mechanical ventilation. All CCU patients requiring mechanical ventilation for more than 48 hrs were include in the study group. Results showed that 24 out of 51 cases developed VAP. They needed prolonged mechanical ventilation and had lower PaO2/FiO2 ratio as compared with the remaining patients who did not develop VAP. Pseudomonas aeroginosa was the commonest and most lethal organism. The study concludes that longer duration of mechanical ventilation and the need of reintubation are associated with proportionate rise in the incidence of VAP.

Yatin Mehta, et.al, 2006, A prospective study was conducted by Escorts Heart Institute and Research Centre, New Delhi to determine the incidence, risk factors, outcome, and pathogens of ventilator-associated pneumonia (VAP) in a cardiac surgical intensive care unit (ICU). The inclusion criteria were patients undergoing mechanical ventilation (MV) for >48 h. The participants are nine hundred fifty-two patients undergoing cardiac operations who received intermittent positive-pressure ventilation (IPPV). VAP was identified by using clinical pulmonary infection score. Of the 952 patients studied, 25 (2.6%) had VAP. Pseudomonas aeruginosa is the most common pathogen associated with VAP and the mortality is increased with VAP.

2. Review related to Effectiveness of Ventilator bundle on prevention of Ventilator Associated Pneumonia:

Rello J, et.al, 2013, A collaborative multi-centre cohort study was conducted in five Spanish adult intensive-care units. The aim of the study was the implementation of care bundles for prevention of ventilator-associated pneumonia (VAP) and its impact on patient outcomes requires validation with long-term follow-up. A care bundle approach based on five measures was implemented. There were 149 patients in the baseline period and 85 after the intervention. VAP incidence decreased from 15.5% (23/149) to 11.7% (104/885), after the intervention ($p < 0.05$). This reduction was significantly associated with hand hygiene, intra-cuff pressure control, oral hygiene and head elevation. The study documented a reduction of median ICU stay (from 10 to 6 days) and duration of mechanical ventilation (from 8 to 4 days) for patients with full bundle compliance (intervention period). The study concluded that the ventilator bundle was effective in preventing VAP among mechanically ventilated patients.

Bukhari.S.Z, et.al, 2012, A prospective longitudinal study was conducted on adult intensive care unit (ICU) patients at Hera General Hospital, Makah, Kingdom of Saudi Arabia. The aim of the study was to reduce ventilator associated pneumonia (VAP) incidence rate, lessen the cost of care, and correlate Ventilator bundle compliance with VAP incidence rate. VAP prevention bundle applied was: head-of-bed elevation; daily sedation-vacation along with a readiness-to-wean assessment; closed system suctioning; and deep venous thrombosis (DVT) prophylaxis. The results showed that the VAP incidence decreases from 26.3% to 10.2%. A significant correlation was found between the VAP rate and its bundle compliance ($p \leq 0.05$). Most frequent pathogens found were Pseudomonas aeruginosa (30.8% of all isolates)

followed by Acinetobacter baumannii (27.7%), and methicillin-resistant Staphylococcus aureus (15.4%). The study concludes that the application of VAP prevention bundle reduced the VAP incidence rate and lowered the cost of care.

Conway Morris, et.al, 2011, An experimental study was conducted in a180 bed, mixed medical–surgical teaching hospital intensive care unit, Scottish, Ireland. This study aimed to determine the effects of implementing the ventilator bundle for reducing the risk of ventilator associated pneumonia. Inclusive criteria are all patients admitted to intensive care for 48 hrs. A four-element ventilator-associated pneumonia prevention bundle, consisting of head-of-bed elevation, oral chlorhexidine gel, sedation holds, and a closed system suctioning were implemented. Compared to the pre intervention period, there was a significant reduction in ventilator- associated pneumonia in the post intervention period ($p < .001$). Rates of methicillin-resistant Staphylococcus aureus acquisition also decreased (10% to 3.6%; $p < .001$). The results shows that implementation of a ventilator-associated pneumonia prevention bundle was associated with a statistically significant reduction in ventilator-associated pneumonia.

Morris. A.C, et.al, 2011, A prospective study was conducted in mixed medical-surgical teaching hospital intensive care unit to determine the effects of implementing the ventilator bundle for controlling the effect of ventilator associated pneumonia on mechanically ventilated patients. The inclusion criteria were all patients admitted to intensive care within 48 hrs and present during the study period. A four-element ventilator-associated pneumonia prevention bundle, consisting of head-of-bed elevation, oral chlorhexidine gel, closed system suctioning and a weaning protocol were implemented. The study result showed that overall bundle compliance

rates were 70%. The study concluded that implementation of a ventilator bundle is effective in reducing the ventilator-associated pneumonia.

J. Divatia, 2010, A prospective cohort study was done on 162 adult patients with mechanical ventilation who were admitted to 17 ICUs in Tata Memorial Hospital in Mumbai. The aim of the study was to assess the effectiveness of ventilator bundle. The bundles included head of bed elevation to 30 degree, changing the position of patient every 3 hourly and use of chlorhexidine mouth wash. The results showed that the mean age of patients was 53.3 ± 17 years. Use of the care bundle was associated with a decreased risk for VAP of 0.78 (95% CI 0.15-0.99). The study documented a reduction of median ICU stay (from 10 to 6 days) and duration of mechanical ventilation (from 8 to 4 days) for patients with full bundle compliance (intervention period).The study concluded that ventilator bundle was effective in reducing ventilator associated pneumonia among mechanically ventilated patients.

Sangeet Narang, 2010, A retrospective observational study was done in Nizwa Hospital, Meerut for determining the effect of "ventilator bundle" in the prevention of ventilator associated pneumonia among mechanically ventilated patients. All the adult medical and surgical patients who were intubated and ventilated in MICU were included in the study. Patients who expired within 24 hrs of admission, who were transferred to tertiary care unit within 48hrs are excluded from the study. "Ventilator bundle "is a package of evidence -based interventions that include: (1) Elevation of patient's head of bed to 30- 45 degrees; (2) Daily sedation vacation and daily assessment of readiness to extubation; (3) Peptic ulcer prophylaxis; (4) turning the position of patient every 2hrly. The study showed that by introducing the concept of "ventilator bundle", significant reduction in VAP by 24.2% in the surgical patients and by 12% in the medical group.

Suresh Agarwal, et.al., 2009, A retrospective study was done in two SICUs at a tertiary care centre to examine the impact of adherence to a ventilator-associated pneumonia (VAP) bundle on the incidence of VAP in surgical intensive care units (SICUs). The inclusion criteria are ventilated patients admitted to SICU. The ventilator bundle intervention included head-of-bed elevation to 30 degree, extubation assessment, sedation break, closed system suctioning, and deep vein thrombosis prophylaxis. VAP was seen at a rate of 10.2 cases in non ventilator bundle group. The rate of VAP decreased to 3.4 cases in ventilator bundle group. The study concluded that initiation of the VAP bundle is associated with a significantly reduced incidence of VAP in patients in the SICU and with cost savings.

Gambez. P, et.al, 2008, A prospective randomized study was done on the Neurosurgery Intensive Care Unit of the Grenoble University France Hospital for comparing the ventilator-associated pneumonia (VAP) incidence rates in mechanically ventilated patients according to the type of endotracheal suctioning (closed versus open**).** One hundred four consecutive patients needing mechanical ventilation for more than 48 h were randomized into two groups. The inclusion criteria include all patients receiving mechanical ventilation for the first 48 hrs. In the Stericath group (S+, n = 50), patients were not disconnected from the ventilator during suctioning. The others were routinely managed (S-, n = 50). The study showed that the non-adjusted incidence rate of VAP was lower for S+ than for S- (7.32 versus 15.89, p = 0.07).). The study concluded that the use of Stericath reduced the incidence rate of VAP without demonstrating any adverse effect.

Inus Schulz, et.al, 2005, A prospective, open, epidemiological clinical study was performed in a surgical ICU of City Hospital Zehlendorf, Berlin, Germany. The aim of the study was to evaluate the effectiveness of ventilator bundle on prevention

of VAP. The data was collected by demographic data, duration of ventilator therapy, length of ICU stay and occurrence of VAP. The ventilator bundle includes head elevation of 30 degree, sedation break and closed system suctioning. The VAP was defined by using the Clinical Pulmonary Infection Score. Among 103 long-term ventilated patients, 49 (48%) developed VAP in control group when compared to the 23% in experimental group. The VAP was caused by Staphylococcus aureus in 38% of cases, followed by Pseudomonas aeruginosa in 10%, Haemophilus influenza in 10% and Klebsiella sp. in 9%.

Wang. JY, et.al, 2005, An experimental study was done to find out the effect of changing position on gas exchange and the incidence of ventilator-associated pneumonia (VAP) in mechanically ventilated patients in a medical intensive care unit (ICU). Thirty five mechanically ventilated patients in a medical ICU received position changing every 3 hourly for 4 days, while 35 control patients received routine positional change. Greater improvement in oxygenation index (the ratio of arterial partial pressure of oxygen to fraction of inspired oxygen) was noted in the patients who received 3 hourly ($p = 0.03$) position changing and also had lower VAP incidence ($p < 0.001$), and had shorter ICU stay ($p = 0.09$). The study concluded that mechanically ventilated patients in the medical ICU who received position changing had improved oxygenation and reduced incidence of VAP compared to controls.

CHAPTER - III

RESEARCH METHODOLOGY

CHAPTER - III

METHODOLOGY

The methodology of research indicates general pattern of organizing the procedure for gathering valid and reliable data for the purpose of investigation. **(Polit D. F Hungler, 2003)**

Methodology is a broader plan to conduct a study. It is the framework or guide used for the planning, implementation and analysis of a study. It includes the descriptions of the research approaches, dependant and independent variables, sampling design and a planned format for data collection, analysis and presentation.

Research Approach:

The research approach used for this study was quantitative evaluative approach.

Research Design:

Research design refers to the blue print for the conduct of the study that maximizes control over the factors that could interfere with the study's desired outcomes. **(Nancy Burns)**

The research design chosen for this study was quasi experimental post test only design. The design can be represented as,

$$\mathbf{E = X\ O_1}$$

$$\mathbf{C = O_2}$$

E Experimental group consisting of 20 patients on mechanical ventilator.

X Ventilator bundle for patients on mechanical ventilator.

$\mathbf{O_1}$ Post test assessment of ventilator associated pneumonia in experimental group.

C Control group consisting of 20 patients on mechanical ventilator.

$\mathbf{O_2}$ Post test assessment of ventilator associated pneumonia in control group.

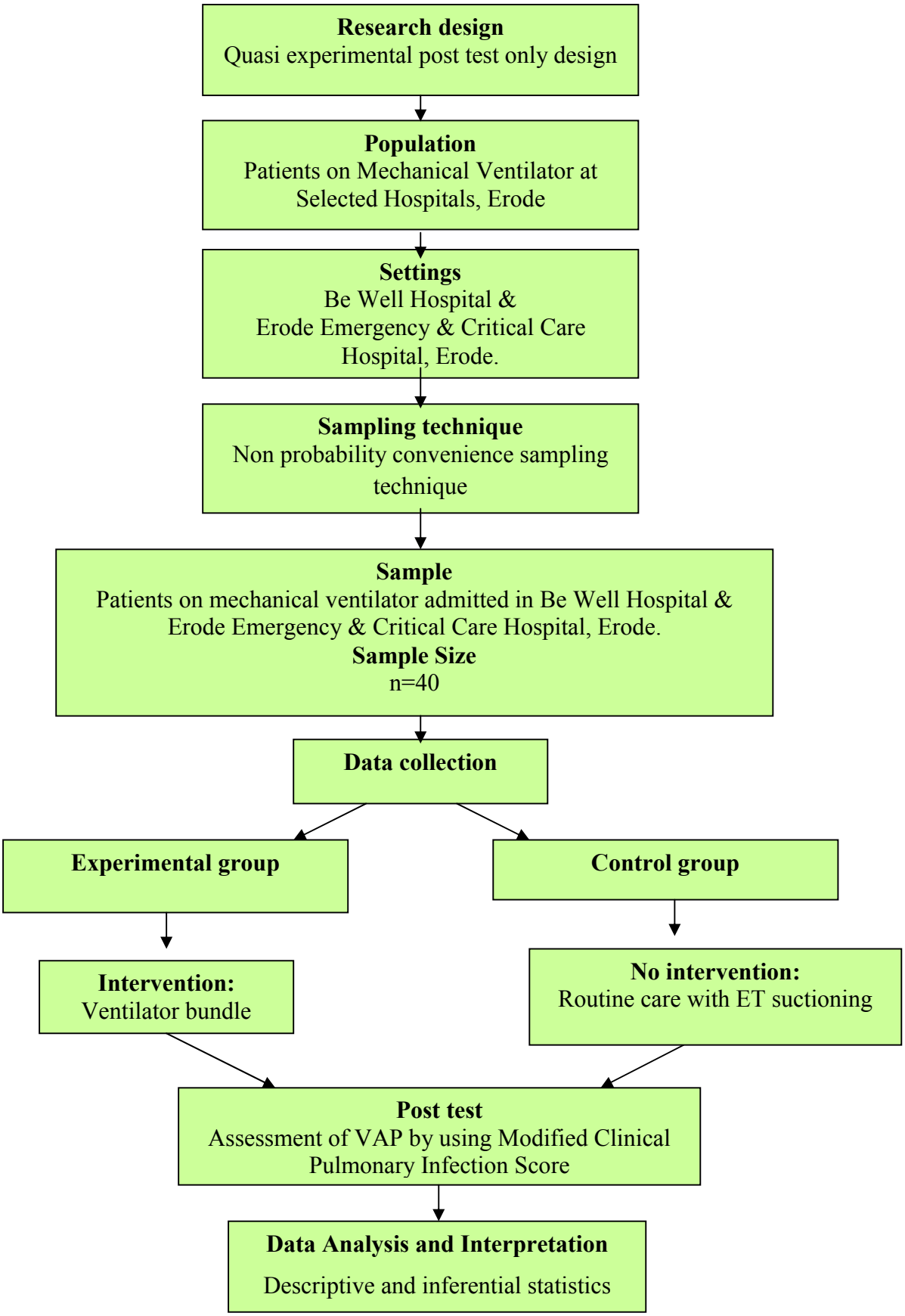


Figure-3.1: Schematic representation of research design

Population:

The population of the study comprises of patients on mechanical ventilator at selected hospitals, Erode.

Description of the Setting:

The study was carried out in Be Well Hospital and Erode Emergency & Critical Care Hospital, Erode. Be Well Hospital is equipped with 100 beds and it has various departments like ICU, NICU, TRAUMA Ward, Emergency Department and IMCU. Be Well Hospital is about 15 km away from Anbu College of nursing, Namakkal. The monthly census report of patient with mechanical ventilator in ICU is 40-50, whereas Erode Emergency & Critical Care Hospital is equipped with 100 bedded multi speciality hospital and it has various departments like Cardiac ICU, Emergency unit, Surgical ICU, NICU & Medical ICU. Erode Emergency & Critical Care Hospital is about 12 kms away from Anbu College of Nursing, Namakkal. The monthly census report of patient with mechanical ventilator in ICU is 22-30.

Sampling:

Sample:

The sample of this study comprises of patients on mechanical ventilator admitted in ICU at Be Well Hospital and Erode Emergency & Critical Care Hospital, Erode, during the study period and those who met the inclusion criteria.

Sample size:

Sample size of the study was 40 patients on mechanical ventilator. Among them 20 patients were selected to the experimental group from Be Well Hospital and 20 patients were selected to the control group from Erode Emergency & Critical Care Hospital.

Sampling Technique:

The investigator selected the samples by non probability convenience sampling technique. Among 40 patients on mechanical ventilator, 20 patients on mechanical ventilator from Be Well Hospital and 20 patients on mechanical ventilator from Erode Emergency & Critical Care Hospital were selected as the experimental and control group respectively.

The investigator selected these two hospitals by using non probability convenience sampling technique and also based on the availability of the sample and feasibility of the study.

Variables:

Independent Variable:

The independent variable of the study was ventilator bundle.

Dependent Variable:

The dependent variable was ventilator associated pneumonia.

Criteria for Sample Selection:

Inclusion Criteria:

- Patients with age group between 20 – 60 years.
- Patients who receive mechanical ventilation.
- Both male and female patients.

Exclusion Criteria:

- Patients after 24 hours of intubation.
- Patients already diagnosed with fever, pneumonia and acute respiratory distress syndrome.
- Patients with cervical and spinal cord injury.
- Patients already intubated from outside hospital.

Description of the Tool:

The tool was prepared by the investigator after an extensive study of the related literature and with the guidance of experts. The tool consists of two sections.

Section A: Demographic Variables:

This section consists of demographic variables like age, sex, reason for mechanical ventilator, frequency of suctioning, frequency of changing the position & history of smoking. The baseline data were collected by using semi structured interview schedule.

Section B: Modified Clinical Pulmonary Infection Score (CPIS) for Assessing Ventilator Associated Pneumonia:

The Clinical Pulmonary Infection Score has utility in both detecting the onset of ventilator associated pneumonia and also determining the sufficiency and adequacy of treatment. The diagnosis of ventilator associated pneumonia was generally based upon variations of the Clinical Pulmonary Infection Score originally developed by Pugin et al., in 1990.

Table – 3.1: Scoring Procedure Interpretation for Ventilator Associated Pneumonia:

Score	Interpretation
0	No infection
1 – 2	Mild infection
3 – 5	Severe infection

Validity and Reliability:

Validity:

The tool was validated by obtaining opinion from 1 medical experts and 3 nursing experts. Experts were requested to judge the tool for its content clarity, sequence and meaningfulness. Appropriate modifications were made according to the opinion of medical and nursing experts and tool was finalized.

Reliability:

The reliability of the tool was checked and established by using inter rater method r' = 1 which showed that the tool was reliable and considered for proceeding.

Pilot study:

Pilot study was conducted in 4 weeks at Be Well Hospital and Erode Emergency & Critical Care Hospital, Erode to find out the feasibility of the study. A formal permission was obtained from the managing directors of Be Well Hospital and Erode Emergency & Critical Care Hospital. It was conducted with the sample size of 6 patients on mechanical ventilator, 3 patients on mechanical ventilator from Be Well Hospital selected for experimental group and 3 patients on mechanical ventilator from Erode Emergency & Critical Care Hospital selected for control group. Ventilator bundle was provided for 3 days to the experimental group. Routine care with endotracheal suctioning was done to the control group. Post test assessment was done on the 4th day for both experimental group and control group by using modified Clinical Pulmonary Infection Score (CPIS). The collected data was analyzed by using descriptive and inferential statistics. The pilot study revealed that the study was feasible and practicable.

Method of Data Collection:

Ethical consideration:

Written permission was obtained from the managing directors of Be Well Hospital and Erode Emergency & Critical Care Hospital, Erode and verbal consent was obtained from the caregivers of the patients.

Data Collection Procedure:

The data was collected for a period of 4 weeks in Be Well Hospital and Erode Emergency & Critical Care Hospital, Erode, those who fulfilled the inclusion criteria. Out of 40 patients on mechanical ventilator, 20 patients were selected from Be Well Hospital as experimental group and 20 patients were selected from Erode Emergency & Critical Care Hospital to control group by using Non probability convenience sampling techniques. Immediately after Endotracheal Intubation, ventilator bundle was provided to the patient for 3 days to the experimental group. The ventilator bundle includes head elevation of 30 degree, closed system suctioning and changing the position of patient every 3 hourly. Routine care with endotracheal suctioning was done to the control group. Post test assessment was done on the 4th day for both experimental group and control group by using modified Clinical Pulmonary Infection Score (CPIS).

Plan for Data Analysis:

The data were analysed by using both descriptive and inferential statistics. The data related to demographic variables were analysed by using descriptive measures (frequency& percentage) and the ventilator associated pneumonia was analysed by using descriptive statistics (mean & standard deviation).The effectiveness of ventilator bundle on prevention of ventilator associated pneumonia were analysed by unpaired ‘t’ test. The association between ventilator associated pneumonia and demographic variables were analysed by using inferential statistics (chi-square test).

Summary:

This chapter dealt with the methodology of the study. It consists of research approach, design, population, setting, sampling, variables, and description of tool, validity, and reliability, method of data collection, pilot study and data analysis method.

CHAPTER - IV

DATA ANALYSIS & INTERPRETATION

CHAPTER – IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with analysis and interpretation of data collected to evaluate the effectiveness of Ventilator Bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator. The collected data was tabulated, organized and analysed by using descriptive and inferential statistics.

Section- A:

Distribution of patients according to their Demographic variables.

Section-B:

a. Distribution of patients according to the post test score on prevention of Ventilator Associated Pneumonia in Experimental group.
b. Distribution of patients according to post test score on prevention of Ventilator Associated Pneumonia in Control group.

Section-C:

a. Comparison of post test score on prevention of Ventilator Associated Pneumonia among patients on mechanical ventilator in experimental and control group.
b. Mean, Standard Deviation and Mean difference on prevention of Ventilator Associated Pneumonia among patients on mechanical ventilator in experimental & control group

Section-D:

a. Effectiveness of Ventilator bundle on prevention of Ventilator Associated Pneumonia among patients on mechanical ventilator in experimental group.
b. Association between prevention of Ventilator Associated Pneumonia among patients on mechanical ventilator in experimental & control group with their selected Demographic variables.

Section-A

Distribution of Patients according to their Demographic Variables.

Table-4.1:

Frequency and Percentage Distribution of Patients according to their demographic variables in Experimental and Control group.

n = 40

S. No	Demographic Variables	Experimental Group n = 20		Control Group n = 20	
		f	%	f	%
1.	**Age in years**				
	a) 20 – 30	6	30	2	10
	b) 31 – 40	5	25	4	20
	c) 41 – 50	4	20	7	35
	d) 51 – 60	5	25	7	35
2.	**Gender**				
	a) Male	14	70	15	75
	b) Female	6	30	5	25
3.	**Reason for mechanical ventilation**				
	a) CNS Disease	9	45	7	35
	b) Cardiac Disease	3	15	3	15
	c) Renal Disease	2	10	3	15
	d) Poisoning	5	25	3	15
	e) Others	1	5	4	20
4.	**Frequency of suctioning**				
	a) 2^{nd} hourly	12	60	6	30
	b) 3^{rd} hourly	8	40	8	40
	c) 4^{th} hourly	-	-	6	30
5.	**History of smoking**				
	a) Yes	10	50	11	55
	b) No	10	50	9	45

Table 4.1 shows the distribution of patients according to their demographic variables in experimental and control group. In experimental group 6(30%) and in control group 2(10%) patients are between the age group of 20 – 30 years. In experimental group 5(25%) and in control group 4(20%) patients are between the age group of 31 – 40 years. In experimental and control group, the patients between the age group of 41 – 50 years are 4 (20%) and 7(35%) respectively. In experimental group 5 (25%) patients and in control group 7(35%) patients are between the age group of 51 – 60 years. In experimental and control group 14(70%) and 15(75%) patients are males. 6(30%) patients in experimental and 5(25%) patients in control group are females.

In experimental and control group 9(45%) and 7(35%) patients are ventilated due to CNS Disease problems respectively. Both in experimental and control group 3(15%) patients are ventilated due to Cardiac Diseases. In experimental group 2(10%) and in control group 3(15%) patients are ventilated due to Renal disease. In experimental and control group, patients ventilated due to poisoning are 5(25%) and 3(15%) patients respectively. In experimental group 1(5%) and in control group 4(20%) patients are ventilated due to other diseases.

In experimental and control group 12(60%) and 6(30%) patients have undergone 2nd hourly suctioning respectively. Both in experimental and control group 8(40%) patients have undergone 3rd hourly suctioning. None of the patients in experimental group and 6(30%) patients in control group have undergone 4th hourly suctioning. In experimental group 10(50%) patients and in control group 11(55%) patients are having the history of smoking habit. In experimental group 10(50%) and in control group 9(45%) patients are not having the history of smoking habit .

Section- B

a) Distribution of patients according to Post Test Score on prevention of Ventilator Associated Pneumonia in Experimental group.

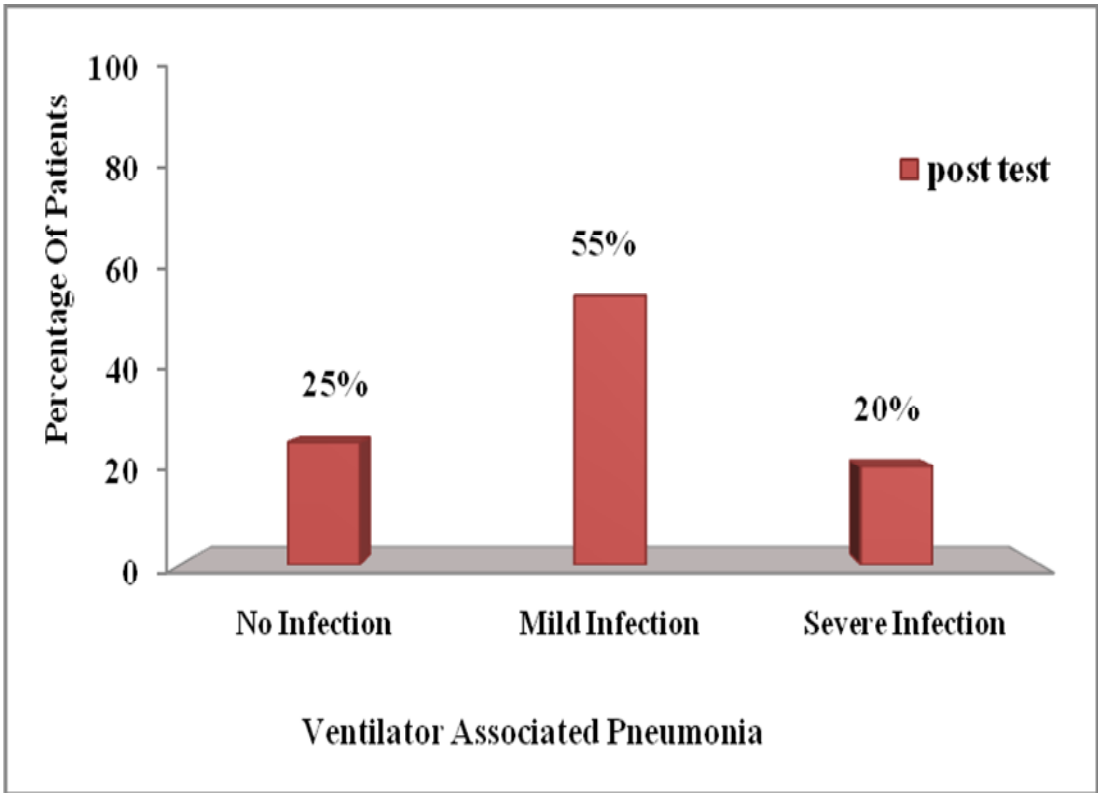


Figure-4.1: Percentage distribution of patients according to post test score on prevention of Ventilator Associated Pneumonia in Experimental group.

The above bar diagram shows that in experimental group 5(25%) patients on mechanical ventilator have no infection, 11(55%) patients on mechanical ventilator have mild infection and 4(20%) patients on mechanical ventilator have severe infection.

b) Distribution of patients according to Post Test Score on prevention of Ventilator Associated Pneumonia in Control group.

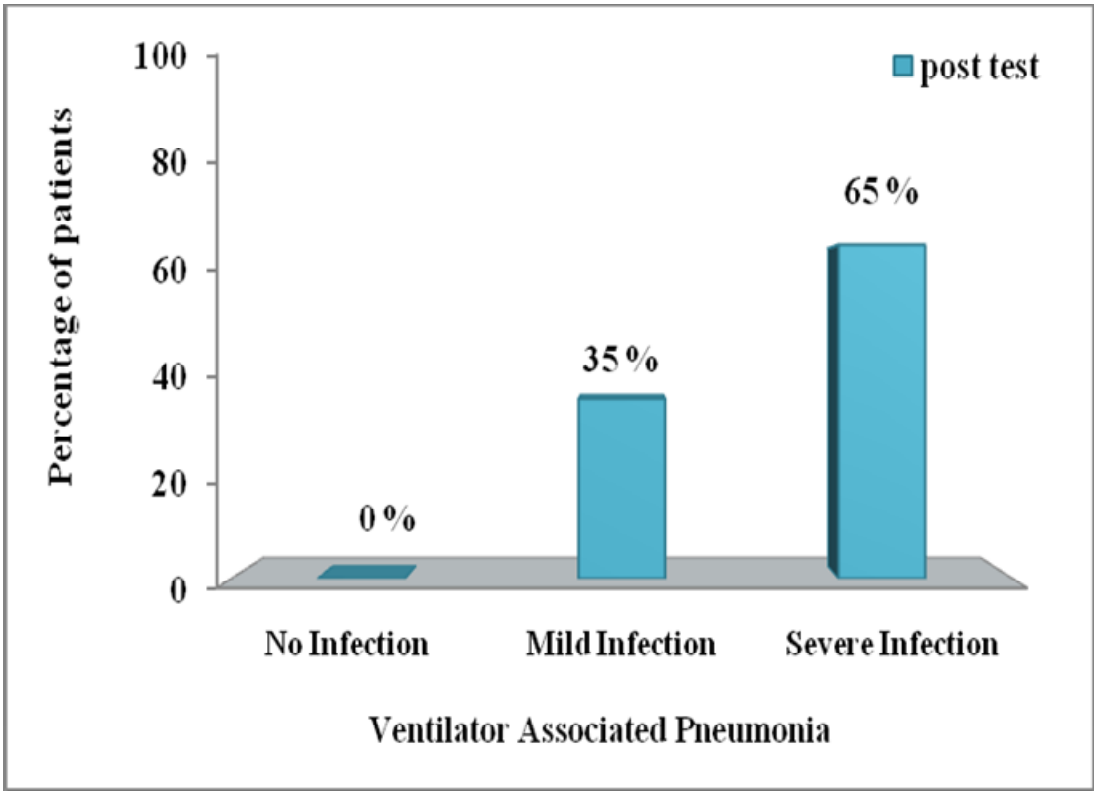


Figure-4.2: Percentage distribution of patients according to post test score on prevention of Ventilator Associated Pneumonia in Control group.

The above bar diagram shows that in control group 7(35%) patients on mechanical ventilator have mild infection and 13(65%) patients on mechanical ventilator have severe infection.

Section –C

c) Comparison of Post test Score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator in Experimental and Control group.

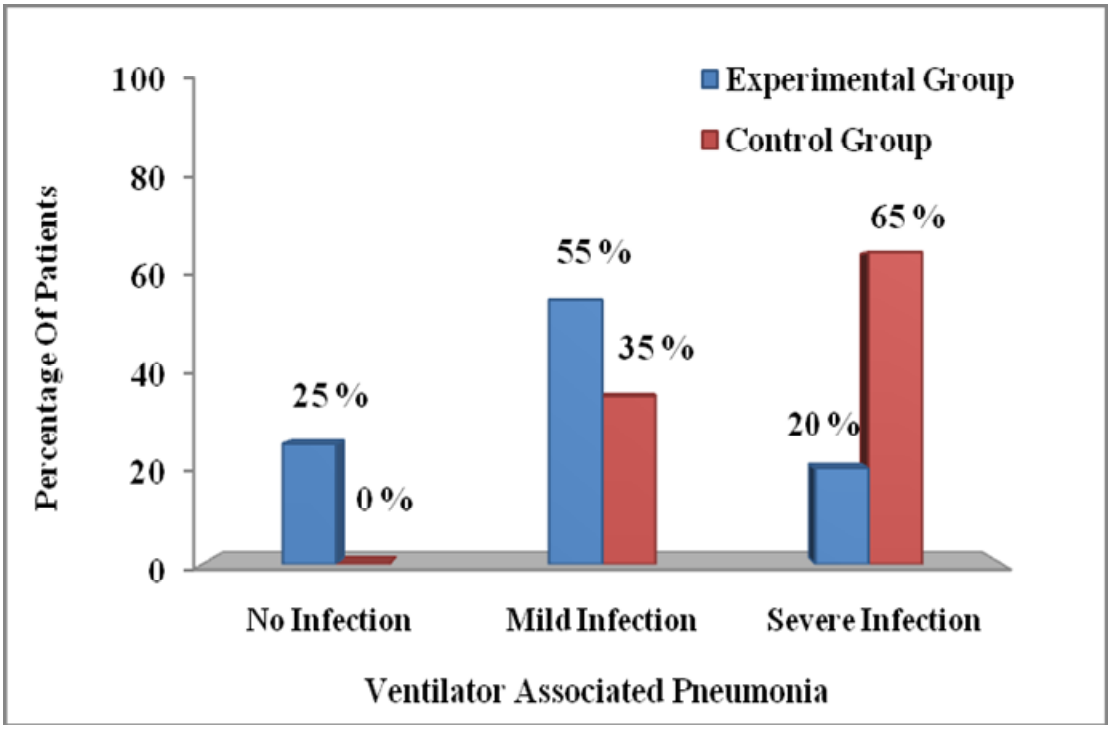


Fig -4.3: Percentage Distribution of Patients according to the Post test Score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator in Experimental and Control group.

The above bar diagram shows that 5(25%) of the patients on mechanical ventilator have no infection in experimental group. In experimental group 11 (55%) of the patients and in control group 7(35%) of the patients on mechanical ventilator have mild infection. In experimental group 4(20%) of the patients and in control group 13(65%) of the patients on mechanical ventilator have severe infection. It reveals that most of the patients in experimental group have mild infection and most of the patients in control group have severe infection.

Table-4.2:

Mean, Standard Deviation and Mean percentage of Post test Score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator in Experimental and Control group.

n = 40

Groups	Maximum Score	Post test			Difference in Mean%
		Mean	SD	Mean%	
Experimental group	5	1.7	1.04	28	31
Control group	5	2.95	1.76	59	

The above table 4.2 shows that in experimental group the post test mean score is 1.7±1.04 and the mean percentage is 28. In control group the post test mean score is 2.95±1.76 and mean percentage is 59. The difference in mean percentage is 31. The mean difference shows that, the ventilator bundle reduces the development of ventilator associated pneumonia in experimental group.

Section- D

Hypothesis testing

a) Effectiveness of Ventilator Bundle on prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator in Experimental Group.

Table-4.3:

Mean, Standard Deviation and 't' value on Post test Score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator in Experimental and Control group.

n= 40

Group	Mean	Standard Deviation	df	't' value	Table Value
Experimental group	1.7	1.04	38	5.20*	2.02
Control group	2.95	1.76			

***significant at p ≤ 0.05 level**

The above table 4.3 reveals that the mean score for experimental group is 1.7 ± 1.04 and the mean score for control group is 2.95± 1.76. The 't' value is 5.20 which is greater than the table value 2.02, significant at $p \leq 0.05$ level. Hence the research hypothesis H_1 is retained. Thus, it is evident that the ventilator bundle is effective in preventing the ventilator associated pneumonia among patients on mechanical ventilator.

b) Association between the Post Test Score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator and their Selected Demographic Variables in Experimental & Control group.

Table-4.4:

Chi square test on post test score on Prevention of Ventilator Associated Pneumonia among Patients on Mechanical Ventilator with their Demographic Variables in Experimental and Control group.

n = 40

S. No	Demographic variables	Experimental group n = 20			Control group n = 20		
		df	χ^2	Table value	df	χ^2	Table value
1.	Age in years	6	2.76	12.59	3	6.26	7.82
2.	Gender	2	1.9	5.99	1	.65	3.84
3	Reason for mechanical ventilation	8	4.07	15.51	4	3.46	9.49
4	Frequency of suctioning	2	4.06	5.99	2	4.43	5.99
5	History of smoking	2	1.2	5.99	1	.09	3.84

***Significant at p ≥ 0.05 level**

The above table 4.4 shows that there is no association in experimental and control group on prevention of ventilator associated pneumonia with their selected demographic variables such as age, sex, reason for mechanical ventilation, frequency of suctioning and history of smoking. Hence H_2 is rejected among patients on mechanical ventilator with their selected demographic variables at $p \geq 0.05$ level.

Summary:

This chapter deals with data analysis and interpretation in the form of statistical value based on the objectives, frequency and percentage distribution on prevention of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables. The 't' test is used to evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator. The chi- square test is used to find out the association between the post test score on prevention of ventilator associated pneumonia with their selected demographic variables. The result shows that ventilator bundle is effective in preventing ventilator associated pneumonia among patients on mechanical ventilator.

CHAPTER - V

DISCUSSION & SUMMARY

CHAPTER –V

DISCUSSION AND SUMMARY

Statement of the Problem:

A study to assess the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals, Erode was conducted by as a partial fulfillment of the requirements for the degree of Master of Science in Nursing at Anbu College of Nursing, Komarapalayam affiliated to the Tamilnadu Dr.M.G.R. Medical University, Chennai.

Objectives:

1. To assess the ventilator associated pneumonia among patients on mechanical ventilator in experimental and control group.
2. To evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator in experimental group and control group.
3. To associate the post test score on prevention of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables in experimental and control group.

Frequency and percentage distribution of patients according to their demographic variables in experimental and control group

The distribution of patients according to their demographic variables showed that in experimental group 6(30%) patients were between the age group of 20 – 30 years and in control group 7(35%) patients were between the age group of 51 – 60 years. Majority of the patients in experimental 14(70%) group and in control 15(75%) group were male. In experimental and control group 9(45%) and 7(35%) patients were ventilated due to CNS Disease problems respectively. Most of the patients had

undergone 2nd hourly suctioning in experimental group 12(60%) and in control group 8(40%) patients had undergone 3rd hourly suctioning. Half of the patients in experimental group 10(50%) and in control group 11(55%) had the history of smoking habit.

Objective-1: To assess the ventilator associated pneumonia in experimental and control group.

In experimental group 5(25%) patients had no infection, 11(55%) patients had mild infection and 4(20%) patients have severe infection. In control group 7(35%) patients had mild infection and 13(65%) patients had severe infection.

The present study was supported by **(Thomas Roding, et.al, 2010)** conducted a randomized control study in an intensive care unit (ICU) of a tertiary care centre in CMC Hospital, Ludhiana. The aim of the study was to critically review the incidence and outcome, identify various risk factors and conclude specific measures that should be undertaken to prevent VAP. A total of 100 patients who were kept on mechanical ventilator were randomly selected. Cases included were patients of both sexes who were kept on mechanical ventilator for more than 48 h, having the age of >15 years. It was found that 37 patients developed VAP. The Declining ratio of partial pressure to inspired fraction of oxygen (PaO_2/FiO_2 ratio) was found to be the earliest indicator of VAP. The most common organism isolated was Pseudomonas. The mortality of patients of the non-VAP group was found to be 41% while that of VAP patients was 54%.

Objective-2: Effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator.

In experimental group the post test mean score was 1.7±1.04 and the mean percentage was 28. In control group the post test mean score was 2.95±1.76 and mean

percentage was 59. The difference in mean percentage was 31. The 't' value was 5.20 which was greater than the table value 2.02, significant at $p \leq 0.05$ level. Hence the research hypothesis H_1 was retained. This showed that the ventilator bundle was effective in preventing the ventilator associated pneumonia among patients on mechanical ventilator.

The present study was supported by **Mandal A.K, (2011)** performed a randomized trial at Fortis Hospital, Punjab. Ventilator bundle approach was provided to 76 patients on mechanical ventilator in ICU for 3 days. The study showed that the post test assessment of ventilator associated pneumonia with clinical pulmonary infection score revealed, that there was a significant reduction in ventilator associated pneumonia in the experimental group (10%) than in control group (3.6%). The study shows that the implementation of ventilator bundle was effective in preventing the ventilator associated pneumonia.

The present study was supported by **Ravishankar M, et.al, (2010)** a prospective study was done in Institute of Medical Sciences & Teaching Hospital, Bidar, Karnataka. Ventilator bundle was implemented to the SICU patients. The rate of VAP was decreased to 3.4 cases in ventilator bundle group and VAP was seen at a rate of 10.2 cases in non ventilator bundle group. The study concluded that the initiation of the ventilator bundle was associated with a significantly reduced incidence of VAP in patients in the SICU.

Objective-3: Association of ventilator associated pneumonia among patients on mechanical ventilator with their selected demographic variables.

The present study finding revealed that, there was no association in experimental and control group on prevention of ventilator associated pneumonia with the selected demographic variables such as age, sex, reason for mechanical

ventilation, frequency of suctioning and history of smoking. Hence H_2 was rejected among patients on mechanical ventilator with their selected demographic variables at $p \geq 0.05$ level.

Summary:

The aim of this study was to evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator. A quasi experimental post test only study design was conducted in Be Well hospital and Erode Emergency & Critical Care Hospital, Erode, 40 patients were selected, according to the patients receiving mechanical ventilation immediately after intubation. Out of 40 patients on mechanical ventilator, 20 patients on mechanical ventilator were selected to experimental group and 20 patients on mechanical ventilator were selected to control group by using Non probability convenience sampling technique. Immediately after Endotracheal Intubation, ventilator bundle was provided for 3 days to the experimental group. The ventilator bundle includes head elevation of 30 degree, closed system suctioning and changing the position of patient every 3 hourly. Post test assessment was done on the 4th day to experimental group and control group by using modified Clinical Pulmonary Infection Score (CPIS).

The baseline data was tabulated by formulating frequency table. The ventilator associated pneumonia was analysed by using descriptive statistics. The effectiveness of ventilator bundle was evaluated by unpaired 't' test. The chi- square analysis was done to associate the ventilator associated pneumonia with their selected demographic variables.

Major findings of the study:

- In experimental group 6(30%) patients were between the age group of 20 – 30 years and in control group 7(35%) patients were between the age group of 51 – 60 years.
- Majority of the patients in experimental 14(70%) group and in control 15(75%) group were male.
- In experimental and control group 9(45%) and 7(35%) patients were ventilated due to CNS Disease problems respectively.
- Most of the patients had undergone 2^{nd} hourly suctioning in experimental group 12(60%) and in control group 8(40%) patients had undergone 3^{rd} hourly suctioning.
- Half of the patients in experimental group 10(50%) and in control group 11(55%) had the history of smoking habit.
- In experimental group 5(25%) patients had no infection, 11(55%) patients had mild infection and 4(20%) had severe infection. In control group 7(35%) had mild infection and 13(65%) patients had severe infection.
- In experimental group mean score was 1.7 ± 1.04 and in control group mean score was 2.95 ± 1.76, the mean percentage of experimental group was 28% and control group was 59%. The mean difference was 31.
- In experimental and control group the mean score was 1.7 ± 1.04 and 2.95 ± 1.76 respectively. The 't' value was 5.20 which is significant, at $p \leq 0.05$ level. Hence H_1 was retained. Thus, it become evident that ventilator bundle was effective in preventing the ventilator associated pneumonia.
- There was no association in experimental and control group on prevention of ventilator associated pneumonia with their selected demographic variables

such as age, sex, reason for mechanical ventilation, frequency of suctioning, and history of smoking. Hence H_2 was rejected among patients on mechanical ventilator with their selected demographic variables at $p \geq 0.05$ level.

Conclusion:

The study was done to evaluate the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals, Erode. The result of this study showed that ventilator bundle was effective in preventing the ventilator associated pneumonia among patients on mechanical ventilator in experimental group. There was no association found between the prevention of ventilator associated pneumonia with the selected demographic variables in experimental and control group. Hence research hypothesis H_2 was rejected at $p \geq 0.05$ level.

Implications:

The findings of the study have the following implications in the various areas of nursing service, nursing education, nursing administration and nursing research.

Nursing Service:

- The nurse should understand the importance of ventilator bundle for the prevention of ventilator associated pneumonia among patients on mechanical ventilator.
- The nurse should teach the other nurses about the benefits & importance of ventilator bundle in preventing the ventilator associated pneumonia among patients on mechanical ventilator.
- The nurse should be provided with adequate exposure to the settings where the ventilator bundle is effective in preventing the ventilator associated pneumonia.

- ❖ Nursing staff can be given specialized training in using closed system suctioning catheter for the prevention of ventilator associated pneumonia.

Nursing Education:

- ❖ The nurse educator should provide the concept about the ventilator bundle on prevention of ventilator associated pneumonia.
- ❖ Nursing curriculum needs to be updated to identify the aspects of nursing care that are lacking to provide supportive education on ventilator bundle for the prevention of ventilator associated pneumonia.
- ❖ The nurse educator should provide teaching regarding ventilator bundle to bring out innovative and creative ideas pertaining to the prevention of ventilator associated pneumonia.

Nursing Administration:

- ❖ Nurse administrator should arrange training programmes on ventilator bundle and closed system suctioning of endotracheal tube for the prevention of ventilator associated pneumonia.
- ❖ Nurse administrator should initiate education program for nurses regarding ventilator bundle for preventing the ventilator associated pneumonia.
- ❖ Nurse administrator should organize in service education programmes regarding various techniques for preventing the ventilator associated pneumonia.

Nursing Research:

- ❖ Disseminate the findings through conferences, seminar, and publications in professional, national and international journals.
- ❖ The researcher can encourage the use for ventilator bundle on preventing the ventilator associated pneumonia.
- ❖ The generalization of study result can be made by further replication of study.

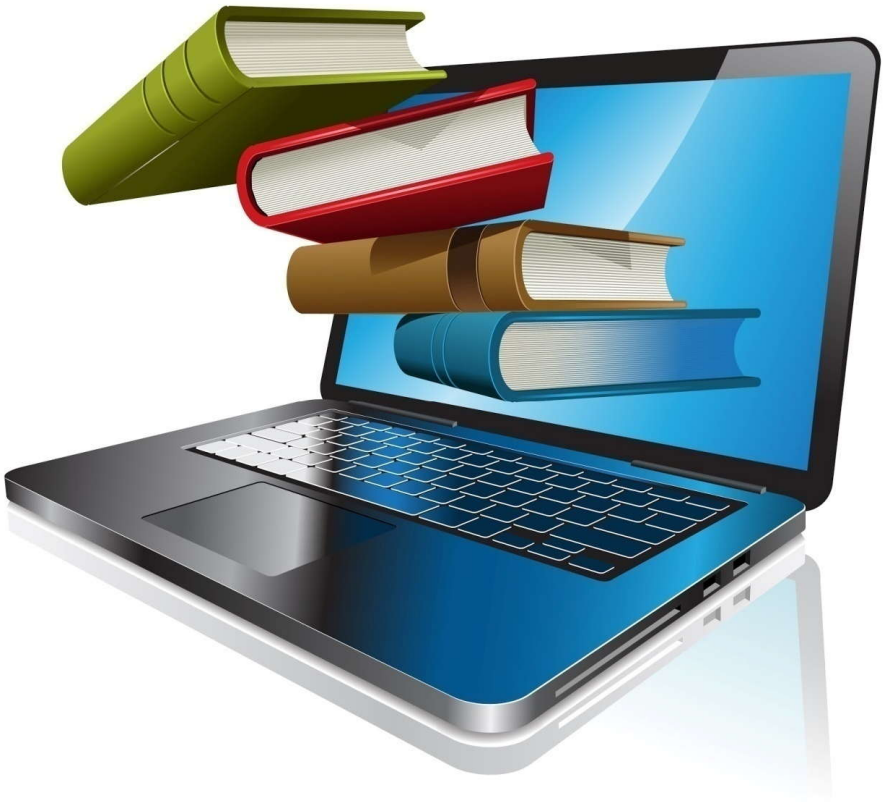
- ❖ As per the study a nursing care guide can be developed for future reference and the care of mechanically ventilated patients with ventilator bundle.
- ❖ The findings of the study can help to expand the scientific body of professional knowledge upon which further research can be conducted.

Recommendations:

- ❖ A similar study can be conducted with large group.
- ❖ A similar study can be conducted in various settings to identify the factors influencing ventilator associated pneumonia.
- ❖ A comparative study can be done to determine the effectiveness of closed suctioning system versus open suctioning system on preventing the ventilator associated pneumonia.
- ❖ A comparative study can be done to determine the effectiveness of closed system suctioning versus supraglottic suctioning of endotracheal tube on prevention of ventilator associated pneumonia.
- ❖ A comparative study can be done to determine the effectiveness of qualitative and quantitative aspiration of tracheal secretion on ventilator associated pneumonia.

Summary:

This chapter dealt with summary, conclusion, implications for nursing practice and recommendation.



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ANNEXURES

ANNEXURE - I

LETTER SEEKING PERMISSION TO CONDUCT A RESEARCH STUDY

ANBU COLLEGE OF NURSING

(G.O. Ms.No.220, Health & Family Welfare (PME) Dept. / 13.06.2007)

MGR Nagar, Pallipalayam Road,
KOMARAPALAYAM - 638 183.
Namakkal Dt., Tamilnadu, India.

✆ : 98427 17575, 04288 - 263181
Fax : 04288 - 263183
Website : www.anbu.ac.in ; E-mail : info@anbu.ac.in

Prof. K. Vijayalakshmi, M.Sc.(N),
Principal.

To
The Chief Medical Officer,
Head – Emergency and Critical Care,
Be Well Hospital,
#5 & 7, Gandhiji Road,
Erode 638001.
Erode.

Respected Sir,

Sub: Letter seeking permission for conducting the study – Regarding.

***

Mr. T. Kudiyarasu, is a **II Year M.Sc.(Nursing)** student of our college is planning to conduct a study to **"A study to assess the effectiveness of Ventilator Bundle on Prevention of Ventilator Associated Pneumonia among patients on Mechanical Ventilator at selected Hospital, Erode ".**

This study is undertaken as part of her research project to be submitted to The Tamil Nadu Dr. MGR Medical University at Chennai, in partial fulfillment of University requirement for the award of M.Sc.(Nursing) degree. I request you to kindly grant permission to conduct the study at your esteemed Hospital. I humbly request you to do the needful towards the same.

Thanking you,

Yours sincerely,

PRINCIPAL
ANBU COLLEGE OF NURSING
MGR NAGAR, PALLIPALAYAM ROAD
KOMARAPALAYAM 638 183
NAMAKKAL DISTRICT

Dr. S. SENTHILKUMARAN,
MD, DIP A & E, FCCM, FAIEM, PHD.
Chief of Medical Service,
Head Emergency & Critical Care,
Reg. 66817, BE WELL HOSPITAL,
No: 5 & 7, Gandhiji Road, ERODE - 1.

ANBU COLLEGE OF NURSING

(G.O. Ms.No.220, Health & Family Welfare (PME) Dept. / 13.06.2007)

MGR Nagar, Pallipalayam Road,
KOMARAPALAYAM - 638 183.
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✆ : 98427 17575, 04288 - 263181
Fax : 04288 - 263183
Website : www.anbu.ac.in ; E-mail : info@anbu.ac.in

Prof. K. Vijayalakshmi, M.Sc.(N),
Principal.

To
The Managing Director,
Erode Emergency & Critical Care Hospital,
Veerappampalayam,
Thindal PO)
Erode.

Respected Sir,

Sub: Letter seeking permission for conducting the study – Regarding.

***

Mr. T. Kudiyarasu, is a **II Year M.Sc.(Nursing)** student of our college is planning to conduct a study to **"A study to assess the effectiveness of Ventilator Bundle on Prevention of Ventilator Associated Pneumonia among patients on Mechanical Ventilator at selected Hospital, Erode ".**

This study is undertaken as part of her research project to be submitted to The Tamil Nadu Dr. MGR Medical University at Chennai, in partial fulfillment of University requirement for the award of M.Sc.(Nursing) degree. I request you to kindly grant permission to conduct the study at your esteemed Hospital. I humbly request you to do the needful towards the same.

Thanking you,

Dr. P. MUTHUKRISHNAN, MBBS., DA.
Managing Director,
Erode Emergency Care Hospital,
Veerappampalayam Main Road,
Thindal (PO), ERODE - 12.

Yours sincerely,

PRINCIPAL
ANBU COLLEGE OF NURSING
MGR NAGAR, PALLIPALAYAM ROAD
KOMARAPALAYAM 638 183
NAMAKKAL DISTRICT

ANNEXURE - II

LETTER REQUESTING OPINION AND SUGGESTION OF EXPERTS FOR

CONTENT VALIDITY OF THE RESEARCH TOOL

From

Mr.T.Kudiyarasu,
Reg No.301412902
II- Year M.Sc(N).,
Anbu College of Nursing,
Komarapalayam - 638183,
Namakkal District.

To,

_____

_____

Through

The Principal,
Anbu College of Nursing,
Komarapalayam – 638183,
Namakkal District.

Respected Sir/ Madam,

Sub: Requesting opinion and suggestions of experts for content validity- Reg.

I, Mr.T.Kudiyarasu, doing II Year M.Sc (Nursing) student of Anbu College of Nursing, Komarapalayam, Namakkal Et.

As a partial fulfillment of the requirement for the award of the Degree of Master of Science in Nursing under The Tamil Nadu Dr.MGR Medical University, Chennai. I have selected the following topic for research, "**A study to assess the effectiveness of ventilator bundle on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals, Erode"**

I herewith enclosed the tool for its content validity and I kindly request you to examine the tool and give your valuable opinion and suggestions.

Thanking you,

Place : Komarapalayam Yours sincerely,

Date :

Mr.T.Kudiyarasu

ANNEXURE - III

CONTENT VALIDITY CERTIFICATE

I hereby certify that I have validated the tool of Mr.T.Kudiyarasu, Reg.No.301412902, M.Sc(N)., student who is undertaking **"A STUDY TO ASSESS THE EFFECTIVENESS OF VENTILATOR BUNDLE ON PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AMONG PATIENTS ON MECHANICAL VENTILATOR AT SELECTED HOSPITALS, ERODE".**

Signature of the Expert:

Name:

Designation:

ANNEXURE –IV

TOOL

SECTION – A: DEMOGRAPHIC VARIABLES

Instructions:

The investigator will ask questions listed below and place the tick mark (✓) against the response

Name: **Patient IP No:**

Date: **Sample number:**

1. Age in Years **( )**

a) 20-30

b) 31-40

c) 41-50

d) 51- 60

2. Gender **( )**

a) Male

b) Female

3. Reason for mechanical ventilation **( )**

a) CNS disease

b) Respiratory disease

c) Cardiac disease

d) Renal disease

e) Poisoning / trauma

f) Others

4. Frequency of suctioning **( )**

a) 2nd hourly

b) 3rd hourly

c) 4th hourly

5. History of smoking **( )**

a) Yes

b) No

If yes a) No of cigarette per day …….

b) Duration of smoking (years) …….

SECTION - B

MODIFIED CLINICAL PULMONARY INFECTION SCORE (CPIS) OR PUGIN SCORE

Variables	Ranges	Score
Temperature (degree in Fahrenheit)	98.6 >99	**0** 1
Leukocytes mm^3	≥ 4000 & ≤ 11000 ≤ 4000 & ≥ 11000	0 1
PaO2/FiO2(mm Hg)	>240 < 240	0 1
Chest radiograph	No infiltration Localized/patchy infiltration	0 1
Tracheal aspirate culture	No growth ≥1 pathogenic bacteria	0 1

Scoring key

0	**No infection**
1 – 2	**Mild infection**
3 – 5	**Severe pneumonia**

VENTILATOR BUNDLE PROCEDURE

INTRODUCTION

Ventilator bundle is a package of evidence based interventions that include the elevation of patients' head of bed to 30 degree, changing the position of patient every 3 hourly and providing closed system suctioning. Ventilator bundle is an essential procedure for reducing the ventilator associated pneumonia among mechanically ventilated patients.

PURPOSES

- It prevents the aspiration of gastric contents into the lungs.
- It helps in drainage of pulmonary secretions.
- To reduce the incidence of ventilator associated pneumonia.
- It prevents the colonization of bacteria.
- To maintain a patent airway.
- To improve the gas exchange.

ARTICLES NEEDED FOR VENTILATOR BUNDLE

- Sterile gloves
- Closed Suction catheters (Stericath)
- Suction apparatus
- 10cc Syringe
- Face mask, goggles
- Sterile Normal Saline Solution

Patient Preparation

- Check doctor's order
- Explain the procedure to the patient (If patient is conscious).

- The patient should receive hyper oxygenation by the delivery of 100% oxygen for >30 seconds prior to the suctioning by increasing the FiO2 of mechanical ventilator.
- Auscultate the breath sounds.

PROCEDURE

- Perform hand washing.
- Elevate the head of bed to 30 degree.
- Turn on suction apparatus and set the vacuum regulator to a negative pressure of 100 mmHg.
- Wear clean gloves and mask.
- Connect tubing to closed suction port.
- Advance catheter through plastic sleeve halfway down to patient's endotracheal tube without applying suction, stop if resistance is met or the patient starts coughing**.**
- Place the dominant thumb over the control vent of the suction port; apply continuous or intermittent suction for not more than10 sec while withdrawing the catheter into the sterile sleeve of the closed suction device.
- Allow patients to rest 30 seconds between suction attempts and repeat steps as necessary to clear secretions.
- Withdraw suction catheter and clean it with sterile saline until clear; being careful not to instill solution into the ET tube.
- Provide right or left lateral position to the patient.
- Repeat the procedure after 3 hours.

AFTER CARE

- Remove gloves and replace the articles.
- Wash hands.
- Record the procedure.

ANNEXURE – V

LIST OF EXPERTS

1. **Dr.S.SENTHILKUMARAN, M.D., A & E.,**

   Chief of Medical Service,

   Head – Emergency and Critical Care,

   Be Well Hospital,

   Erode.

2. **Dr. Mrs.M.Latha, Ph.D(N).,**

   Principal,

   Department of Medical Surgical Nursing,

   Sakthi College of Nursing,

   Karur.

3. **Mr.Anbarasan, M.Sc(N).,**

   Professor,

   Karpaga Vinayaka College of Nursing,

   Pudukottai.

4. **Ms.Ramya Rosalind, M.Sc(N),**

   Asst. Professor,

   Karpaga Vinayaka College of Nursing,

   Pudukottai.

ANNEXURE – VI

PHOTOS