Review Article

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Effectiveness of Ventilator Bundle Care Checklist on Prevention of Ventilator Associated Pneumonia

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Abstract

Lung and breathing problems are common and 5th leading cause of death in worldwide. In India, the respiratory disorder stands in the 3rd place including COPD, asthma, pneumonia, tuberculosis 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, the most used mode of life support in medicine today, but it is not without complications. Physiologic complications associated with mechanical ventilation include ventilator induced lung injury, cardiovascular compromise, pneumothorax and the most importantly ventilator associated pneumonia.

Keywords: Ventilator Induced Lung Injury; Cardiovascular Compromise; Pneumothorax; Pneumonia.

INTRODUCTION

The fifth largest cause of death worldwide is lung and respiratory issues, which are frequent. In India, respiratory disorders such as COPD, asthma, pneumonia, and tuberculosis are ranked third. A patient needs more invasive treatment, such as intubation and mechanical ventilation, to survive if they are unable to maintain a patent airway, appropriate gas exchange, or both. The most common form of life support employed in modern medicine, mechanical ventilation is a technique to artificially support or replace spontaneous breathing, although it is not without risks. Pneumothorax, cardiovascular compromise, ventilator induced lung injury, and, most significantly, ventilator associated pneumonia is among the physiological side effects of mechanical ventilation.[1,2]

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Mechanical ventilator associated pneumonia (VAP) is a type of lung infection that occurs in individuals who are receiving mechanical ventilation in hospitals or other healthcare settings. It is a serious and potentially life-threatening condition that can develop when bacteria, viruses, or fungi enter the lungs through the ventilator system.[2]

When a person requires mechanical ventilation, a breathing tube is inserted into their airway, allowing the delivery of oxygen and the removal of carbon dioxide. This invasive procedure can disrupt the body's natural defence mechanisms and provide a pathway for bacteria or other pathogens to enter the lungs.[3]

Common risk factors for developing VAP include:

1. *Prolonged ventilation:* The longer a person remains on a ventilator, the higher the risk of developing VAP.
2. *Supine positioning:* Being in a lying position for an extended period can impair the clearance of secretions from the lungs, increasing the risk of infection.
3. Impaired cough and swallowing reflexes: Conditions such as sedation, neurological disorders, or trauma can weaken the ability to clear the airway effectively.
4. *Weakened immune system:* Patients with compromised immune systems are more susceptible to infections, including VAP.
5. *Prior antibiotic use:* Over use or in appropriate use of antibiotics can lead to the emergence of drug resistant bacteria, increasing the risk of VAP.[3,4,5]

Signs and symptoms of VAP may include:

1. Fever
2. Worsening or new-onset cough
3. Increased or purulent sputum production
4. Difficulty breathing or shortness of breath
5. Chest pain
6. Rapid heart rate
7. Changes in lung sounds on auscultation

Prevention measures for VAP are crucial and may include:

1. Strict hand hygiene for healthcare providers and visitors.
2. Regular oral hygiene and mouth care to reduce the risk of aspiration of oral bacteria.
3. Elevating the head of the bed between 30 to 45 degrees to prevent aspiration and improve lung function.
4. Daily "sedation vacations" to assess the patient's readiness for ventilator weaning.
5. Regular assessment of the need for continued mechanical ventilation to minimize the duration of ventilation.
6. Regular cleaning and maintenance of the ventilator equipment.

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 care checklist 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

Quantitative evaluative research methodology and a post-test only quasi-experimental research design were employed in this study. A total of 20 mechanically ventilated patients were chosen using non-probability convenience sampling approach. The samples were further assigned 10 in the experimental group and 10 in the control group. The experimental group receives the ventilator care along with their routine care, while control group receives only the prescribed routine care. A semi-structured interview schedule was used to acquire the data. Frequency, percentage, mean, and standard deviation are descriptive statistics. Chi-square test and unpaired T-test are inferential statistics.

RESULTS

Results showed that in the experimental group, 2 (20%) patients had severe illness during the post test, 5 (50%) patients had mild infection, and 3 (30%) patients did not acquire infection. In the control group, 6 (60%) patients had severe infections, compared to 4 (40%) patients with moderate infections. The post-test mean score for the experimental group was 1.71 and the post-test mean score for the control group was 2.88 and 1.56.

The average disparity was 26.

The estimated value of 5.18 was higher than the table value of 2.02, which at a p-value of 0.05 was considered significant. So, the research premise H1 was kept. There was no association between their chosen demographic characteristics and the prevention of ventilator associated pneumonia in the experimental or control group. This demons trates that the ventilator bundle care checklist was successful in shielding mechanical ventilator users against ventilator associated pneumonia.

DISCUSSION

Findings of the Study

- In experimental group 3 (30%) patients were between the age group of 20–30 years and in control group 4 (40%) patients were between the age group of 51–60 years.
- Majority of the patients in experimental 7 (70%) group and in control 8 (80%) group were male.
- In experimental and control group 5 (50%) and 3 (30%) patients were ventilated due to CNS Disease problems respectively.
- Most of the patients had undergone 2nd hourly suctioning in experimental group 6 (60%) and in control group 4 (40%) patients had undergone 3rd hourly suctioning.
- Half of the patients in experimental group 5 (50%) and in control group 6 (60%) had the history of smoking habit.
- In experimental group 2 (20%) patients had no infection, 6 (60%) patients had mild infection and 2 (20%) had severe infection. In control group 3 (30%) had mild infection and 7 (70%) patients had severe infection.
- In experimental group mean score was 1.6 ± 1.02 and in control group mean score was 2.85 ± 1.86, the mean percentage of experimental group was 33% and control group was 59%. The mean difference was 26.
- 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 H1 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 H2 was rejected among patients on mechanical ventilator with their selected demographic variables at $p \geq 0.05$ level.

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

Nursing Service

- The study will help to understand the importance of ventilator care for the prevention of ventilator associated pneumonia among patients on mechanical ventilator.
- The study will teach the other nurses about the benefits & importance of ventilator bundle care check list in preventing the ventilator associated pneumonia among patients on mechanical ventilator.
- The study will provide with adequate exposure to the settings where the ventilator bundle is effective in preventing the ventilator associated pneumonia.
- The study will emphasize on training in using closed system suctioning catheter for the prevention of ventilator associated pneumonia.

Nursing Education

- The nurse educator can use and provide the concept about the ventilator bundle on prevention of ventilator associated pneumonia.
- The study will help to explore the nursing curriculum, to be updated to implement 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 emphasize on innovative and creative ideas pertaining to the prevention of ventilator associated pneumonia.

Nursing Administration

- Nurse leaders should emphasize on training programmes on ventilator bundle and closed system suctioning of endotracheal tube

for the prevention of ventilator associated pneumonia.

- Nurse clinicians should initiate education program for nurses regarding ventilator bundle for preventing the ventilator associated pneumonia.
- Nursing experts should arrange in-service education programmes regarding various techniques for preventing the ventilator associated pneumonia.

Nursing Research

- Findings of the study can be used by the future nurse/health care researcher as baseline in order to conduct further interventional research.
- Based on the research, CNE classes can be scheduled at frequent intervals using the sources of the study.
- The study result can help in further replication of the topic.

CONCLUSION

The study was done to evaluate the effectiveness of ventilator bundle care checklist on prevention of ventilator associated pneumonia among patients on mechanical ventilator at selected hospitals. The findings of this study demonstrated that the ventilator bundle was successful in preventing ventilator associated pneumonia in the experimental group of patients using mechanical ventilation. The prevention of ventilator associated pneumonia and the chosen demographic factors in the experimental and control groups did not show any correlation.

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