

Implementation of The Ventilator Associated Pneumonia Bundle in the Intensive Care Unit

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ABSTRACT

Ventilator is a medical used to help patients to breath in the Intensive Care Unit (ICU). Patients with ventilator are at risk of experiencing Ventilator Associated Pneumonia (VAP). VAP is one of the Health Care Associated Infections. VAP contributes to the morbidity and mortality of patients treated in the ICU. One of the efforts to prevent and control VAP is to implement a VAP bundle. This study aims to describe the implementation of the VAP bundle in the ICU in July-September 2022. This type of research is descriptive analytic which describes the application of the VAP bundle in ICU, used purposive sampling with inclusion criteria of patients who had used a ventilator for more than 48 hours and did not experience pneumonia at the first time they were put on ventilator. The research sample obtained was 30 respondents. The results of the study showed that 50% of respondent were in the age range of 50-59 years old, 60% were female and 66.7% were a post-surgical patient. The implementation of hand hygiene was 86.7%, the implementation of head up 30-45 was 96.7%, the implementation of giving peptic ulcer disease prophylaxis was 93.3% and the implementation of giving deep vein thrombosis prophylaxis was 26.7%. VAP in July-September still occurs. The average VAP incidence rate in July-September 2022 is 2.53%. Conclusions and recommendations, the VAP bundle has been implemented in the ICU, progressing but not yet optimal, efforts to prevent VAP are needed.

Keywords: intensive care unit; VAP bundle; Ventilator

INTRODUCTION

The Intensive Care Unit (ICU) is a unit within a separate hospital that specifically treats critically ill patients who require intensive monitoring, especially patients with respiratory failure. ICU rooms are specially prepared with trained staff and special equipment for observation, treatment, and therapy. The ICU treatment room is equipped with equipment, including monitors, syringe pumps, infusion pumps, and ventilators, which will support the care of critical patients in the ICU (HIPERCCI, 2016).

A mechanical ventilator is one of the medical equipment that is often used in the ICU room. Patients who use mechanical ventilators are critically ill patients who need support in the respiratory system. Ventilator installation aims to maintain alveolar ventilation; help meets oxygen needs, help respiratory muscles, and eliminate or retain carbon dioxide. Data on patients using ventilators in the ICU room at Prof. Hospital. Dr. I.G.N.G. Ngoerah, in 2021, had a total of 700 patients. Using a ventilator has a positive side in helping the patient's breathing but has a risk of Ventilator-Associated Pneumonia (VAP) (Saodah, 2019).

Pneumonia is a disease of the lungs and respiratory system in which the alveoli become inflamed and fluid accumulates. Bacteria, viruses, fungi, or parasites can cause pneumonia. VAP is one of the healthcare-related infections or what we call Health Care-Associated Infections (HAIs), which contributes to the mortality of patients treated in the ICU room (PERDICI, 2013). Various attempts have been made to prevent and treat complications resulting from VAP, but the mortality rate due to VAP is still high, namely 16.2% to 74.1% (Kharel et al., 2021).

The incidence of VAP is not only caused by the use of a ventilator but is influenced by several factors. Several risk factors can increase the incidence of VAP, such as patient characteristics, duration of ventilator use, decreased consciousness, burns, comorbidities, use of antibiotics, invasive procedures, genetics, and implementation of preventive measures. Each factor does not stand alone but influences one another. By knowing some of the risk factors that cause VAP, it is hoped that it can predict the possibility of VAP occurring to increase preventive measures for VAP

(Wu et al., 2019). Various efforts have been made to control and prevent VAP, including implementing a VAP bundle. The VAP bundle is described as a group of evidence-based interventions that, when implemented, can prevent VAP (Idawaty et al., 2018). Implementation of the VAP bundle for the prevention and control of VAP is listed in the Regulation of the Minister of Health (Permenkes) Republic of Indonesia number 27 of 2017 concerning Guidelines and Infection Prevention which includes hand hygiene, bed position 30-45, oral hygiene, management of oropharyngeal and tracheal secretions, assessment of sedation every day, peptic ulcer prophylaxis and provision of Deep Vein Thrombosis (DVT) prophylaxis (Ramadhan, 2019).

Prof. Hospital. Dr. I.G.N.G. Ngoerah determined the incidence of VAP as an indicator of hospital quality. Data on the incidence of infection related to ventilator installation was obtained through surveillance activities carried out by the Infection Prevention Control Nurse (IPCN). Data was collected using surveillance forms and electronic data in the Hospital Management Information System (SIMRS). The data is then collected, analyzed, and reported to the hospital leadership for further follow-up improvements. The maximum standards are set in the quality indicators of the Committee for Infection Prevention and Control and Antimicrobial Control (PPI & PRA) Prof. Hospital. Dr. I.G.N.G. Ngoerah is 5.8‰ or 5.8 per 1000 days of ventilator use. The incidence of VAP in Prof. Hospital. Dr. I.G.N.G. Ngoerah, from month to month, varies. The incidence of VAP in 2019 was 2.21‰ or 33 events out of 9141 days of ventilator use. In 2020, it was 2.907‰ or 19 events out of 4956 days of ventilator use. In 2021, the number of VAP events was 2‰ or 15 out of 7480 days of ventilator use (Komite PPI dan PRA, 2021). Even though it did not exceed the set target, based on the data, VAP occurred almost every month. Based on VAP data, which fluctuates/ varies from month to month, there has been no similar research on the description of the application of the VAP bundle in the ICU.

METHOD

The research method used in this research is a descriptive-analytic research design that explains the description of the implementation of the VAP bundle. The population in this study were patients who were installed on a ventilator in the ICU and treated in July- September 2022. The sample in this study included all patients who had been installed on a ventilator and met the inclusion criteria, namely new patients who had used a ventilator for more than 48 hours. The samples excluded were patients who had been on a ventilator for less than 48 hours and patients who had experienced pneumonia at the start of being placed on a ventilator.

RESULT

This research was conducted in the ICU Room of Prof. Dr. I.G.N.G. Ngoerah Hospital during July-September 2022. The results of this study are presented in tabular form as follows.

Participant’s Characteristic

Table 1. Sample Characteristics Based on Age, Gender, and Disease Diagnosis (n=30)

Characteristics	Frequency (n)	Percentage (%)
Age		
0-19	4	13.3
20-29	5	16.6
30-39	3	10.0
40-49	3	10.0
50-59	15	50.0
Gender		
Male	12	40.0
Female	18	60.0
Disease Diagnosis		
Surgical	20	66.6
Non-surgical	10	33.3

Description of the VAP Bundle Implementation

The overall implementation of the VAP bundle on samples that are attached to a ventilator can be seen in the table below.

Table 2. Implementation of Hand Hygiene, Head Up, Oral Hygiene, Secret Management, Sedation and Extubating Assessment, Peptic Ulcer Disease Prophylaxis, and Administration of Anti-DVT (n=30)

Variable	Frequency (n)	Percentage (%)
Implementation of Hand Hygiene		
Performed	26	86.7
Not performed	4	13.3
Implementation of head up 30-45°		
Performed	29	96.0
Not performed	1	3.3
Implementation of oral hygiene		
Performed	30	100.0
Not performed	0	0.0
Implementation of secretion management		
Performed	30	100.0
Not performed	0	0.0
Implementation of sedation and extubating assessment		
Performed	30	100.0
Not performed	0	0.0
Implementation of giving peptic ulcer disease prophylaxis		
Given	28	93.3
Not Given	2	6.6
Implementation of administration of anti-DVT		
Given	8	26.7
Not Given	22	73.3

Table 3. VAP Incidence Rate

Month	Frequency (n)	Days of ventilator use	Incidence Rate (‰)
July	2	707	2.82
August	2	651	3.07
September	1	612	1.63
	5	1970	2.53

DISCUSSION

The result showed that most respondents were adult patients in the room used as the research location was an adult ICU. However, there were a small number of pediatric patients because these patients required dialysis services using a ventilator simultaneously, and this service was not yet available in the Pediatric Intensive Care Room Units (PICU). Most respondents were female and were surgical patients, and these patients were postoperative patients who required intensive monitoring after surgery. This differs from the statement that men use vehicles more and do extreme activities, so the possibility of illness and injury is higher (Putu et al., 2023).

Nurses must provide professional care by prioritizing patient safety (Rastiti et al., 2022). The application of standard precautions should be a key strategy for preventing the transmission of infectious agents between patients and healthcare workers. Hand hygiene is a routine part of caring for patients with mechanical ventilators. Hands must be cleaned properly using the basic ingredients of clean running water and liquid soap and with a 70% alcohol-based liquid if hands appear clean (Kemenkes, 2017). This study's results align with the results of the journal analysis, which found that hand hygiene can reduce the risk of VAP (Solikin et al., 2020).

Positioning can prevent aspiration in patients in the ICU. Patients with ventilators in the ICU will be given sedation so that secretions do not occur periodically. This condition will result in colonization of the oropharynx and stomach. The position of elevating the shoulders and head can prevent oropharyngeal and gastrointestinal aspiration (Sari, 2020). The result of this study is in line with the results of research where the semi-recumbent position is the position of elevating the

head of the mattress as high as 300. The semi-recumbent position is recommended for patients using mechanical ventilation to avoid VAP.

The result of this study is in line with research conducted in a meta-analysis of 13 literature involving 1533 patients regarding the effectiveness and safety of chlorhexidine for VAP prevention; it was shown that oral care using chlorhexidine solution can reduce the incidence of VAP (Dai et al., 2022). Oral hygiene was carried out in the ICU room of Prof. Hospital. Dr. I.G.N.G. Ngoerah used 0.2% chlorhexidine, which is in line with Weiyang Dai's research. This study also aligns with research results that chlorhexidine for oral care can prevent VAP events in one out of every 17 patients attached to a ventilator for more than 48 hours (Solikin et al., 2020).

Based on the observation results, it was found that the officers had carried out secretion management well. This is in line with research conducted by Sari (2020), where it was found that the results of secretion management were 100% carried out to prevent the accumulation of secretions in the endotracheal to prevent microaspiration of oropharyngeal secretions. Micro aspiration is a major risk factor for VAP (Febyan & Lardo, 2020).

An overview of the implementation of patient weaning by conducting a sedation assessment and training the patient to breathe spontaneously in patients with ventilators in the ICU room shows that the patient's weaning activities have been carried out properly. This weaning occurs when the patient meets the weaning criteria through a standardized protocol by repeatedly practicing spontaneous breathing trials, called spontaneous breathing trials (SBT) (Sarinti et al., 2016). Following are the criteria for patients who can be weaned: the patient is well alert, home dynamically stable (without using a vasopressor), nothing new can cause acute respiratory distress, minimal ventilation support and end-ventilation pressure, low FiO₂ and predictable can be given oxygen by mask or nasal after extubation (Sarinti et al., 2016).

The types of drugs used for peptic ulcer disease prophylaxis found in this study were proton pump inhibitors and Histamine-2 receptor blockers and were administered intravenously. This study's results align with a journal published by the Cleveland Clinic Journal of Medicine in 2022, which states that the indication for giving prophylaxis to peptic ulcer disease is in patients who receive ventilation with positive pressure for more than 48 hours. Although giving peptic ulcer prophylaxis does not reduce mortality, it can reduce the risk of gastrointestinal bleeding and does not increase the risk of developing pneumonia (Saeed et al., 2022).

The results showed that 22 respondents (66.7%) of patients treated were postoperative patients who still had a risk of bleeding. This is in line with Ejaz's view that anti-DVT administration is contraindicated in patients with active bleeding (Ejaz et al., 2018). The provision of anti-DVT is in line with the journal Intensive Care Med in 2022, which states that critical patients with ventilators in the ICU are at risk of thrombosis. The consensus stipulates using several forms of heparin as pharmacological prophylaxis when patients enter the ICU, but administration must be temporarily stopped in patients with active bleeding and severe thrombocytopenia (Helms et al., 2022).

CONCLUSION

Based on the research results conducted on patients attached to a ventilator in the ICU Room of Prof. Hospital. Dr. I.G.N.G. Ngoerah, in July-September 2022, an overview of the implementation of the VAP bundle was obtained from 30 respondents. Through univariant analysis, it can be concluded that the percentage of hand hygiene is 86.7%, the implementation of VAP bundle head up 30-45 is 96.7%, and the implementation of VAP bundle oral hygiene has been implemented 100% carried out. An overview of the implementation of the VAP bundle for sedation and extubation studies has been 100% carried out, the implementation of the VAP bundle for giving peptic ulcer disease prophylaxis was 93.3%, and the implementation of the VAP bundle for giving deep vein thrombosis prophylaxis was 26.7%. VAP in July-September still occurs. The average VAP incidence rate in July-September 2022 is 2.53‰.

Referring to the results of this study, the VAP bundle has been implemented in the ICU, and it is progressing but not yet optimal. It is necessary to increase the implementation of the VAP bundle, especially in the implementation of hand hygiene and the implementation of prophylactic DVT following the patient's clinical condition.

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