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Effect Application Bundle Vap and Installation Normal 0.9% on the Ventilator Associated Events Incidence in Icu RSUD Mardi Waluyo Hospital Blitar City

Anang Yoszaria[1*], Yenny Puspitasari[2], Agustin Widyowati[3]
[1,2,3] Universitas Strada Indonesia, Kediri, Indonesia
**Corresponding author: yoszaria@gmail.com*

ABSTRACT

Ventilator-Associated Events (VAE) is serious complications that often occur in patients with mechanical ventilation in Intensive Treatment Unit. VAE includes ventilator-associated condition (VAC), infection-related ventilator-associated complications (IVAC), and Possible Ventilator-Associated Pneumonia (PVAP), which can increase morbidity, mortality, length of treatment, and maintenance costs. VAE prevention efforts are focused on applying the ventilator maintenance bundles and additional interventions, normal saline 0.9% installation. This study aims to analyze effect VAP bundle application and normal saline 0.9% installation to VAE incidence in ICU RSUD Mardi Waluyo Blitar. Research method uses the quasi-experimental design with pretest-posttest with control group design. Research sample consists patients who use mechanical ventilator according to inclusion criteria, divided into control and intervention groups. Bundle VAP implemetation to VAC insidence (P= 0,317) and IVAC insidence (p = 0,083), normal salin instalation VAC (p = 0,083) and IVAC insidence (p = 0,001), result ordinal regression. p-value 0,002 for Bundle VAP implemetation and p = 0,121 for normal salin installation. Regression analysis shows that Bundle VAP is protective factor for VAE incidence, while saline installation has additional effect strengthens prevention. Conclusion this research confirms importance implementation VAP Bundle consistently as main strategy preventing VAE in ICU. Normal saline installation can considered additional and easily applied additional intervention. Clinical implications study are need strengthen hospital policy implementation VAP bundle and socialization use normal saline as part patient care protocol with mechanical ventilation.

Keywords: bundle ventilator assiate pnemonia, normal saline 0,9% installation intensive care unit, ventilator-associated event

BACKGROUND

Ventilator-associated events (VAE) remain a critical complication among patients receiving mechanical ventilation in intensive care units (ICU). VAE include ventilator-associated conditions (VAC), infection-related ventilator-associated complications (IVAC), and possible ventilator-associated pneumonia (PVAP), which significantly contribute to higher morbidity, mortality, prolonged hospital stays, and increased healthcare costs. Both international and national data show that the incidence of ventilator-associated pneumonia (VAP) remains high, while the implementation of VAP bundles in many hospitals, particularly in Indonesia, is still suboptimal.

This study aimed to analyze the effect of implementing a VAP prevention bundle and the instillation of 0.9% normal saline on the incidence of VAE in the ICU of Mardi Waluyo General Hospital, Blitar. The research background was based on the high prevalence of pneumonia in this ICU, alongside the limited evidence on compliance with VAP bundle implementation. Furthermore, the practice of instilling 0.9% normal saline before suctioning remains controversial due to its potential adverse effects, thus requiring further evaluation, particularly with aerosol administration methods.

METHODS

The study applied Quasy experimental with pretest-posttest nonequivalent group design. The research population consisted of all ICU patients requiring mechanical ventilation during July–August 2025. Eligible patients were divided into three groups: a control group (no additional intervention), an intervention group with VAP bundle implementation, and another intervention group receiving aerosolized 0.9% normal saline instillation prior to suctioning. The independent variables were VAP bundle implementation and normal saline instillation, while the dependent variable was the occurrence of VAE, measured through indicators such as PEEP, FiO_2, body temperature, and leukocyte count. Data analysis employed Wilcoxon tests and nominal regression.

RESULTS

Control	VAC		iVAC		VAE	
	Positive	Negative	Positive	Negative	Positive	Negative
Before	0	30	30	0	0	30
After	18	12	20	10	16	14
TOTAL	30		30		30	

Table 1 Cross Tabulation of Control Group with VAC and iVAC Incidents in the ICU Room of Mardi Waluyo Regional Hospital, Blitar City, July 1 – August 27, 2025

The cross-tabulation results in Table 1 show that all respondents in the control group before treatment experienced negative VAE, VAC, and iVAC. After treatment, there were 18 respondents with positive VAC and 20 respondents with iVAC, while the majority of VAE cases were positive, namely 16 respondents. This condition indicates that the treatment carried out on patients with mechanical ventilators so far in the ICU Room of Mardi Waluyo Regional Hospital, Blitar City has not been effective in preventing VAE.

Bundle VAP	VAC		iVAC		VAE	
	Positive	Negative	Positive	Negative	Positive	Negative
Before	1	29	0	30	0	30
After	4	26	3	27	3	27
TOTAL	30		30		30	

Table 2 Cross Tabulation of VAP Bundle Implementation Groups with VAC and iVAC Incidents in the ICU of Mardi Waluyo Regional Hospital, Blitar City, July 1 – August 27, 2025

The cross-tabulation results in Table 2 show that all respondents in the control group before the implementation of the VAP Bundle were negative for VAE, VAC, and iVAC. While after the implementation of the VAP Bundle, there were 4 respondents with positive VAC and 3 respondents with positive iVAC, while there were 4 respondents with positive VAE. Based on Table 4.14, there was a significant difference in the value of ventilator-

associated condition (P-value = 0.317) and infection-related ventilator-associated complication (P-value = 0.083) before and after the implementation of the VAP Bundle in patients with mechanical ventilators in the ICU room of Mardi Waluyo Regional Hospital, Blitar City. This shows that the implementation of the VAP Bundle in patients with mechanical ventilators is effective in preventing VAE events both before 48 hours, which is indicated by low VAC events, and can prevent VAE events in the next 48 hours, which is indicated by low subsequent iVAC events in the ICU room of Mardi Waluyo Regional Hospital, Blitar City.

Instalasion Normal Saline	**VAC**		**iVAC**		**VAE**	
	Positive	**Negative**	**Positive**	**Negative**	Positive	Negative
Before	0	30	2	28	0	30
After	4	26	23	7	11	19
TOTAL	30		30		30	

Table 3 Normal Saline Installation Groups with VAC and iVAC Incidences in the ICU of Mardi Waluyo Regional Hospital, Blitar City July 1 – August 27, 2025.

The cross-tabulation results in Table 4 show that all respondents in the control group before the installation of 0.9% Normal Saline were negative for VAE, VAC, and only 2 respondents were declared positive for iVAC. Meanwhile, after the installation of 0.9% Normal Saline, there were 4 respondents with positive VAC and 23 respondents with iVAC, while the majority of VAE cases were negative, namely 19 respondents. Based on Table 4.14, there was a significant difference in the value of ventilator-associated condition (P-value = 0.083) and infection-related ventilator-associated complication (P-value temperature = 0.000) before and after the installation of 0.9% normal saline aerosol in patients with mechanical ventilators in the ICU room of Mardi Waluyo Regional Hospital, Blitar City. These data indicate that 0.9% normal saline infusion before suctioning in patients on mechanical ventilators effectively prevented VAE events before 48 hours, as indicated by a low incidence of VAC. However, it was not effective in preventing VAE events in the subsequent 48 hours, as indicated by a high incidence of iVAC in the ICU of Mardi Waluyo Regional Hospital, Blitar City.

DISCUSSION

The implementation of the VAP Bundle had a significant protective effect on VAE events in the ICU of Mardi Waluyo Regional Hospital, Blitar City. The regression estimate of -1.253 with a p-value of 0.002 indicates that this intervention statistically reduced the risk of events, with a 95% confidence interval (CI) ranging from -2.047 to -0.459, which does not include zero. These findings strengthen the evidence that the implementation of the VAP bundle significantly contributes to the prevention of ventilator-associated events (VAE). The Wald value of 9.555 also indicates the strength of the variance contribution.

Normal saline installation showed a positive estimate of 0.655, which was statistically insignificant (p = 0.121) and had a CI range that included zero (-0.173 to 1.483). This indicates that the use of normal saline did not have a consistent effect on increasing or decreasing the incidence of ventilator-associated events (VAEs) in the studied population. Although this procedure is still frequently used clinically, these results indicate the need for further evaluation of its actual benefits, especially in the SOP care of patients on mechanical ventilators.

Application of VAP bundles affects the pathogenesis process of VAE, such as lowering the risk of aspiration, reducing bacterial colonization, and accelerating the weaning process. Therefore, the significant results of the VAP bundle in this study can be explained physiologically as a form of multifactor risk control. In contrast, saline only functions

temporarily in secretion dilution, so it does not sufficiently affect the overall pathogenesis of VAE. The results of this study are consistent with the study of Rosenthal et al. (2022) which reported that the implementation of the VAP bundle reduced the rate of ventilator-related infections by 40–60%. Meanwhile, studies related to saline have shown mixed results and most do not support their use as a routine intervention (Klompas et al., 2022). This study also supports the view that the VAP bundle should be a top priority in the prevention of VAE, while the normal installation of 0.9% saline has been shown to be effective in the prevention of VAE in the first 48 hours after the use of mechanical ventilators. This is in line with the findings of Torres et al. (2017) that VAE prevention requires a multifactorial approach, and VAP bundles have consistently been shown to be more effective than single interventions In addition, recent meta-analyses confirm that the application of bundles can significantly reduce ventilation duration and ICU stay duration, the application of VAP bundles contributes directly to a decrease in length of hospitalization, treatment costs, and ICU patient mortality rates (Torres et al., 2017). This is in line with the research of Wang et al. (2022) in (Klompas et al., 2022) which showed that hospitals with higher VAP bundle adherence experienced a significant decrease in mechanical ventilation duration and ICU stay length (Klompas et al., 2022). Normal installation of 0.9% saline was not able to have a similar impact. Based on the results of this study, it was only effective to use it for the first 48 hours after the use of mechanical ventilators. In some case reports, its use actually increases the risk of complications due to bacterial colonization and decreased oxygen saturation immediately after suction (AARC, 2017).

Therefore, this intervention is not recommended as a routine strategy in the prevention of VAE. Thus, this study confirms that the application of VAP bundles is the main protective factor against the incidence of VAE, while the normal installation of 0.9% saline while the normal installation of 0.9% saline has been shown to be effective in the prevention of VAE in the first 48 hours after the use of mechanical ventilators and cannot be used as a routine intervention in the prevention of complications in patients with mechanical ventilators. The clinical implications of the results of this study confirm that the application of VAP bundles should be the main strategy for the prevention of VAE, as it has been proven to be statistically significant in reducing the incidence of complications. Normal installation of 0.9% saline has been proven to be effective in preventing VAE in the first 48 hours after the use of mechanical ventilators and cannot be used as a routine intervention in preventing complications of patients with mechanical ventilators. This means that ICU resources should be more focused on improving compliance with bundle implementation rather than maintaining procedures that have not been proven effective. The leadership and management of the ICU of Mardi Waluyo Hospital, Blitar City, can be the basis for the results of this research in the formulation of nosocomial infection control policies. The application of VAP bundles in patients with mechanical ventilators, not onlyimprove service quality but also reduce costs due to long-term care caused by VAE. This is in line with the research of Wang et al. (2022) which stated that consistent implementation of VAP bundles is able to reduce ICU stay and total patient care costs. In addition, in planning health worker training. Nurses and ICU doctors of Mardi Waluyo Hospital, Blitar City must be given regular training related to VAP bundles, including aspects of monitoring, oral hygiene, sedation management, and ventilator weaning. The results of this study can be an entry point for further research by practitioners and academics to develop studies on the effectiveness of combining VAP bundles with other interventions, such as nutritional therapy, fluid control, or respiratory physiotherapy. Thus, VAE prevention strategies can be more comprehensive and in accordance with the clinical needs of ICU patients in general.

CONCLUSION

Based on the results of the study regarding the effect of the application of vap bundles and the normal installation of 0.9% copy on the incidence of ventilator associated events in the ICU room of Mardi Waluyo Hospital in Blitar, it can be concluded: 1. The application of the VAP bundle has been shown to be effective in significantly reducing the incidence of VAC and IVAC. The results of the Wilcoxon test showed that there was a significant difference between before and after the application of the VAP bundle to the incidence of VAC (P= 0.317) and IVAC (p = 0.083). This proves that there is no significant difference in the incidence of VAC and IVAC before and after the implementation of the VAP bundle, so that the application of the VAP bundle is effective in significantly reducing the incidence of VAE in patients in the ICU room of Mardi Waluyo Hospital, Blitar City. 2. The results of the Wilcoxon test showed that there was no significant difference in the incidence of VAC before and after normal installation of 0.9% copy (p = 0.083) and there was a significant difference in the incidence of I VAC before and after normal installation of 0.9% copy (p = 0.001). These results indicate that an additional strategy of normal use of saline can help prevent VAE before 48 hours and is not effective within 48 hours after the installation of a mechanical ventilator. 3. The application of the VAP Bundle has a significant protective effect on the incidence of VAE in the ICU of Mardi Waluyo Hospital, Blitar City. The estimated regression value of -1.253 with a p-value of 0.002 indicates that this intervention statistically lowers the risk of ventilator-associated events (VAE). On the other hand, saline installation with a positive estimate of 0.655 (p = 0.121) did not have a significant effect, so it could not be used as a sustainable prevention strategy.

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