THE ROLE OF ORGANIZATION AND RESOURCES IN IMPROVING THE IMPLEMENTATION OF VAP BUNDLES IN THE HOSPITAL (ICU) HEALTH SECTOR

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ABSTRACT

Background: Ventilator-Associated Pneumonia (VAP) is one of the most common hospital-acquired infections in Intensive Care Units (ICUs), significantly affecting morbidity, mortality, and healthcare costs. The implementation of VAP bundles, a set of evidence-based interventions, has been shown to reduce VAP incidence. However, the role of organizational support and resource management in the successful implementation of these bundles remains underexplored, **Objective**: This study aims to explore the role of organizational factors and resource availability in supporting the implementation of VAP bundles in healthcare settings, particularly in ICUs, **Methods**: A quantitative approach using a literature review methodology was employed in this study. Data were collected from 6 relevant articles published between 2019 and 2025, selected from an initial pool of 76 articles obtained through structured searches in Google Scholar, PubMed, Scopus, and ScienceDirect with Boolean keywords such as "Ventilator-Associated Pneumonia (VAP) bundle," "organizational readiness," "resource management in healthcare," "ICU," and "prevention bundle implementation," to identify factors affecting the success of VAP bundle implementation in ICUs, focusing on organizational support, resource allocation, and technology integration, **Results**: The study found that organizational readiness, including strong managerial support, clear policies, and continuous training, plays a crucial role in ensuring compliance with VAP protocols. Additionally, the availability of adequate resources, including medical equipment, trained personnel, and sufficient time, significantly enhances the effectiveness of VAP bundle implementation. The use of technology, such as electronic health records (EHR) and real-time performance monitoring systems, was also found to improve compliance and reduce VAP rates, **Conclusion**: Successful implementation of VAP bundles relies on the integration of organizational support, resource management, and technological innovation. Healthcare organizations must prioritize these factors to ensure effective prevention of VAP in ICUs.

Keywords: Ventilator-Associated Pneumonia, VAP bundles, ICU, organizational support, resource management, technology, healthcare systems.

Introduction

Applying the Ventilator-Associated Pneumonia (VAP) bundle in clinical practice has become an essential strategy to improve patient care outcomes in the intensive care unit (ICU). Ventilator-Associated Pneumonia (VAP) is a leading cause of morbidity and mortality among patients requiring mechanical ventilation, especially in the ICU. In this context, the VAP bundle, which consists of a series of evidence-based interventions such as oral care, endotracheal cuff pressure management, and elevating the head of the bed, is effective in reducing VAP incidence and improving patient care quality (Burja et al., 2017); . However, the effective implementation of the VAP bundle requires strong organizational support and proper resource management to ensure its success in hospital settings.

Implementing changes in healthcare organizations, such as the VAP bundle, is often hindered by several factors related to organizational readiness, workplace culture, and the allocation of available resources (Weiner, 2020). In many cases, the success of the VAP bundle implementation depends on the organization's readiness to adopt this change, which includes factors such as However, despite the valuable insights provided by these studies regarding the factors supporting VAP bundle implementation, many healthcare organizations still face significant challenges in applying this strategy. Key challenges include organizational culture barriers that do not support change, inadequate resources, and insufficient training for medical staff and nurses (Ladbrook Khaw, et al., 2019); Wyk Rispel, L. C., 2022). Therefore, it is crucial to understand in-depth how organizational and resource management can play a role in supporting the successful implementation of the VAP bundle in hospital environments.

This literature review is important because, despite the proven effectiveness of the VAP bundle in reducing VAP incidence in the ICU, its successful implementation still heavily depends on factors related to organizational readiness and resource management. Several studies have identified that VAP bundle implementation is often hindered by a lack of management support, organizational cultures that do not support change, and limitations in staff training and supervision (Giang, 2025; Maxwell Cole, D. A., 2019). By understanding the role of organizations and resources in supporting VAP bundle implementation, this research aims to contribute to the development of more effective strategies for VAP bundle implementation in hospitals.

Additionally, this literature review also has the potential to provide new insights into managerial support, staff training, and effective interprofessional communication (Randall Schults, J. A., & Cooke, M., 2019)(Weiner, 2020). Organizational readiness refers to the extent to which an organization is prepared to implement change initiatives, including in the context of applying the VAP bundle (Thomas & Dannapfel, P., 2022).

Organizational readiness in the context of implementing the VAP bundle includes several elements, including managerial quality, the organization’s commitment to change, and the presence of collaborative practices among healthcare professionals (Guerrero Williams et al., 2017; Lennon Bouamrane et al., 2022). Previous studies have shown that strong support from management and organizational leaders significantly influences staff commitment to change, which in turn contributes to the success of VAP bundle implementation in the ICU (Randall Schults, et al., 2019). Furthermore, literature also highlights the importance of interprofessional communication skills and cross-cultural training to support sustainable changes in clinical practice (Guerrero Williams, et al., 2017).

resource management in the healthcare sector, specifically in supporting the application of evidence-based interventions such as the VAP bundle. By identifying factors that influence the successful implementation of the VAP bundle, this research could offer recommendations for improving the efficiency and effectiveness of resource management in intensive care settings.

The main objective of this literature review is to understand the role of organizations and resources in supporting the implementation of the VAP bundle in the healthcare sector, particularly in hospitals and ICUs. This research will explore how managerial support, staff training, and resource allocation can influence the success of VAP bundle implementation. Furthermore, this study aims to identify the challenges faced by hospitals in implementing the VAP bundle and explore potential solutions to enhance the success rate of its implementation.

Based on the existing literature, the application of the VAP bundle in clinical practice has become a focal point in efforts to reduce ventilator-associated pneumonia incidence, a major health issue in the ICU (Burja Belec, et al., 2017; Niedzwiecka, et al., 2019) . Various studies have shown that applying this bundle can significantly reduce VAP incidence when there is high adherence to the established protocols (Rehmani Latif, et al., 2024; Triamvisit Srisomporn, W., & Wongsurakiat, P., 2021). However, the literature also indicates that the success of VAP bundle implementation heavily depends on organizational and resource-related factors, including managerial quality and staff involvement in the change process (Weiner, 2020; Randall Schults, et al., 2019).

This study fills the gap in the existing literature by focusing on the role of organizations and resource management in the context of VAP bundle implementation. Although many studies have examined the clinical effectiveness of the VAP bundle, few have researched how organizational factors and resources affect its successful implementation in hospitals (Guerrero Williams et al., 2017). Therefore, this study contributes to a more holistic understanding of the factors influencing the application of the VAP bundle in the healthcare sector.

Based on the above discussion, the research question for this study is: "What is the role of organizations and resources in supporting the implementation of the VAP bundle in the healthcare sector, particularly in hospitals and intensive care units?" This study will explore the various factors influencing VAP bundle implementation in hospitals, with a focus on organizational aspects and available resources.

Metods

This study uses a literature review methodology with three databases: Google Scholar, Scopus, and ScienceDirect. The search includes keywords adjusted according to Boolean operator standards. The keywords and Boolean operators (AND, OR, NOT) are used to ensure that the search results are relevant and specific to the research objectives. The keywords used include:

Table 1. Keywords

1.	"Ventilator-Associated Pneumonia"	AND	"bundle"	AND	"organizational support"	AND	"quantitative"
2.	"VAP"	AND	"protocol"	AND	"organization"	AND	"compliance"
3.	"hospital"	AND	"support"	AND	"VAP"	AND	"implementation"

4.	"ICU"	AND	"VAP"	AND	"leadership"	AND	"adherence"
5.	"resources"	AND	"VAP bundle"	AND	"healthcare"	AND	"study"

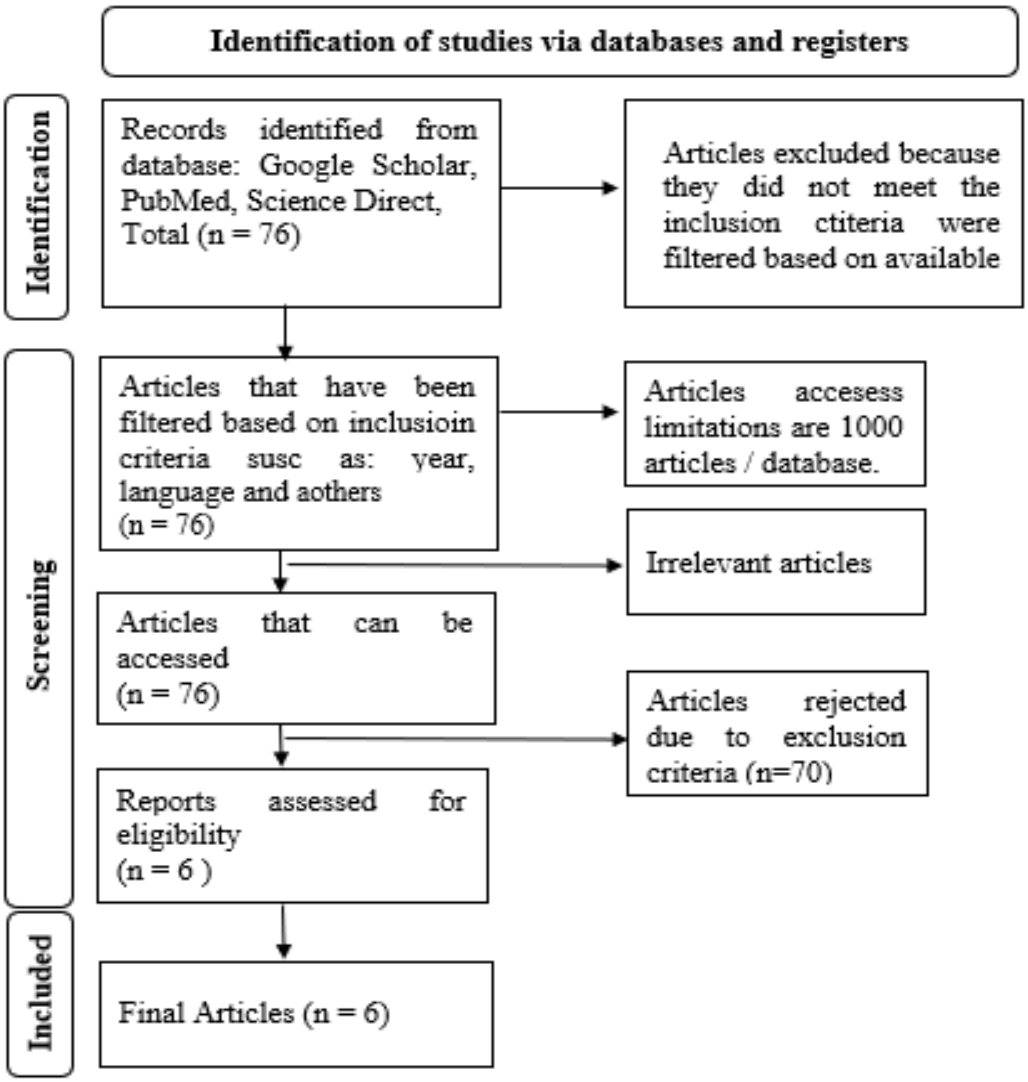
The above keywords are then combined with Boolean operator as follows: ("Ventilator-Associated Pneumonia") AND ("bundle") AND ("organizational support") AND ("quantitative"), ("VAP") AND ("protocol") AND ("organization") AND ("compliance"), ("hospital") AND ("support") AND ("VAP") AND ("implementation"), ("ICU") AND ("VAP") AND ("leadership") AND ("adherence"), ("resources") AND ("VAP bundle") AND ("healthcare") AND ("study").

In this literature review, only English keywords are used. The selection of articles is based on the inclusion and exclusion criteria that have been established, as shown in Table 2:

Table 2. Inclusion and Exclusion Criteria

No.	Inclusion Criteria	No.	Exclusion Criteria
1.	Articles published in international or national journals focusing on the implementation of the VAP bundle in the healthcare sector, particularly in the ICU.	1.	Articles not directly related to the implementation of the VAP bundle or those using a qualitative approach.
2.	Articles published in the last 10 years.	2.	Articles using qualitative research designs or case studies without quantitative data.
3.	Articles using quantitative designs to measure the effectiveness and factors influencing the implementation of the VAP bundle.	3.	Studies that do not involve the direct implementation of the VAP bundle.
4.	Studies focusing on hospital or ICU settings.	4.	Articles that do not meet validity and reliability standards.
5.	Articles meeting validity and reliability standards.		

Article quality assessment using Critical Appraisal Checklist. 4 stages used by researchers in completing articles that are adjusted to the PRISMA Flowchart (Figure 1).



Figur 1. PRISMA Flowchart

Result

Table 3. Article Analysis Results

NO	JUDUL	AUTHOR	HASIL
1.	A systematic scoping review of the cost-impact of ventilator-associated pneumonia (VAP) intervention bundles in intensive care Australia	Elyse Ladbrook, Damien Khaw, Stéphan Bouchoucha, Anastasia Hutchinson, Australia (2021)	The use of VAP intervention bundles can significantly reduce intensive care costs.
2.	Implementing paediatric appropriate use criteria for endotracheal suction to reduce complications in mechanically ventilated children with respiratory infections	Jessica A. Schults, Karina R. Charles, Jane Harnischfeger, Robert S. Ware, Ruth H. Royle, Joshua M. Byrnes, Debbie A. Long, Amanda J. Ullman, Sainath Raman, Michaela Waak, Anna Lake, Marie Cooke, Adam Irwin, Lyvonne Tume, Lisa Hall, Australia (2024)	Implementation of the PAWS guidelines was associated with a reduction in the use of inappropriate suction interventions.
3.	Incidence and related factors of catheter-associated bloodstream infection in neonates: A systematic review and meta-analysis	Yan Pang, Jinzhu Fu, Ying Tan, Lina Zhang, Li Bai, Miaomiao Yan, Huimin Li, Xin Wang, China (2024)	Factors influencing the risk of CABSI have been identified, with a significant incidence in mechanically ventilated neonates.
4.	A systematic review and critical appraisal of guidelines and their recommendations for sedation interruptions in adult mechanically ventilated patients	Nicole D. Graham, Ian D. Graham, Brandi Vanderspank-Wright, Melissa Demery Varin, Letitia Nadalin Penno, Canada (2023).	Sedation interruption is recommended to enhance patient recovery and reduce the duration of mechanical ventilation.
5.	Effectiveness of nonpharmacological interventions to prevent adverse events in the intensive care unit: A review of systematic reviews	Stefanie Suclupe, Percy Efrain Pantoja Bustillos, Javier Bracchiglione, Carolina Requeijo, Karla Salas-Gama, Ivan Solña, Angela Merchán-Galvis, Jaume Uya Muntaña, Gemma Robleda, Maria Jose Martinez-Zapata, Spanyol (2023).	Interventions such as subglottic drainage of secretions and semi-sitting positioning are effective in preventing ventilator-associated pneumonia.

6.	Technology-enabled performance monitoring in intensive care: An integrative literature review	Jacqueline DeMellow, Tae Youn Kim, Amerika Serikat,	The use of technology can improve adherence to evidence-based bundles in the ICU, with significant reductions in infections.

Discussion

The Role of Organization in the Implementation of the VAP Bundle

One of the main findings of this literature review is that organizational support plays a crucial role in the success of VAP bundle implementation. This finding aligns with the organizational readiness theory proposed by (Weiner, 2020), which emphasizes that an organization's readiness to implement changes, including evidence-based interventions, is a key factor in determining the success of any change within the healthcare system. As stated by (Randall Schults, et al., 2019)Strong managerial support and clear policies play a significant role in increasing staff commitment to change, including the implementation of the VAP bundle. This study found that hospitals with clear policies regarding the VAP bundle and active management support tend to have higher compliance with VAP protocols, which aligns with the findings of, who showed that supportive and consistent policies play a major role in the successful implementation of evidence-based protocols.

Furthermore, this finding supports the study by (Ladbrook et al., 2021), which states that organizational factors involving managerial commitment and adequate resource allocation have a significant impact on improving the implementation of the VAP bundle. In this study, hospitals that provided ongoing training and integrated VAP protocols into standard hospital operations showed better results in reducing VAP incidents. This indicates that the success of VAP bundle implementation depends not only on the existence of protocols but also on how well the organization supports the implementation of these protocols through binding policies and intensive training.

Resources Supporting VAP Bundle Implementation

The availability of hospital resources has also proven to be a factor that significantly affects the effectiveness of VAP bundle implementation. This study found that hospitals with adequate resources, such as appropriate medical equipment and sufficient time to perform preventive procedures, tend to succeed in reducing VAP incidents. This aligns with the resource-based view (RBV) theory developed by (Barney, 1991), which states that unique and valuable resources in an organization can provide a competitive advantage that differentiates the organization from others. In the context of hospitals, adequate resources such as appropriate medical equipment, trained personnel, and sufficient time are essential to ensure that all elements of the VAP bundle can be consistently applied.

The findings in this literature review also reinforce the study by (Thoonsen et al., 2024), which shows that time and resource constraints in the ICU can hinder the full implementation of VAP protocols. This study found that hospitals with efficient resource management and clear priorities for infection prevention, such as VAP, have higher success rates in

implementing the VAP bundle. This suggests that although the existing guidelines and protocols have been proven effective, without adequate resource support, the success of implementation will be hindered.

Technology Supporting VAP Bundle Implementation

Another significant finding in this literature review is the importance of technology in supporting compliance with VAP bundle implementation. This study found that hospitals that utilize information technology to monitor performance and provide real-time feedback to medical teams show improved compliance with VAP protocols. This finding aligns with the study by (DeMellow & Kim, 2018), which showed that using technology for performance monitoring in the ICU can enhance compliance with evidence-based protocols and reduce infection rates. Technologies such as electronic health records (EHR) and monitoring dashboards that provide real-time feedback to medical teams have proven to increase the efficiency and effectiveness of VAP bundle implementation.

Another relevant study by (Ladbrook et al., 2023) states that technology can facilitate the monitoring of compliance with various steps in the VAP bundle and provide clearer insights into elements that require more attention. Therefore, this study's findings support the conclusion that technology plays a crucial role in enhancing the effectiveness of VAP bundle implementation, particularly in collecting accurate data and providing quick feedback.

Barriers to VAP Bundle Implementation

However, despite various organizational and resource factors supporting the implementation of the VAP bundle, this study also identified several barriers that can reduce the effectiveness of VAP protocol implementation. These barriers include lack of management support, time and resource constraints, and mismatches between existing guidelines and local conditions. This finding is consistent with research by (Ladbrook et al., 2023) and (Thoonsen et al., 2024), which shows that factors such as organizational culture not supporting change, lack of adequate training, and discrepancies between guidelines and local conditions can delay the effective implementation of evidence-based protocols. Therefore, healthcare organizations need to make adjustments that fit the local context and provide ongoing training for medical staff to overcome these barriers.

This literature review contributes significantly to understanding the role of organization and resources in the implementation of the VAP bundle. The findings, which highlight the importance of organizational and managerial support, as well as the availability of sufficient resources, provide new insights into developing more effective implementation strategies for VAP prevention in ICUs. Moreover, this study also strengthens the evidence that technology plays a crucial role in improving compliance with evidence-based protocols, which can help reduce VAP incidents in hospitals.

This literature review reinforces the existing understanding of VAP bundle implementation and highlights key factors that support its success. Therefore, hospitals and healthcare organizations need to focus on strengthening organizational support, resource management, and leveraging technology to ensure the successful implementation of the VAP bundle and reduce VAP incidents in ICUs.

Conclusion

The implementation of the VAP bundle in ICUs can be successful if supported by strong organizational factors, adequate resources, and the use of technology. Solid managerial support, clear policies, and ongoing training play crucial roles in ensuring compliance with VAP protocols.

Additionally, the availability of resources, including medical equipment and trained personnel, significantly enhances the effectiveness of the VAP bundle. The use of technologies such as electronic health records (EHR) and real-time performance monitoring systems can also improve compliance and reduce VAP incidents. The main barriers to implementing the VAP bundle include time and resource constraints and the mismatch of guidelines with local conditions, which need to be addressed with more structured and ongoing support.

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