



Adherence Towards Ventilator Associated Pneumonia Guidelines of Nurses Working in Critical Care

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Abstract: Ventilator-associated pneumonia (VAP) is a significant cause of morbidity and mortality in critically ill patients. Nurses' adherence to VAP prevention guidelines plays a critical role in reducing the incidence of this infection. However, various institutional and personal barriers can impact compliance rates in clinical settings. **Objective:** To assess the adherence of critical care unit (CCU) nurses to ventilator-associated pneumonia (VAP) guidelines and identify factors influencing this adherence. **Methods:** A cross-sectional study was conducted in the Critical Care Department of Medicare Hospital, Multan, from January 2024 to January 2025. A total of 100 nurses working in the ICU and CCU departments were included in this study, which employed convenience sampling. Data were collected using a structured questionnaire consisting of three parts: demographic information, VAP guideline adherence (scored on a validated scale), and perceived barriers to compliance. Statistical analysis was performed using SPSS version 25. Mean adherence scores were compared across different variables using appropriate statistical tests, with a significance level set at $p < 0.05$. **Results:** The mean adherence score was 28.9 ± 4.04 (range: 17–34). Among the participants, 25% demonstrated good compliance, 30% satisfactory compliance, and 45% poor compliance with VAP guidelines. Significant barriers identified included staff shortage (70%), forgetfulness (65%), cost-control policies (60%), outdated education (44%), and fear of poor patient outcomes (42%). Nurses managing more than 20 ICU beds had adherence scores 8.0 points higher than those working fewer than 10 beds ($p < 0.001$). Additionally, nurses with prior education on VAP guidelines scored 0.8 points higher than their counterparts. **Conclusion:** Adherence to VAP guidelines among ICU nurses is suboptimal, with a significant proportion demonstrating poor compliance. Higher adherence was associated with more enormous ICU responsibilities and prior education on VAP. Institutional policies aimed at improving staffing levels and ongoing VAP education may enhance compliance and improve patient outcomes.

Keywords: Nurses, Nursing, Pneumonia, Ventilator

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Introduction

Chronically ill patients treated in the ICU are often intubated or connected to a ventilator to ease their pain. However, a common complication of being on a ventilator for 48 hours or more is ventilator-associated pneumonia, which is characterised as a parenchymal lung infection (1). The rate of VAP ranges from 1.1 to 7.4 episodes per 1,000 ventilated days in developed countries and 14.7 episodes in developing countries (2). In Asia, 13% of patients on ventilators develop VAP with an average of 15.1 episodes (3)

Healthcare institutes adopt necessary interventions to reduce the risk of VAP and have set guidelines to follow from intubation to extubation (4). Nurses are responsible for implementing these guidelines and impacting respiratory care and patient outcomes in the ICU and CCU. In Pakistan, although nurses are aware of protocol and have the resources to implement it, compliance with guidelines in daily practice is negligible. This study was conducted to assess the adherence of CCU nurses to guidelines for preventing ventilator-associated pneumonia and to identify factors that impact this adherence.

Methodology

A cross-sectional study was conducted in the Critical Care Department of Medicare Hospital, Multan, from January 2024 to January 2025. A total of 100 nurses working in the ICU and CCU department of the hospital were included. Non-consenting nurses and newcomers were excluded. All participants provided their verbal consent to participate in the study. The hospital's ethics board approved the study.

Data was collected through a questionnaire divided into three parts. The first part included questions about demographics and employment details,

including age, sex, qualification, ICU experience, job title, and previous qualifications or certifications for mechanical ventilation and VAP. The second part consisted of 17 questions about nurses' adherence to VAP guidelines, which could be answered on a Likert scale ranging from 0 to 2, with 0 indicating 'never' and 2 indicating 'always.' The minimum score was 0, and the maximum score was 34, with higher scores indicating better compliance. A total score of less than 30 was considered poor compliance, a score between 30 and 32 was regarded as satisfactory compliance, and a score higher than 32 was considered good compliance. The third part investigated the hurdles that prevent nurses' compliance with the guidelines through 15 questions that could be answered on a Likert scale, ranging from 1 (strongly agree) to three (strongly disagree). All data was evaluated by SPSS version 20. Demographic data and variables in the second and third sections were presented as percentages and frequency. The mean \pm SD was used to represent continuous variables. The compliance scores between nurses were compared using a t-test and ANOVA. Factors affecting compliance were determined by multivariate analysis. Statistical significance was considered at a p-value of less than 0.05.

Results

Data from 100 nurses were collected, yielding a 100% response rate. The mean age was 29.8 ± 6.1 years, with a 90% female population. Eighty nurses (80%) held a bachelor's degree, 65 nurses (65%) had 1-5 years of experience, and half of them worked in general or medicine intensive care units and attended to 16-20 beds. 75 (75%) had prior knowledge about mechanical ventilators, and 70 (70%) received knowledge about VAP prevention. The mean adherence score was 28.9 ± 4.04 , with a minimum score of 17 and a maximum score of 34. 25 (25%) had good compliance

scores, 30 (30%) had satisfactory compliance and 45 (45%) had poor compliance scores. General ICU nurses had the highest score of 29.6 ± 4.2 , which was significantly higher than that of burn unit nurses (27.1 ± 5.33) ($p = 0.003$). Similarly, nurses who managed fewer than 10 beds had considerably lower scores than those who worked 10-15 beds (28.1 ± 4.3 vs 29.2 ± 3.9 , $p = 0.003$) (Table I).

Most nurses followed VAP guidelines, including handwashing before and after patient care (97%), wearing gloves (97%), administering oral care (94%), and maintaining a semi-Fowler position (94%). However, low compliance was noted in other guidelines, including the regular replacement of humidifiers (60%), the replacement of suction systems for every patient (64%), and the use of kinetic beds (63%). Only 43% complied with subglottic secretion suctioning guidelines. Commonly

recognised hurdles to adherence to VAP guidelines were staff shortage (70%), cost-control policies (60%), forgetfulness to perform procedures (65%), outdated education (44%), and avoidance of poor patient outcomes (42%).

Table II shows a multi-variate analysis indicating predictors of VAP compliance. The Burn ICU was used as a reference, according to which the score of nurses in the general ICU was 5.1 points higher than that, while nurses in the surgical ICU had 8.5 points higher scores ($p < 0.001$). Nurses managing more than 20 ICU beds had an adherence score of 8.0, which was higher than that of nurses working in ICUs with fewer than 10 beds ($p < 0.001$). Nurses with prior education in VAP guidelines scored 0.8 points higher than those without previous knowledge.

Table 1: Social And Demographic Variables of Nurses and Adherence Score

Variables	N(%)	Adherence score	P
Age			
20-29 years	65 (65%)	30.5 ± 5.3	
30-39 years	30 (30%)	30.6 ± 3.6	
Older than 40 years	5 (5%)	29.3 ± 2.8	0.854
Gender			
Male	10 (10%)	28.3 ± 5.1	0.176
Female	90 (90%)	30.1 ± 4.5	
Education			
Diploma	20 (20%)	30.2 ± 4.2	
Bachelors or higher	80 (80%)	30.4 ± 4.0	0.591
Job title			
Nurse	95 (95%)	30.16 ± 4.6	
Head nurse/ supervisor	5 (5%)	27.9 ± 4.3	0.462
Experience			
1-5 years	65 (65%)	30.0 ± 4.7	
6-10 years	20 (20%)	29.94 ± 4.54	
More than 10 years	15 (15%)	29.3 ± 4.0	0.309
Department			
General / medicine ICU	50 (50%)	29.8 ± 4.2	
Surgical ICU	20 (20%)	29.6 ± 3.1	
CCU	25 (25%)	28.2 ± 4.9	0.003*
Burn ICU	5 (5%)	27.1 ± 5.33	
Number of beds			
Less than 10	15 (15%)	28.1 ± 4.3	
10-15	30 (30%)	29.2 ± 3.9	
16-20	45 (45%)	30.7 ± 4.6	0.003*
More than 20	10 (10%)	30.9 ± 4.2	
Previous knowledge of mechanical ventilator	75 (75%)	30.8 ± 4.0	
Previous knowledge about VAP prevention	70 (70%)	30.0 ± 29.2	

Table 2: Factors Influencing VAP Guidelines Compliance

Factors	B	Standard error	Beta	T	P	95% CI
Department						
General ICU	5.1	0.9	0.7	3.8	<0.001	2.5-7.12
Medical ICU	5.7	1.8	0.8	4.3	<0.001	3.3-8.5
Surgical ICU	8.5	1.8	1.0	4.7	<0.001	5.0-10.9
CCU	6.2	2.1	0.6	3.6	<0.001	3.1-8.7
Burn ICU	Reference					
Number of beds						
10 or less	Reference					
10-15	5.3	1.3	0.8	5.2	<0.001	2.8-7.3
More than 20	8.0	1.8	0.9	5.0	<0.001	4.9-11.3
Previous knowledge about VAP prevention	0.8	0.7	0.2	1.9	0.050	0.09-1.8

Discussion

This study was conducted to evaluate the adherence of nurses to VAP guidelines in the intensive care unit (ICU). An 86% compliance score was recorded in our study, which is higher than Finland (66%), Spain (78%), Brazil (67%), the Middle East (69%), Iran (27%), and Europe (73%) (5-9). The score is also slightly higher than that of the study conducted in

Islamabad and Rawalpindi (10). The high score can be attributed to the placement of policies and strict protocols for their compliance.

Compliance with guidelines, including handwashing before and after patient management (97%), wearing gloves (97%), oral care (94%), and maintaining a semi-Fowler position (94%), was observed in the present study. These statistics are inconsistent with previous studies, which reported compliance incidence rates of 92%, 93%, 78-95%, and 88-100%,

respectively (11-13). However, some studies have shown significantly lower compliance rates, ranging from 11% to 50%, respectively (14,15). Low compliance was noted in other guidelines, including changing humidifiers regularly (60%), changing suction systems for every patient (64%), using kinetic beds (63%), and following subglottic secretion suctioning guidelines (43%). This may be because these guidelines are not typically taught at the bachelor's level and are instead learned through clinical practice and hospital training. In addition, the lack of resources such as kinetic beds, endotracheal tubes for secretion suctioning, and circuit suction may urge nurses to non-compliance. In previous literature, compliance rates of 34%, 20%, 43%, and 10-45% have been reported for the guidelines above (16, 17).

Nurses managing more beds and who had received prior VAP prevention education had higher compliance than those managing lower bed counts and had no previous knowledge. In addition, the nurse shortage and failure to implement evidence-based procedures and cost control policies served as hurdles to compliance with VAP guidelines. These findings are consistent with those of other studies (18).

Our study has some limitations. The responses to the questionnaire are self-reported, which may have influenced the findings with bias.

Conclusion

ICU nurses demonstrate a satisfactory level of adherence to VAP guidelines, which is directly correlated with the number of beds managed and their prior knowledge of procedures and VAP prevention.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0985d-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

HZ (Post RN)

Manuscript drafting, Study Design,

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Review of Literature, Data entry, Data analysis, and drafting article.

NS (Post RN),

Conception of Study, Development of Research Methodology Design,

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Study Design, manuscript review, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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