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## The Relationship Between Nurse's Knowledge about Ventilators and Compliance in Preventing Ventilator - Associated Pneumonia (VAP) in the ICU

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### ABSTRACT

Ventilator Associated Pneumonia (VAP) is one of the most common nosocomial infections in ICU patients and has the potential to increase morbidity, mortality, and cost of care. Nurses' compliance with VAP prevention protocols is greatly influenced by their knowledge of ventilators and related nursing practices. This study aims to analyze the relationship between nurses' knowledge of ventilators and their compliance in VAP prevention in the ICU. This study was an observational study with a cross-sectional design. The sample consisted of 60 ICU nurses selected purposively in three hospitals in city X. Data were collected using a ventilator knowledge questionnaire and VAP prevention compliance observation. Data analysis used the Pearson correlation test to determine the relationship between knowledge and compliance. The results showed a significant positive relationship between nurses' knowledge level about ventilators and compliance in VAP prevention ( $r = 0.58$ ;  $p < 0.01$ ). In conclusion, increasing nurses' knowledge regarding ventilators has an effect on improving VAP prevention compliance. It is recommended that hospitals regularly conduct training and education for ICU nurses to improve nosocomial infection prevention practices.

**Keywords:** Nurse Knowledge, Ventilator, VAP, Compliance, ICU

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## 1. Introduction

Ventilator -Associated Pneumonia (VAP) is pneumonia that occurs in patients receiving mechanical ventilation for more than 48 hours in the intensive care unit (ICU). VAP is one of the most common and serious nosocomial infections, with mortality rates ranging from 20–50%, depending on the patient's condition and quality of care. In addition to increasing the risk of morbidity, VAP also increases the length of stay, hospital costs, and the workload of healthcare workers.

VAP prevention is a top priority in ICU nursing practice. Proven effective interventions include: head-of-bed elevation of 30–45 degrees, oral care with antiseptics, aseptic management of respiratory secretions, reduction of ventilator use when possible, and adherence to hand hygiene protocols. Successful VAP prevention relies heavily on nurses' adherence to protocols, which in turn is influenced by their knowledge of ventilators and related nursing practices.

Nurses' knowledge of ventilators includes understanding how they work, managing patients on ventilators, signs of complications, and preventive measures to reduce the risk of infection. Nurses with a high level of knowledge tend to be more disciplined in implementing prevention protocols, while nurses with low knowledge are at risk of substandard practices, increasing the likelihood of VAP.

Several previous studies have shown a relationship between nurses' knowledge and adherence to clinical practices, including VAP prevention. However, in some hospitals, a gap between knowledge and practice is still found, which may be caused by factors such as experience, workload, patient safety culture, and resource availability.

This study aims to analyze the relationship between nurse's knowledge of ventilators and their compliance in VAP prevention in the ICU. The results are expected to provide a basis for hospitals in designing training, education, and evaluation strategies for nurse compliance, thereby reducing the risk of nosocomial infections and improving the quality of care in the ICU.

## 2. Research Methods

### a. Research Design

This study used an observational method with a cross-sectional design, which aimed to analyze the relationship between nurses' knowledge about ventilators and their compliance in VAP prevention in the ICU. This design was chosen because it allows for the simultaneous measurement of independent variables (knowledge) and dependent variables (compliance) at a specific point in time.

### b. Population and Sample

- Population: All nurses working in the ICU at three hospitals in city X.
- Sample: 60 nurses were selected using purposive sampling, with the following inclusion criteria:





- 1) Have a minimum of 6 months work experience in ICU.
- 2) Willing to participate in research and provide complete data.
- 3) Actively caring for patients using ventilators.

#### c. Research Instruments

- 1) Ventilator Knowledge Questionnaire:
  - Contains 25 closed-ended questions that measure nurses' understanding of ventilators, patient management, signs of complications, and VAP prevention measures.
  - Knowledge scores were categorized into low, medium, and high.
- 2) VAP Prevention Compliance Observation:
  - Checklist of VAP prevention practices based on international standards, including: head of bed elevation, antiseptic oral care, asepsis in ventilator management, and management of respiratory tract secretions.
  - Compliance scores were categorized into low, medium, and high.

#### d. Research Procedures

- 1) Educate nurses about the purpose of the research and obtain consent for participation.
- 2) Fill out the ventilator knowledge questionnaire (pre -observation).
- 3) Conduct direct observation of VAP prevention practices for 1–2 hours per shift, without researcher intervention.
- 4) Calculate knowledge and compliance scores, then group them into low, medium, and high categories.

#### e. Data analysis

- Quantitative analysis was conducted using the Pearson correlation test to see the relationship between nurses' knowledge and compliance.
- The significance level was set at  $p < 0.05$ .
- Data were analyzed using SPSS version 25.
- Qualitative observation results from field notes were used to support the interpretation of quantitative results, such as barriers to practice and motivational factors for nurses.

This methodological approach is expected to provide a clear picture of the influence of nurses' knowledge on compliance in VAP prevention, as well as being the basis for recommendations for training programs and improving the quality of ICU patient care.

### 3. Results And Discussion

#### a. Results





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This study involved 60 ICU nurses from three hospitals in city X. Data analysis showed variations in the level of nurses' knowledge about ventilators and the level of compliance in VAP prevention.

**Table 1.****Distribution of Nurses' Knowledge and Compliance Levels (n=60)**

Variables	Low	Currently	Tall	Mean $\pm$ SD
Ventilator Knowledge	10	28	22	17.2 $\pm$ 3.5
VAP Prevention Compliance	12	30	18	16.8 $\pm$ 4.0

**Correlation Analysis:**

- Pearson correlation between ventilator knowledge and VAP prevention adherence:  $r = 0.58$
- P- value :  $< 0.01$

**Interpretation of Results:**

Pearson correlation test results showed a significant positive relationship between nurses' knowledge of ventilators and their adherence to VAP prevention. This means that the higher the nurses' knowledge, the higher their adherence to VAP prevention protocols.

**Qualitative Findings:**

Based on observations and field notes:

- 1) Nurses with high knowledge tend to routinely perform head of bed elevation, antiseptic oral care, and respiratory tract secretion management according to protocol.
- 2) Some nurses with moderate or low knowledge sometimes miss preventive measures, especially when the workload is high or the patient's condition is critical.
- 3) Motivational factors, supervision, and work experience also play a role in the level of compliance.

These results confirm that nurse's knowledge is an important factor in ensuring consistent and effective VAP prevention practices, thereby reducing the risk of nosocomial infections in the ICU.

**b. Discussion**

The results of this study indicate a significant positive relationship between nurses' knowledge about ventilators and their adherence to the prevention of Ventilator Associated Pneumonia (VAP) in the ICU. Nurses with a high level of knowledge tend to be more disciplined in implementing prevention protocols, such as head-of-bed elevation of 30-45 degrees, oral care with antiseptics, aseptic secretion management, and the use of aseptic techniques when handling ventilators. This is in line with previous





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research findings showing that knowledge is a major predictor of nurses' adherence to clinical practice (Banerjee & Ghosh, 2018; Lu & Huang, 2018).

The increased compliance of nurses with high levels of knowledge can be explained by several mechanisms. First, a good understanding of ventilators and the risks of VAP makes nurses more aware of the consequences of skipping preventive measures. Second, adequate knowledge allows nurses to integrate VAP prevention protocols into routine practice despite work pressures or critical situations in the ICU. Third, the combination of knowledge, experience, and clinical supervision strengthens nurses' intrinsic motivation to consistently implement preventive measures.

This study also found that some nurses with moderate or low knowledge sometimes missed preventive measures, especially during high workloads. This finding suggests that knowledge alone is not enough; it needs to be supported by ongoing training, supervision, and a strong patient safety culture. Furthermore, the availability of resources, such as adequate oral care devices and ventilators, also impacts compliance.

Overall, these findings underscore the importance of ongoing education, simulation training, and monitoring of ICU nurses' practices to improve VAP prevention adherence. These strategies not only improve patient safety but also reduce morbidity, mortality, and healthcare costs associated with nosocomial infections.

#### 4. Conclusion And Suggestions

##### a. Conclusion

Based on the research results, it can be concluded that:

- 1) There was a significant positive relationship between nurses' knowledge about ventilators and their compliance in VAP prevention in the ICU ( $r = 0.58$ ;  $p < 0.01$ ).
- 2) Nurses with high levels of knowledge tend to be more compliant with VAP prevention protocols, including head of bed elevation, antiseptic oral care, and aseptic secretion management.
- 3) Nurse knowledge is the main factor influencing compliance, but the success of prevention practices is also influenced by work experience, supervision, workload, and resource availability.

##### b. Suggestions

Based on the findings of this study, several suggestions that can be given are:

- 1) Increased education and routine training: Hospitals need to provide regular training on ventilators and VAP prevention protocols for all ICU nurses.
- 2) Monitoring and evaluation: Routine monitoring of VAP prevention practices is conducted, including the use of checklists, audits, and feedback to nurses.





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- 3) Strengthening patient safety culture: Encouraging nurses to consistently implement evidence-based practices, despite facing high workloads or critical situations in the ICU.
- 4) Adequate facilities and resources: Hospitals need to provide supporting equipment, such as antiseptics, adequate ventilators, and asepsis equipment, so that preventive practices can be carried out optimally.
- 5) Further research: Further research is recommended to assess other factors that influence nurse compliance, such as motivation, work experience, and hospital organizational factors.

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