

A Study to Assess the Knowledge on VAP Care Bundle among Medical Surgical / ICU Nurses of Selected Tertiary Care Hospital of Western Maharashtra

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Abstract: Background: Ventilator-associated pneumonia (VAP) is a critical healthcare-associated infection that significantly contributes to increased morbidity, mortality, and healthcare costs. The care bundle, a collection of evidence-based practices, is designed to reduce the incidence of VAP by promoting standardized care procedures. In the Intensive Care Unit (ICU), where patients are highly dependent on their caregivers, the knowledge, attitudes, and behaviors of nurses play a pivotal role in patient recovery. Unfortunately, challenges such as inadequate oral health care, a lack of awareness about VAP prevention standards, and suboptimal nursing practices can hinder effective prevention efforts. Methods: A descriptive study was conducted to assess the knowledge of VAP prevention among 50 nurses working in the Medical-Surgical ICU of a tertiary care hospital in Pune. Convenience sampling was employed to select the participants for this study. Results: The study revealed varying levels of knowledge among the nurses regarding VAP prevention. Of the 50 nurses surveyed, 42% demonstrated a high level of knowledge (scoring above 66%), 56% had a moderate level of knowledge (scoring between 34% and 66%), and 2% had a poor level of knowledge (scoring below 34%). The mean knowledge score was 60.93%, with a standard deviation of 9.71%. Conclusion: Nurses' knowledge of the VAP care bundle is integral to delivering high-quality, safe, and cost-effective care to patients undergoing mechanical ventilation. This knowledge not only directly influences patient outcomes but also enhances hospital efficiency and elevates the overall standard of healthcare delivery. Strengthening nurse education and adherence to VAP prevention protocols is essential to improving patient safety and reducing healthcare costs.

Keywords: Ventilator associated pneumonia, Nurse knowledge, ICU Care bundle, Infection prevention, Patient safety, ICU stay

1. Introduction

Ventilator-associated pneumonia (VAP) is a profound and debilitating hospital-acquired infection that often arises in patients receiving mechanical ventilation, contributing significantly to increased morbidity, mortality, and escalating healthcare costs. Fortunately, VAP is largely preventable through the adoption of evidence-based interventions, such as the ventilator care bundle, which has proven to effectively reduce its incidence while enhancing patient outcomes. By prioritizing prevention, healthcare providers can not only shorten ICU and hospital stays but also alleviate the broader financial burden on the healthcare system, while mitigating the growing threat of antibiotic resistance. Consistently adhering to these best practices ensures the delivery of superior care, bolsters patient safety, and maximizes resource efficiency. Ultimately, this approach fosters a more sustainable and effective healthcare model, improving both the quality of care and the overall efficiency of the healthcare system, all while reducing unnecessary costs.

2. Background of Study

Ventilator-associated pneumonia (VAP) remains a significant contributor to hospital morbidity and mortality, despite ongoing advancements in diagnostic methods and treatment protocols. As with many healthcare challenges, the principle of "prevention is better than cure" holds especially true for VAP. This condition is entirely preventable, and a comprehensive approach to its prevention can lead to substantial reductions in hospital stays, healthcare costs, morbidity, and mortality. According to the International Nosocomial Infection Control Consortium (INICC), the overall rate of VAP is 13.6 per 1,000 ventilator days,

underscoring the importance of addressing this preventable complication.

VAP is not just a clinical concern; it also serves as a key epidemiological marker for the quality of healthcare delivery. As a preventable nosocomial infection, it contributes to avoidable mortality and morbidity, making it a critical focus for healthcare providers. Beyond patient outcomes, VAP imposes a significant financial burden on healthcare systems. It increases the length of ICU stays, demands extensive antibiotic use, and results in additional resource consumption. The cost associated with each episode of VAP is substantial, with an estimated \$40,000 per episode in the U. S. and approximately £9,000 in the U. K.

The impact of VAP on mortality is complex and difficult to measure due to the numerous confounding factors present in the at-risk population. However, studies have indicated varying degrees of attributable mortality, ranging from high to near-neutral. Regardless of the precise impact on mortality, the burden of VAP on healthcare systems is indisputable, and efforts to mitigate its occurrence are essential.

Fortunately, numerous studies, particularly from developing countries, have shown that simple, cost-effective interventions can significantly reduce the incidence of VAP. Key practices, including proper hand hygiene, effective management of respiratory secretions, oral hygiene with chlorhexidine, head of bed elevation above 30°, daily sedation breaks, and thorough assessments for extubation, have all proven effective in preventing VAP. Additionally, implementing prophylactic measures for peptic ulcers and deep vein thrombosis, along with ensuring consistent use of gloves by healthcare workers, can further reduce VAP rates.

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In the Intensive Care Unit (ICU), where patients are highly dependent on their caregivers, the actions, awareness, and behaviors of nurses are crucial to patient recovery. Unfortunately, barriers such as poor oral health awareness, lack of familiarity with VAP prevention protocols, and inconsistent nursing practices can hinder effective prevention efforts. Addressing these gaps in knowledge and practice is essential for improving patient outcomes and reducing the incidence of VAP in ICU settings.

Aim

To assess the knowledge and practices of ICU nurses regarding the prevention of ventilator-associated pneumonia (VAP) and evaluate the impact of evidence-based interventions, such as the ventilator care bundle, in improving patient outcomes, reducing healthcare costs, and enhancing overall care quality.

Objectives of study

- To evaluate the knowledge of critical care nurses regarding the VAP care bundle at a prominent tertiary care hospital in Western Maharashtra.
- To explore the relationship between critical care nurses' knowledge and their selected demographic variables.

Operational Definitions

- **Assess:** To systematically evaluate the level of knowledge regarding the ventilator care bundle for preventing VAP using a structured questionnaire method.
- **Knowledge:** The comprehensive understanding, both theoretical and practical, of the ventilator care bundle and its role in preventing ventilator-associated pneumonia (VAP).
- **Ventilator: Associated Pneumonia (VAP)** – A lung infection that develops in patients who are on mechanical ventilation, as defined by the Centers for Disease Control and Prevention (CDC).
- **Care Bundles:** A series of evidence-based interventions strategically implemented to manage and optimize the care of patients receiving mechanical ventilation.

Intubation and mechanical ventilation both significantly increase the risk of bacterial pulmonary infections, as the invasive endotracheal tube provides a direct pathway for bacteria to enter the lower respiratory tract, residing within the trachea. The absence of the natural cough reflex, compounded by excessive mucus production in mechanically ventilated patients, further facilitates bacterial colonization. Nosocomial pneumonia, particularly ventilator-associated pneumonia (VAP), has become a leading cause of death among hospital-acquired infections, with a crude mortality rate of approximately 30%. VAP specifically refers to bacterial pneumonia that develops in patients receiving mechanical ventilation. Pneumonia that arises within the first 48-72 hours post-intubation is termed early-onset VAP, typically caused by aspiration during the intubation process, while VAP occurring beyond this period is classified as late-onset.

Approximately 5-15% of hospitalized patients in intensive care units (ICUs) acquire infections during their admission, with ICU patients being 5-10 times more likely to develop nosocomial infections compared to those in general wards.

Notably, about 86% of hospital-acquired pneumonia cases are linked to mechanical ventilation. The prevention of VAP remains a significant clinical challenge, as it is associated with high morbidity, mortality, extended hospital stays, and substantial treatment costs. Studies indicate that over 80% of hospital-acquired pneumonia cases are related to VAP, with its prevalence varying across countries. It is particularly more prevalent in less developed and developing nations, exacerbating the duration of mechanical ventilation, ICU stay, hospital treatment costs, and overall mortality. A study in the United States reported that the direct and indirect costs of VAP can reach approximately \$57,000 per episode. Several factors contribute to the heightened risk of VAP, including male gender, aging, underlying chronic diseases such as chronic obstructive pulmonary disease (COPD), low consciousness levels, prolonged mechanical ventilation, reintubation, supine positioning, co-existing infections, the need for tracheostomies, excessive use of antibiotics, and bronchoscopy procedures.

Given the high mortality rate associated with VAP, its prevention is of utmost clinical importance. Nurses caring for mechanically ventilated patients play a crucial role in preventing VAP, underscoring the need for their knowledge and awareness of best practices. Numerous studies have highlighted significant gaps in the knowledge of ICU nurses regarding VAP prevention. In a major study conducted across 22 European countries, Labeau et al. (2006-2007) found that ICU nurses had a mean of only 45.1% correct responses when asked about VAP prevention measures. A substantial proportion of nurses lacked knowledge about key aspects such as proper intubation techniques, ventilator interface replacement, and the use of suction systems. Similarly, Curhan et al. (2014) highlighted that ICU nurses exhibited poor knowledge, with factors such as education level, work experience, and participation in VAP-related workshops influencing their awareness.

In a study conducted in Yemen, Al-Sayaghi (2014) also reported poor knowledge among ICU nurses regarding VAP prevention, with some aspects, like the frequency of humidifier and suction system changes, showing particularly low knowledge levels. The growing prevalence of chronic diseases and the aging population has led to an increased demand for mechanical ventilation, thereby raising the risk of VAP. Studies such as Easter et al. (US) indicate that the use of mechanical ventilation in emergency departments (EDs) has significantly increased over the years, yet patients receiving mechanical ventilation in these settings often do not receive optimal care.

Emergency department nurses play an essential role in caring for mechanically ventilated patients, yet their knowledge of VAP prevention has largely remained unexamined. Most research to date has focused on ICU nurses, leaving a crucial gap in understanding the knowledge levels of emergency department staff who frequently manage mechanically ventilated patients. This study aims to bridge this gap by assessing the level of knowledge among emergency department nurses regarding the prevention of VAP, ultimately contributing to enhanced patient care and improved clinical outcomes in these high-stakes settings.

3. Methodology

Sample:

A sample represents a carefully selected subset of a defined population, chosen to reflect the broader group of interest. In this study, the sample comprised Medical-Surgical ICU nurses employed at a selected tertiary care hospital.

Sampling Technique

A sampling plan outlines the precise methodology for selecting study participants. In this study, a non-probability convenience sampling technique was employed, selecting participants based on their availability and proximity to the research setting. Nurses working in the critical care unit who met the predefined selection criteria were chosen to participate in the study. **Duration of data collection was 04Dec 2023 to 12Dec 2023**

Sample Size

The sample comprised fifty nurses working in Intensive Care Units and acute wards, all of whom met the established inclusion criteria for this study.

Sample Criteria

The researcher identified all samples that met the established inclusion criteria. The criteria for sample selection were defined as follows:

Inclusion Criteria:

- Nurses currently employed in intensive care units or acute care wards.
- Nurses who voluntarily consented to participate in the study.

Exclusion Criteria:

- Nurses who have previously undergone specialized training in the VAP bundle protocol.

Tool Preparation

The tool for this study was meticulously developed to assess the knowledge of medical-surgical and ICU nurses on the Ventilator-Associated Pneumonia (VAP) care bundle. The tool comprised a structured questionnaire consisting of 02 sections of Section A: Sociodemographic Data and Section B: Questionnaire on knowledge of VAP care bundle. The content of the questionnaire was derived from established guidelines and current best practices related to VAP prevention. To ensure validity, the tool was reviewed by subject matter experts and refined based on their feedback, ensuring that it accurately captures the knowledge of the target group. Pre-testing of the tool was conducted in a similar clinical setting to ensure its clarity, reliability, and appropriateness for the study population.

4. Data Collection Techniques and Tools

A structured questionnaire was developed to assess the knowledge of medical-surgical and ICU nurses regarding the VAP Care Bundle at a selected tertiary care hospital in Western Maharashtra

Description of tool

The tool comprised a structured questionnaire divided into two sections:

Section A: Sociodemographic Data

Section B: Knowledge Assessment on VAP Care Bundle

a) Section I – Sociodemographic Variables

This section gathered information regarding the demographic and professional characteristics of the nurses, specifically focusing on factors such as age, educational background, years of clinical experience, current area of practice, any specialized training received, and the frequency with which they manage ventilated patients.

b) Section II – Knowledge of Nurses Regarding VAP Bundle Protocol

This section included 15 multiple-choice questions designed to assess the nurses' knowledge of the VAP care bundle protocol.

Scoring System

Each correct answer was awarded 1 point. No marks were deducted for incorrect responses.

Feasibility Study

A feasibility study is crucial for evaluating the practicality and viability of a proposed research project prior to its full-scale execution. It enables the identification of potential challenges, required resources, and associated risks, ensuring that the study can be effectively conducted within the available time, budget, and infrastructure. By assessing factors such as participant accessibility, data collection strategies, and logistical arrangements, a feasibility study offers invaluable insights into the project's likelihood of success. This process empowers researchers to make informed decisions, refine their methodology, and mitigate risks, ultimately enhancing the potential for meaningful outcomes and ensuring the research is both achievable and sustainable. A pilot study was done on 10 samples.

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