

The Usability of Mechanical Ventilation and Its Interface With Nursing Care: An Integrative Review

A Usabilidade da Ventilação Mecânica e Sua Interface Com o Cuidado de Enfermagem: Uma Revisão Integrativa

La Usabilidad de la Ventilación Mecánica y Su Interfaz con la Atención de Enfermería: Una Revisión Integradora

RESUMO

Introdução: A ventilação mecânica é um dos principais recursos de suportes de vida para pacientes críticos. Portanto, é fundamental que os Enfermeiros estejam capacitados para prestar uma assistência segura e de qualidade, pois desempenham um papel fundamental na detecção precoce de uma interação inadequada entre o paciente e o ventilador. **Objetivo:** Verificar através da revisão integrativa de literatura se a usabilidade do ventilador mecânico faz parte do processo assistencial. **Método:** Trata-se de uma revisão integrativa de literatura realizada em três bases de dados no mês de setembro de 2024. **Resultados:** Apesar da ventilação mecânica ser crucial no manejo de pacientes críticos, há um déficit significativo relacionado ao conhecimento dos Enfermeiros, mostrando uma discrepância entre a percepção do conhecimento e sua prática real. **Conclusão:** Evidencia-se a importância da capacitação e o treinamento contínuos para a prática assistencial de qualidade, identificando e suprimindo lacunas de conhecimento.

DESCRIPTORES: Ventilação mecânica; enfermagem; conhecimento; unidade de terapia intensiva.

ABSTRACT

Introduction: Mechanical ventilation is one of the main life support resources for critically ill patients. Therefore, it is essential that nurses are trained to provide safe and quality care, as they play a fundamental role in the early detection of inadequate interaction between the patient and the ventilator. **Objective:** To verify through an integrative literature review whether the usability of the mechanical ventilator is part of the care process. **Method:** This is an integrative literature review carried out in three databases in September 2024. **Results:** Although mechanical ventilation is crucial in the management of critically ill patients, there is a significant deficit related to nurses' knowledge, showing a discrepancy between the perception of knowledge and its actual practice. **Conclusion:** The importance of continuous training and education for quality care practice is evident, identifying and filling knowledge gaps.

DESCRIPTORS: Mechanical ventilation; nursing; knowledge; intensive care unit.

RESUMEN

Introducción: La ventilación mecánica es uno de los principales recursos de soporte vital para pacientes críticos. Por lo tanto, es fundamental que los enfermeros estén capacitados para proporcionar una atención segura y de calidad, ya que desempeñan un papel clave en la detección temprana de una interacción inadecuada entre el paciente y el ventilador. **Objetivo:** Verificar mediante una revisión integrativa de la literatura si la usabilidad del ventilador mecánico forma parte del proceso de atención. **Método:** Se trata de una revisión integrativa de la literatura realizada en tres bases de datos en el mes de septiembre de 2024. **Resultados:** A pesar de que la ventilación mecánica es crucial en el manejo de pacientes críticos, existe un déficit significativo relacionado con el conocimiento de los enfermeros, lo que muestra una discrepancia entre la percepción del conocimiento y su práctica real. **Conclusión:** Se evidencia la importancia de la capacitación y el entrenamiento continuo para la práctica de atención de calidad, identificando y supliendo las brechas de conocimiento.

DESCRIPTORES: Ventilación mecánica; enfermería; conocimiento; unidad de cuidados intensivos.

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Integrative Review

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INTRODUCTION

Mechanical ventilation (MV) is one of the main life supports for critically ill patients and aims to maintain oxygenation and/or ventilation, fully or partially replacing spontaneous ventilation. It can be classified into non-invasive ventilatory support, when an external interface is used, and invasive support, when the use of an endotracheal tube or tracheostomy tube is necessary. ⁽¹⁾⁻⁽²⁾

According to Resolution No. 639/2020 of the Federal Nursing Council, it is the Nurse's responsibility to assemble, test and install invasive and non-invasive mechanical ventilation devices, monitor, check alarms, perform initial adjustments and manage mechanical ventilation parameters. ⁽³⁾

According to the National Registry of Intensive Care, in 2023 the percentage of hospitalizations in public hospitals where the use of MV was necessary was 26.28%, which is equivalent to 64,038 patients. Therefore, given the high number of people using ventilatory support, it is essential that nurses are trained to provide safe and quality care, as they play a fundamental role in the early detection of an inadequate interaction between the patient and the ventilator. ⁽⁴⁾⁻⁽⁵⁾

However, it is known that many

professionals lack specific theoretical and practical knowledge on this topic, although theoretically everyone is able to provide such care, in practice they may end up presenting unsatisfactory performance. A survey conducted in 2019, 77.3% of the nurses surveyed stated that they would not be able to recognize complications related to MV in their professional routine. ⁽⁶⁾⁻⁽⁷⁾

Given the theme presented, the study sought to evaluate the Nurse's knowledge regarding the usability of mechanical ventilation applied in their care practice in ICUs.

METHOD

This is an integrative literature review, where the research question was "Is the usability of mechanical ventilation applied by nurses in their care practice?", developed based on the PICO strategy, which was used as an eligibility criterion.

For the search strategy, the terms indexed in the Health Sciences Descriptors (DeCS) were used: "ventilação mecânica", "Enfermagem", "conhecimento" and "Unidade de Terapia Intensiva" and Medical Subject Headings (MESH): "mechanical ventilation", "nursing" e "knowledge", combined using the Boolean operator AND.

The bibliographic search took

place in September 2024. For this purpose, the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), the National Library of Medicine (PubMed) and the Virtual Health Library Platform (VHL) were used.

The inclusion criteria were primary studies with full texts published in the last five years, in Portuguese, English and Spanish. And as exclusion criteria, secondary studies, monographs, dissertations, theses, technical productions, articles that exceeded the publication period limit and paid articles.

When using the descriptors in the database, 451 cataloged articles were found. Following the exclusion criteria, 153 studies were discarded for exceeding the publication time, 113 for not being full texts and free, 129 excluded for straying from the proposed theme, resulting in a total of 3 articles eligible for the bibliographic composition of the present study.

RESULTS

After reading the selected articles in full, it was possible to develop a table that includes the title, authors, year of publication, study methodology and summary of results obtained in order to facilitate the collection of data from the studies.

Table 1 – Characterization of the studies included in this integrative review, according to the title, authors, year of publication, study methodology and summary of results. Rio de Janeiro, Brazil, 2024.

Title	Authors	Year	Method	Result
Knowledge of intensive care unit nurses about mechanical ventilation: exploratory-descriptive study	Ana Flavia Bucci, Maira Deguer Misko, Erika Christiane Marocco Duran e Ana Paula Boaventura	2021	Quantitative, exploratory-descriptive	Nurses have knowledge of mechanical ventilation that needs to be continually improved.
Nursing care in mechanical ventilation: perceptions, attributions and knowledge of professionals Nurses who work in intensive care units in the mid-west and west of Santa Catarina	Edson Luiz Stechinski, Mariane Carolina de Almeida, Fabiana Meneghetti Dallacosta e Antuani Rafael Baptistella	2019	Cross-sectional, quantitative	It was observed that professionals with more experience had more self-reported knowledge about Mechanical Ventilation, but this difference was not observed among those with specialization in Intensive Care.
Knowledge Regarding Mechanical Ventilation and Practice of Ventilatory Care among Nurses Working in Intensive Care Units in Selected Governmental Hospitals in Addis Ababa, Ethiopia: A Descriptive Cross-Sectional Study	Kedir Abdureman Hassen, Micheal Alemayehu Namera, Andualem Wubetie Aniley, Ararso Baru Olani e Sofoniyas Getaneh Bedane	2023	Cross-sectional study	Knowledge about Mechanical Ventilation and the practice of ventilatory care among Nurses in the selected public hospitals was considered low.

Source: Prepared by the author, 2024.

The selected studies focus on nurses' knowledge about mechanical ventilation. It is observed that these studies highlight the importance of continuing education for the training and qualification of professionals. This is due to the crucial role that nurses play in the care and prevention of health problems of their patients.

DISCUSSION

After analyzing the selected articles, it was possible to identify the common points between them, which allowed the creation of four categories: Knowledge about Mechanical Ventilation, Ventilator Assembly and Management, Nurse Interventions in Ventilatory Support and Impact on Quality of Care.

KNOWLEDGE ABOUT MECHANICAL VENTILATION

Invasive mechanical ventilation is one of the main resources used in the management of critically ill patients. However, this procedure is associated with a series of risks that can compromise the patient's health. In order to reduce the adverse effects of mechanical ventilation, it is essential to master specialized knowledge with an emphasis on monitoring the ventilatory response over time.

Regarding knowledge about mechanical ventilation, Bucci et al.⁽⁸⁾ in his research reports that only 12 of 36 participants (34.29%) answered all the questions in the research instrument correctly. After analyzing the results, he observed from the nurses' responses that the physiotherapist was the most active professional in

mechanical ventilation in the unit, totaling 97.22%.

From the same point of view, Hassen et al.⁽⁹⁾ shows that 75 of the 146 nurses surveyed had a knowledge deficit related to ventilatory support. Although more than half of the participants demonstrated insufficient knowledge about mechanical ventilation, with 51.4% of the nurses presenting gaps in this topic, 57.5% stated that they had participated in training related to the use of ventilatory support.

Unlike the previous authors, Stechinski et al.⁽¹⁰⁾ presents its results through the perception of Nurses about their knowledge related to MV. In their research, it was observed that 80% of those surveyed reported having satisfactory knowledge regarding the functions and indications of mechanical ventilation, and 20% partial/superficial knowledge.

The studies by Bucci et al.⁽⁸⁾ and Hassen et al.⁽⁹⁾ revealed discrepancies between Nurses' perception of their understanding of the topic and the actual level of knowledge identified in the research, highlighting the need for continuous investment in education and training.

FAN ASSEMBLY AND HANDLING

Regarding the types of mechanical ventilators, Bucci et al.⁽⁸⁾ showed that only 12 nurses (33.33%) answered correctly. When asked about the professional who adjusts the mechanical ventilation parameters together with the physician, it was shown that 35 (97.22%) answered physiotherapists. Regarding cycling, 20 (55.55%) identified the correct cycling of mechanical ventilators. Regarding alarms, 35 (97.22%) recognized the low volume, expired minute and high positive airway pressure alarms.

Regarding the mechanical ventilator parameters, Hassen et al.⁽⁹⁾ show that the majority, 93 (63.7%) of the participants, were familiar with the

pressure-controlled ventilation mode, while almost two-thirds of the 99 (68.8%) nurses were not familiar with the volume-controlled ventilation mode. In the context of alarms, 96 (65.8%) nurses recognized the high pressure alarms, and more than half of the 83 (56.8%) participants did not know the cause of the low expired volume alarms.

As already mentioned, Stechinski et al. ⁽¹⁰⁾ present their results through the perception of nurses about their knowledge regarding ventilation modes, thus, 88% responded that they have satisfactory knowledge. Regarding the difference between ventilation modules, 72% responded that they have knowledge, while regarding correct cycling, 60% responded that they have an understanding. Regarding alarm adjustment, 64% of professionals reported having mastery over this practice, while parameter adjustments, only 36% perform it.

In summary, the data analyzed show a significant disparity between the technical knowledge necessary for the adequate management of mechanical ventilation and the daily practice of nurses. The perception of knowledge reported by some nurses is not fully reflected in practice, indicating the need for continuous and specific training to ensure safe and effective ventilatory support

NURSING INTERVENTIONS IN VENTILATORY SUPPORT

Among the main nursing interventions performed on patients on mechanical ventilation mentioned by the nurses in the research by Bucci et al. ⁽⁸⁾, it was possible to identify the aspiration of the orotracheal tube and upper airways (35%), elevated decubitus at 30° (21.67), fixation of the orotracheal tube (18.33), performance of pulmonary auscultation during the physical examination (13.33) and oral hygiene (11.67).

Regarding interventions, in the

research by Hassen et al. ⁽⁹⁾ we can identify that most nurses check the depth level of the endotracheal tube (80.1%), 50.7% identified complications related to IMV, 41% reported that they perform aspiration when necessary and 37% perform cuff pressure monitoring. When asked about following care practices for preventing MV-associated pneumonia, 69.2% of participants were not following them.

Stechinski et al. ⁽¹⁰⁾ present the participants' perception of the role of the Nurse in patient care, where the most frequent responses were detecting problems (96%) and assembling and testing the mechanical ventilator (96%), followed by parameter adjustment (36%). In addition to assistance, they were asked whether mechanical ventilator data is included in their nursing progress, 68% responded that it is partially present and 32% completely.

As per the 2024 Practical Guidelines for Mechanical Ventilation ⁽¹¹⁾, Nursing care for patients on ventilatory support includes: changing circuits, filters, humidifiers and methods of fixing the ventilatory prosthesis; attention during bathing and changing positions, aiming to reduce the duration of mechanical ventilation and prevent delirium; in addition to care with oral hygiene and management of feeding, both oral and enteral.

IMPACT ON QUALITY OF CARE

When we relate the fact that the Nurse has or does not have specialization in the area of intensive care with the knowledge that he believes he has about mechanical ventilation, Stechinski et al. ⁽¹⁰⁾ shows that we did not find any statistical difference between specialist and non-specialist professionals. In their research, 68% of nurses do not have specialization in the area, while 32% are specialists, however, the difference between knowledge was in the time of work in

the ICU.

Bucci et al. ⁽⁸⁾ obtained the same result as the previous survey. Only 16 (44.4%) nurses had specialized in intensive care, and only 5 (41.67) answered all the questions in the survey instrument correctly. As for nurses who did not specialize, 7 out of 12 (58.33) participants answered all the questions in the instrument correctly.

Unlike previous surveys, Hassen et al. ⁽⁹⁾ found a significant relationship between the educational level and work experience of nurses, associated with practice focused on mechanical ventilation. Nurses with a technical diploma demonstrated less knowledge on the subject than those with a bachelor's or master's degree. In addition, professionals with more than ten years of experience presented better results when compared to those with one to five years of experience.

It is noted that there is a lack of knowledge related to mechanical ventilation that accompanies nurses from graduation to professional practice, therefore, the qualification and training of health professionals is the way to ensure significant improvements in the quality of care offered to patients, reflecting in the reduction of complications and in better clinical outcomes.

CONCLUSION

As discussed in this study, the usability of mechanical ventilation by nurses is essential for promoting effective care. The results found reaffirm the importance of training and qualification for nurses, stating that knowledge is crucial for quality care practice, contributing to safe and evidence-based care.

It was possible to identify that nurses, perhaps due to the accumulation and overload of activities, combined with the lack of knowledge regarding the importance of knowledge and correct handling of invasive ven-

tilatory support, have been moving away from their competencies, leaving the responsibility for providing care to patients on mechanical ventilation to other health professionals.

Professional experience has demonstrated significant results in relation to the usability of mechani-

cal ventilation, when compared to the performance of specialist nurses. This data leads us to a critical reflection: are specialist nurses receiving adequate specialized training to meet the demands of care?

Finally, the relevance of the lack of current bibliography for the discus-

sion of the study is highlighted. Despite the relevance of the topic, in national and international discussions, there is a lack of new research, emphasizing the need for more debates, studies and publications to improve

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