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NURSING CARE FOR PATIENTS ON MECHANICAL VENTILATION: AN INTEGRATIVE REVIEW

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ABSTRACT

Objective: To identify in the scientific literature the main nursing care for patients on mechanical ventilation. **Methods:** This was an integrative review carried out in the Virtual Health Library (VHL), allowing simultaneous access to the following databases: Base de dados de enfermagem (BDENF), Índice Bibliográfico EspanholemCiências da Saúde (IBECS) and Literatura Latino-Americana e Caribenhaem Ciências da Saúde (LILACS). The descriptors "mechanical ventilation", "artificial respiration", "nursing care", "nursing" and "critical care" were used. The time limit set was between 2015 and 2020. **Results:** 12 articles comprised the sample of this study and regarding the nursing care identified, these were divided into six categories: endotracheal tube care, mechanical ventilator-related care, circuit-related care, care during hygiene and aspiration, care related to the prevention of bronchial aspiration, and care related to sedation. **Conclusion:** This review study identified the main nursing care related to patients on mechanical ventilation. Good nursing practice in invasive mechanical ventilation, designed by intensive care nurses, scientifically supports patient care in invasive ventilatory support.

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INTRODUCTION

Mechanical ventilation (MV) is one of the most common interventions performed in intensive care units (ICUs) worldwide, with a predicted increase in incidence over the next decade, and is one of the main reasons why patients require an ICU bed (Guilhermino *et al.,* 2018). MV is a life-saving treatment, decreasing the patients' work of breathing and reversing acute respiratory acidosis and hypoxemia (PERTAB, 2009). It is indicated in acute respiratory failure, heart failure, sepsis, and in situations where patients are unable to protect their airways, such as drug overdose, slow reversal of anesthetic agents, and neuromuscular disorders (Pertab, 2009; Guilhermino *et al.,* 2018). When MV is used invasively, an endotracheal tube or tracheostomy tube is used. Although MV is vital, it can cause complications, including endotracheal tube complications, ventilator-associated lung injury, barotrauma, ventilator-associated pneumonia (VAP), diaphragm atrophy, psychological problems and communication difficulties (Rose *et al.,* 2015). MV complications are associated with longer duration of therapy, which leads to higher in-hospital mortality rates, longer hospital stays and higher costs. Prolonged weaning processes from MV, i.e. patients who failed at least three weaning attempts or required more than seven days after the first attempt at spontaneous breathing, are associated with a significantly longer length of stay, ICU stay and mortality compared to successful weaning on the first attempt (Sellares*et al.,* 2011; Kable *et al.,* 2012).Research evidence on the role and autonomy of ICU nurses focuses on their participation in the critical care of these patients (Danckers*et al.,* 2013). Usually, experienced ICU nurses exercise high levels of autonomy in the care of patients requiring MV (Rose *et al.*, 2011). It is understood that this modality of patient support in intensive care requires specialized

assistance from a multiprofessional team, but the nurse is responsible for maintaining the intubated patient's airway patent, in addition to mastering the ventilator parameters, a necessary item for the evaluation and maintenance of these critical patients (Morais *et al.,* 2016). MV management is complex and dynamic, requiring extensive knowledge and skills to make complex, accurate and timely decisions to provide safe, best-practice care and reduce the risk of complications (Blackwood *et al.,* 2011). Thus, this study aimed to identify in the scientific literature the main nursing care for patients on mechanical ventilation.

MATERIALS AND METHODS

This is an integrative literature review conducted through the following steps: 1) Definition of the guiding question and research objectives; 2) Establishment of the inclusion and exclusion criteria/sampling of studies; 3) Literature search; 4) Categorization and analysis of the studies; 5) Presentation and discussion of the sample results and; 6) Presentation and synthesis of knowledge. Data collection was performed in the literature between May and June 2021, through the Virtual Health Library (VHL), allowing simultaneous access to the following databases: ase de Dados de Enfermagem (BDENF), Índice Bibliográfico Español enCiencias de la Salud.Literatura (IBECS) andLiteratura Latino-americana e do Caribe emCiências da Saúde (LILACS).The following descriptors in health sciences (DeCS) were used: mechanical ventilation, artificial respiration, nursing care, nursing and critical care. For the search process the Boolean operators "AND" and "OR" were used. Inclusion criteria were articles available in full in Portuguese, English or Spanish and published between 2015 and 2020. Review studies (integrative and systematic), duplicates (duplicate articles in the databases), and studies without a relevant approach to the research were excluded. After applying the search filters in the databases, 159 articles were initially found. 111 publications were eligible to read their titles and abstracts, but only 22 articles were selected for reading in full. Ten publications were excluded, and so the final sample consisted of 12 articles, as shown in Figure 1. The selected articles were submitted to the classification of the level of evidence, based on the instrument Hierarchical Classification of Evidence for Evaluation of Studies (Stillwell *et al.,* 2010).According to this classification, levels I and II are considered strong evidence, III and IV moderate, and V to VII weak.

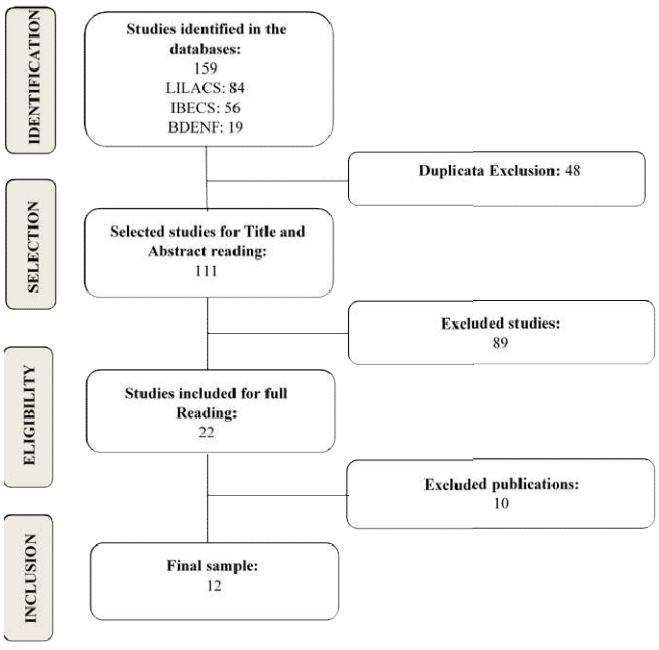

Figure 1. Flowchart of study selection, Recife (PE), Brazil, 2021

RESULTS

12 articles were analyzed in this review study, as shown in Table 1. The highest frequency of publication was related to the year 2020 (n: 04), followed by 2019 (n: 03). Regarding the typology of the studies, seven were purely descriptive or cross-sectional, with level of evidence VI, three are observational descriptive (level of evidence - VI) and only two are randomized clinical trials, representing the highest level of evidence among the studies analyzed (II). Regarding the nursing care identified in the analyzed studies, these were divided into six categories: endotracheal tube care (2 care and 7 studies), mechanical ventilator-related care (2 care and 3 studies), circuit-related care (1 care and 1 study), care during hygiene and aspiration (8 care and 7 studies), care related to preventing bronchial aspiration (1 care and 7 studies), and care related to sedation (1 care and 3 studies) - Table 2.

DISCUSSION

The results of this review evidenced the main care that the nurse should exercise in the management of patients under mechanical ventilation, and one of these care concerns the endotracheal tube and the mechanical ventilator. Among the care related to the endotracheal tube, the nursing team must be attentive to maintain the cuff pressure between 20 and 30 cmH20, according to the National Health Surveillance Agency (ANVISA, 2017). This is a very important care because it prevents complications related to tracheal mucosa injury, as well as accidental displacement of the tube and also microaspiration (Alcan *et al.,* 2017; Bucoski*et al.,* 2020; Santos *et al.,* 2020). The scientific literature recommends that the cuff pressure should be measured and if possible adjusted after the nursing team changes the patient's position in bed, because this change can alter the cuff pressure, which is extremely important for the professional to manage the endotracheal tube (Alcan *et al.,* 2017). This tube protects the mechanically ventilated patient's airway, however, its care goes beyond measuring the cuff pressure; the nurse must be attentive to its fixation in order to avoid cutaneous-mucosal lesions associated with invasive devices (Pinto *et al.,* 2015). As for the care directed to the mechanical ventilator and circuit, two articles specifically analyzed these parameters, whose recommendation is that the circuit should not be frequently changed, but only when it is dirty. Other specific cares refer to the ventilator alarms, which must be present in order to avoid inadequate ventilations to the patient (Marta *et al.,* 2016). Regarding hygiene and aspiration care, these were listed by seven articles in light of the results. It is known that oral health deteriorates rapidly in mechanically ventilated patients and some patients suffer oral mucosa lesions during the intubation procedure and, after intubation, patients may present a tendency to dry mouth (Pinto *et al.,* 2015; Hua *et al.,* 2016).

These factors, in addition to a severely compromised immune system, can cause increased bacterial colonization in the oral mucosa, with the endotracheal tube serving as a direct route to the lungs. Proper oral hygiene can reduce bacterial overgrowth and reduce the risk of infection. In a meta-analysis of over 18 randomized controlled trials (RCTs), routine oral hygiene with 0.12% chlorhexidine reduced the incidence of VAP (Hua *et al.,* 2016). The aspiration of secretions, a primordial care of the nursing team, should also be taken into consideration in this review, since this aspiration, when performed incorrectly, can lead to VAP. Aspiration of subglottic secretion may be performed by both nurses and physiotherapists and may help in preventing complications and infections (Mao *et al.,* 2016). A recent meta-analysis of 20 randomized clinical trials found that subglottic suctioning reduced the risk of VAP by 45% compared to patients who did not receive suctioning (Mao *et al.,* 2016). Regarding care to prevent bronchial aspiration, keeping the head support elevated between 30 and 45º was evidenced by seven studies. This preventive measure is common to all national and international guidelines and recommendations (Nevot, 2015).

Table 1. General characterization of the articles of the sample, Recife-PE, Brazil, 2021

ID	1st author (year)	Study objective	Study method	Study population
01	Pinto DM (2015)	To analyze nursing care in the prevention of cutaneous-mucosal injuries associated with the presence of lower airway invasive devices.	Descriptive	118 nurses
02	Nevot MLV (2015)	Describe the evolution of VAP incidence density during the study period.	Retrospectivedescriptive	94 patients
03	Abbasinia M (2016)	To evaluate the effect of a planned respiratory care program on the incidence of VAP in a mechanically ventilated patient.	RandomizedClinicalTrial	64 patients
04	Marta CB (2016)	To describe and discuss the behaviors of nursing professionals when faced with alarms triggered by electromedical equipment.	Descriptive	16 nurses
05	Martí-Hereu L (2017)	To identify the bedside elevation time of patients on mechanical ventilation and the patient factors related to such elevation in an intensive care unit.	Cross-sectionalandobservational	261 patients
06	Lourençone SEM (2019)	To evaluate the adherence rate of the nursing team's preventive actions for VAP	Longitudinal observational	154 patients
07	Nau WS (2019)	Compare the efficiency of the vibrocompression and hyperinflation techniques with mechanical ventilator in isolation and the association of the two techniques	RandomizedClinicalTrial	93 patients
08	Cruz JRM (2019)	To identify nursing procedures in patients undergoing invasive mechanical ventilation and the development of pneumonia in an intensive care unit.	RandomizedClinicalTrial	20 nurses
09	Bucoski SS (2020)	To evaluate the cuff pressure variation of intensive care unit patients	Cross-sectional	10 patients
10	Santos C (2020)	Identify care designed as good nursing practice for patients on invasive mechanical ventilation in the hospital emergency setting.	Qualitativedescriptive	16 nurses
11	Pazos CP (2020)	Identify nursing care for patients on mechanical ventilation.	Cross-sectional	67 patients
12	Barbosa TP (2020)	To associate sedation level, daily sedoanalgesic drug withdrawal criteria and mortality of patients on mechanical ventilation in an Intensive Care Unit.	Longitudinal	204 patients

Table 2. Nursing care by category and level of evidence of studies, Recife-PE, Brazil, 2021

Carecategory	ID	Nursing Care	Level of Evidence
Endotracheal tube care	02, 03, 06, 08, 09, 11	Check cuff pressure and maintain it between 20-30 cmH 2	VI
	01, 09, 11	Attach the endotracheal tube properly and replace it periodically	VI
Care related to the mechanical ventilator	04, 09	Maintain intensive and frequent care of mechanical ventilator alarms	VI
	06, 09	Mount the ventilator aseptically and protect the Y-connection when opening the system	VI
Care related to the circuit	09	Replace the circuit when it is visibly dirty	VI
Care during hygiene and aspiration	02, 06, 09	Perform oral hygiene with 0.12% chlorhexidine	VI
	03, 08, 09	Aspirate with aseptic technique after the evaluations	VI
	09	Wear personal protective equipment during aspiration	VI
	07	Perform suction associated with hyperinflation techniques with a mechanical ventilator and vibrocompression	II
	09	Wash the latex with distilled water or saline solution and protect in clean, dry packaging after the procedure	VI
	02, 08, 09, 10	Sanitize hands before and after handling the ventilation system	VI
	10	Wash the nasogastric tube or nasoenteric tube with water after dieting	VI
	09	Perform continuous monitoring of the patient during the bed bath and check cuff pressure after the procedure	VI
Care related to the prevention of bronchial aspiration	02, 03, 05, 06, 08, 09, 10	Keep the head of the bed elevated between 30 and 45°.	VI
Carerelatedtosedation	02, 09, 12	Constantly evaluate sedated patients by means of validated sedation scales	VI

Thus, they indicate or recommend keeping the mechanically ventilated patient's bedside elevated between 30º - 45º to avoid aspiration of gastric and/or oropharyngeal contents and, consequently, ventilator-associated pneumonia (VAP) (Abbasinia*et al.,* 2016; Martí-Hereu and ArreciadoMarañón, 2017). A nursing care also addressed in one of the studies analyzed is the constant evaluation of patients under sedation (Nevot, 2015; Bucoski*et al.,* 2020; Barbosa *et al.,* 2020). Patients who are critically ill and require mechanical ventilation often experience a combination of pain, restlessness, anxiety and delirium, which is promoted and influenced by a complex interaction of physiological, pathological and external factors (Reade and Finfer, 2014; Urner *et al.,* 2018). The management of sedation in ICU patients has undergone a dramatic change over the past 15 years. There is growing evidence indicating that prolonged and deep sedation is associated with poor outcomes, whereas minimizing sedation is associated with reduced duration of mechanical ventilation and shorter ICU and hospital stays (Reade and Finfer, 2014). Only a small subgroup of ICU patients require deep sedation, mainly those with severe respiratory failure, shock or intracranial hypertension and those who require paralysis (usually for the same conditions mentioned) (Urner *et al.,* 2018). Sedation should always be administered in a patient-directed manner, using a validated sedation assessment tool, such as the Richmond agitation-sedation scale or the Riker sedation-agitation scale (Urner *et al.,* 2018). For most patients receiving mechanical ventilation in the ICU, a reasonable target is a Richmond Agitation-Sedation Scale score of -2 to 0 or a Riker Sedation-Agitation Scale score of 3-4; both targets are representative of a calm, interactive, or mildly sedated patient (Urner *et al.,* 2018).

CONCLUSION

This review study identified the main nursing care related to patients under mechanical ventilation, whose main categories refer to management of the endotracheal tube, mechanical ventilator, circuit, oral hygiene and aspiration care, bed position and level of sedation. These cares were extracted from recent studies (last five years) and with level of evidence II and VI, the latter being the most frequent.

Studies related to this theme should be more frequent, so that the intensivist nurse can provide care based on scientific research.

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