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Review Article

Nursing care for adult patients on mechanical ventilation in the prone position: an integrative review*

Cuidados de enfermagem ao paciente adulto em ventilação mecânica na posição prona: revisão integrativa

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ABSTRACT

Objective: to identify nursing care for adult patients on mechanical ventilation in the prone position. **Methods:** an integrative review conducted in distinct stages using descriptors related to nursing and the prone position, searching the MEDLINE, EMBASE, SCOPUS, CINAHL, Web of Science, SciELO, LILACS, BDENF, and Google Scholar databases. Nursing care practices were grouped by thematic affinity into analytical categories. **Results**: the search identified 2,192 studies, 13 of which comprised the final sample. The identified care categories were nursing assessment, complications and skin assessment, reintubation equipment and emergency cart, sedation and neuromuscular blockade, pre-oxygenation, arterial blood gas analysis, suctioning equipment, head-of-bed elevation, eye care, oral hygiene, enteral nutrition, patient positioning, and team staffing and training. **Conclusion**: prone-position nursing care practices were identified, focusing on patient safety and complication prevention in adults undergoing mechanical ventilation. **Contributions to practice:** this study systematizes nursing care for adult patients on mechanical ventilation in the prone position, providing support for standardizing care protocols, strengthening clinical decision-making, and enhancing critical patient safety.
Descriptors: Nursing; Nursing Care; Prone Position; Respiratory Distress Syndrome; Review.

RESUMO

Objetivo: identificar os cuidados de enfermagem ao paciente adulto em ventilação mecânica na posição prona. **Métodos:** revisão integrativa conduzida em distintas etapas utilizando descritores relacionados à enfermagem e posição prona com busca nas bases MEDLINE, EMBASE, SCOPUS, CINAHL, *Web of Science*, SciELO, LILACS, BDENF, Google Acadêmico. Os cuidados de enfermagem foram agrupados por afinidade temática em categorias analíticas. **Resultados**: a busca identificou 2.192 estudos, dos quais 13 compuseram a amostra final. As categorias de cuidados identificadas foram a avaliação de enfermagem, das complicações e da pele, material para reintubação e carrinho de emergência, sedação e bloqueio, pré-oxigenação, gasometria arterial, material para aspiração, posição da cabeceira, cuidados oculares, higiene oral, nutrição enteral, posicionamento do paciente, dimensionamento e treinamento das equipes. **Conclusão**: foram identificados cuidados de enfermagem na posição prona, voltados à segurança do paciente, e à prevenção de complicações em adultos sob ventilação mecânica. **Contribuições para a prática:** o estudo sistematiza os cuidados de enfermagem a pacientes adultos em ventilação mecânica em prona, oferecendo subsídios para a padronização de protocolos assistenciais, fortalecimento da tomada de decisão clínica e segurança do paciente crítico.
Descritores: Enfermagem; Cuidados de Enfermagem; Decúbito Ventral; Síndrome do Desconforto Respiratório; Revisão.

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Introduction

Acute Respiratory Distress Syndrome (ARDS) is characterized by respiratory failure caused by an inflammatory process affecting the pulmonary parenchyma, compromising gas exchange and resulting in hypoxemia, decreased lung compliance, and bilateral infiltrates[1]. It is an acute condition with an exacerbation period varying from 6 to 48 hours, depending on the location and extent of pulmonary involvement[2]. Patients with severe forms often require admission to an Intensive Care Unit (ICU), an environment integrating advanced monitoring technologies, life support, and specialized multidisciplinary care, although mortality rates remain high[3-4]. Clinical management involves interventions aimed at optimizing oxygenation and reducing complications, such as mechanical ventilation adjustments, sedation, neuromuscular blockade, alveolar recruitment, and hemodynamic parameter control[5]. Among these strategies, the prone position stands out, as it promotes the redistribution of pulmonary pressures and improves the ratio of partial pressure of oxygen to fraction of inspired oxygen (PaO_2/FiO_2)[6].

The prone position has been progressively incorporated as a viable and safe therapeutic strategy in ARDS management, including in critical care environments. Evidence indicates that its early adoption significantly improves oxygenation and can positively impact clinical outcomes, provided it is accompanied by standardized protocols and adequate training of multidisciplinary teams[6-7].

In this context, nursing plays a leading role in care, possessing the technical and scientific competence to plan and lead the maneuver, coordinate human resources, safely execute the position change, and perform continuous patient monitoring, ensuring quality and safety[8-9].

Key nursing interventions, beyond the proning maneuver itself, include monitoring vital signs, managing the endotracheal tube and cuff pressure, using pillows for pressure relief, eye protection, pressure injury prevention with dressing applications, repositioning, managing urinary and enteral catheters, and monitoring for complications, among others[10].

Consequently, it is essential to synthesize available knowledge on nursing care for patients in the prone position, as this intervention, despite being a consolidated therapeutic strategy[6], still presents challenges regarding practice standardization and complication prevention[11].

The prone position in ARDS management has been widely addressed in the literature, emphasizing clinical outcomes and intervention efficacy, while the systematization of the involved nursing care remains less explored. Furthermore, there is a gap in the literature regarding the categorical organization of this care[6,11].

Thus, updating and systematizing available knowledge, organized into care categories, can broaden the understanding of care practices, inform the development of protocols and guiding tools, and strengthen clinical decision-making in intensive care nursing, ultimately enhancing critical patient safety[12]. Therefore, this study aimed to identify nursing care for adult patients on mechanical ventilation in the prone position.

Methods

Study design

This integrative review was conducted in distinct methodological stages[13], namely: (1) developing the research question; (2) searching the scientific literature; (3) selecting the articles; (4) extracting the data; (5) synthesizing the data; and (6) writing and publishing the results.

The guiding question was formulated using the PICo strategy[14]: P (Population), I (Phenomenon of Interest), and Co (Context). The population comprised adult patients on mechanical ventilation; the phenomenon of interest was nursing care; and the context was the prone position. Thus, the guiding question was defined as follows: What are the recommended nursing care practices for adult patients on mechanical ventilation during the proning maneuver?

Population

Inclusion criteria encompassed primary studies (quantitative, qualitative, or mixed methods), systematic reviews, consensus statements, guidelines, directives, theses, and dissertations involving patients over 18 years old, published in Portuguese, English, or Spanish. Animal and *in vitro* studies, studies with neonates and children, reflection articles, commentaries, abstracts, undergraduate theses, editorials, and book chapters were excluded.

The literature search was conducted on May 22, 2025, for studies published between 2015 and 2025 in Portuguese, English, and Spanish. The databases were accessed via the Coordination for the Improvement of Higher Education Personnel (CAPES, in Portuguese) Journals Portal and included: The Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Excerpta Medica Database (EMBASE), SCOPUS, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science, the Scientific Electronic Library Online (SciELO), the Latin American and Caribbean Health Sciences Literature (LILACS), and the Nursing Database (BDENF), along with Google Scholar. Google Scholar was used as a supplementary source to identify potentially relevant literature not indexed in traditional databases, with an analysis of the first ten pages of results sorted by relevance.

The search strategy was developed using the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH): "Enfermagem", "Nursing", "Enfermería", "Posição prona", "Prone position", and "Posición prona". These terms and their synonyms were applied to the title, abstract, and keyword fields, as well as controlled descriptors when available in each database, combined using the Boolean operators OR and AND. The search strategy was developed by the principal investigator and validated by a librarian experienced in conducting searches in health science databases. The publication type filter ("journal article") was applied in the MEDLINE/PubMed database. In the other databases, we initially opted not to restrict by document type in the search strategy to prioritize higher sensitivity in study retrieval. Thus, the publication type criterion was considered during the selection stage when screening titles and abstracts. The search strategies used for each database are presented in Figure 1.

Database	Search strategy
MEDLINE	("Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND ("Nursing"OR "Nurses"OR Nurs*) AND (journal article [Publication Type]).
EMBASE	("Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND ("Nursing"OR "Nurses").
CINAHL	("Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND ("Nursing"OR "Nurses"OR Nurs*).
SCOPUS	("Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND ("Nursing"OR "Nurses"OR Nurs*).
Web of Science	("Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND ("Nursing"OR "Nurses"OR Nurs*).
SciELO	("Decúbito Ventral" OR "Posição prona" OR "Posición Prona" OR "Prone Position" OR "Prone positioning") AND ("Enfermagem" OR "enfermeria" OR "Nursing" OR "Nurses").
LILACS/ BDENF	("Decúbito Ventral" OR "Posição prona"OR "Posição Prone"OR "Posición Prona"OR "Posición prone"OR "Decúbito prone" OR "Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND("Enfermagem"ORenfermeir*OR"enfermeria"OR enfermer* OR "Nursing"OR "Nurses"OR Nurs*).
Google Scholar	("Decúbito Ventral" OR "Posição prona"OR "Posição Prone"OR "Posición Prona"OR "Posición prone"OR "Decúbito prone" OR "Prone Position"OR "Prone positioning"OR "Prone position"OR "Position prone") AND (Enfermagem OR enfermeiros OR enfermeria OR enfermeros OR Nursing OR Nurses OR Nurse).

Figure 1 – Search strategies applied in study selection. Florianópolis, SC, Brazil, 2025

Data collection

Data from the selected studies were collected, exported from the databases, and imported into the Rayyan® software. Duplicate studies were then removed, followed by the reading of titles and abstracts.

Two independent reviewers evaluated the studies against the eligibility criteria using a double-blind approach. In case of disagreements, a third reviewer was planned to be consulted for consensus; however,

this was not necessary. Study organization and reporting were guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[15].

For data extraction, the principal investigator developed an instrument containing the following data points: title, year, author and country, objective, study method, care practices performed, and conclusion.

Data analysis

The extracted data were analyzed qualitatively. Nursing care practices related to the prone position were mapped and organized into a synthesis matrix. Subsequently, a comparative analysis of the findings was performed, considering the frequency of the reported care practices across the studies and the similarities among their recommendations. Care practices were then grouped by thematic affinity, enabling the construction of analytical categories and the synthesis of results.

Ethical aspects

Regarding ethical aspects, as this was a review study, submission to an Institutional Review Board was not required. We emphasize that all original authors were properly cited, ensuring scientific integrity and ethical rigor. The studies were coded using the letter "S" for study, followed by an Arabic numeral (S1, S2...). An artificial intelligence tool was used as technical support for normalizing and standardizing the bibliographic references, with no interference in the scientific content. No prior protocol was registered for this review.

Results

The study selection process is presented in the flowchart, following PRISMA guidelines (Figure 2). At the end of the screening and eligibility process, 13 studies were included in the qualitative synthesis.

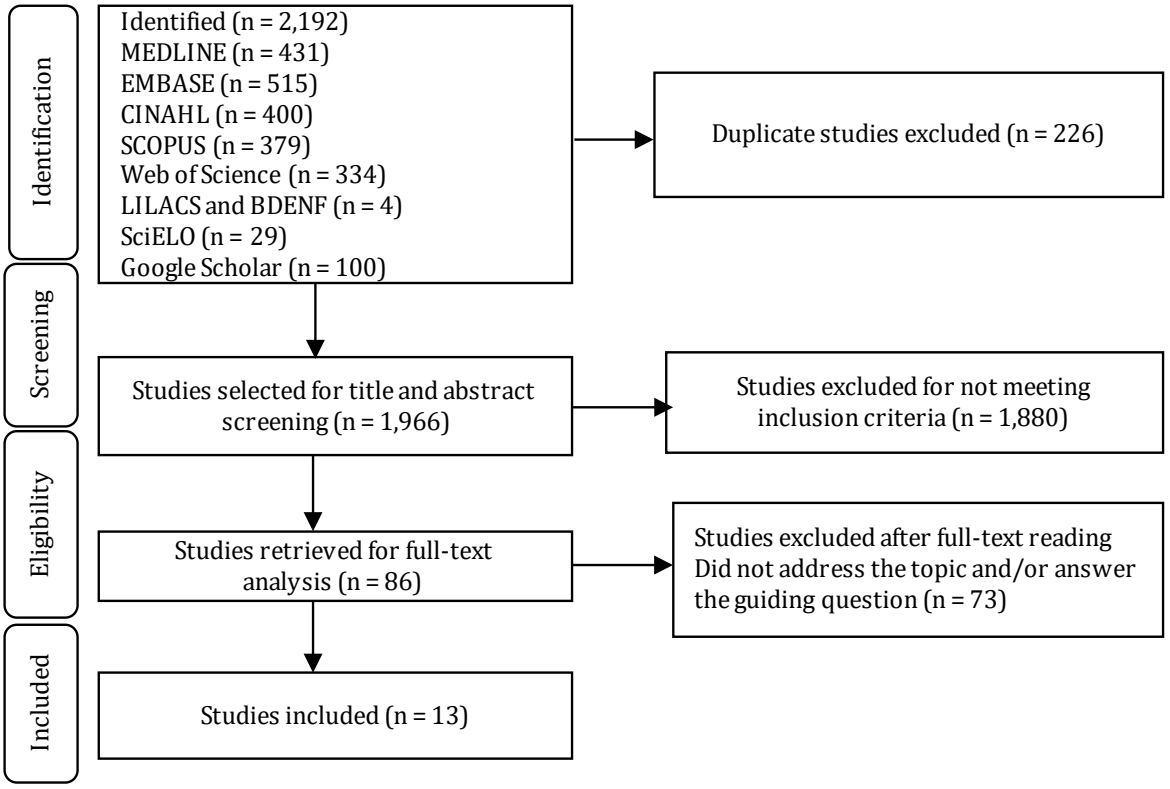

Figure 2 – Flowchart of the study identification, screening, eligibility, and inclusion process, adapted from PRISMA. Florianópolis, SC, Brazil, 2025

Regarding publication year, three studies were published in 2023[7,16-17], two in 2022[9,18], three in 2021[8,10,19], and one in each of the years 2020[20], 2019[21], 2017[22], 2016[23], and 2015[24]. Regarding language, 10 studies were published in English and three in Portuguese. As for the countries where they were conducted, three[10,16,24] were carried out in the United States (n=3; 23.1%), three[8-9,19] in Italy (n=3; 23.1%), three[18,22-23] in Brazil (n=3; 23.1%), two[20-21] in England (n=2; 15.4%), and two[7,17] in China (n=2; 15.4%) (Figure 3).

N	Author, year, country	Method	Main care practices performed during patient proning	Conclusion
S1	Morata et al(2023)[16] USA	Practice consensus	Skin assessment; pressure injury prevention; prophylactic dressing application; proper ETT securement; eye care; head-of-bed elevation at 15-30°; diet suspension one hour before proning; prior training.	Proning improves the ventilatory pattern, and nursing interventions reduce complications.
S2	Chen et al (2023)[17] USA	Cross-sectional	Frequent patient repositioning; use of pillows and cushions for support; team training.	Proning is effective in improving oxygenation but requires preventive strategies to minimize complications.
S3	Chen et al (2023)[7] China	Before-and-after type	Vital sign assessment, catheter securement, gastric residual volume evaluation, skin condition assessment; minimum of five professionals; use of pillows; swimmer's position; head at 30°, feet down; alternating facial position every 2 hours. Monitors oxygenation, vital signs, and mechanical ventilation. Assess and prevent pressure injuries.	Intervention with the management protocol significantly improved the oxygenation index in severe COVID-19 patients.
S4	Silva et al (2022)[18] Brazil	Cross-sectional	Pressure injury assessment, bony prominence protection, repositioning, use of pillows; vital sign monitoring. Care with device securement, dislodgment, and obstruction; tracheal suctioning; ETT monitoring; oral hygiene.	Executing the maneuver requires specific nursing interventions to prevent complications and ensure patient safety.
S5	Lucchini et al (2022)[9] Italy	Retrospective cohort	Bony prominence protection; eye care; ETT securement; skin reassessment; repositioning; use of pillows; specific dressings to prevent facial injuries; monitoring of invasive devices to prevent dislodgment.	Prolonged proning is feasible and can reduce nursing staff workload without a significant increase in severe complications.
S6	Bruni et al (2021)[19] Italy	Consensus recommendations	Position, ETT securement; cuff pressure (20-30 cmH_2O); reintubation equipment; arterial and venous catheter securement; sedation and blockade; ensuring pre-oxygenation; alignment; professional positioning; post-maneuver verification of ETT and vital signs, reconnecting vascular lines, patient positioning; protecting pressure areas; restarting nutrition.	Execution and monitoring of the prone position are nursing responsibilities, making complication prevention and identification essential.
S7	Ryan et al (2021)[10] USA	Observational cohort	Five-professional team. Repositioning every 2 hours; ETT securement and cuff pressure check before and after each turn. Monitoring of vital signs and skin integrity.	The protocol enabled safe execution without unplanned extubations or pressure injuries.
S8	Binda et al (2021)[8] Italy	Observational	Minimum team of five professionals; head alternation; eye care; oral hygiene; ETT securement; dressing application; enteral nutrition pause; cuff pressure verification; log-rolling; swimmer's positioning; repositioning every 2–4 hours; foot dorsiflexion; monitoring of SpO_2, capnography, and invasive blood pressure. Electrocardiogram; restarting the diet; pressure injury assessment; airway suctioning; line and tube securement; reintubation equipment.	The protocol and team training allowed the maneuver to be performed with few complications; training in high-demand scenarios is recommended to optimize resources.
S9	Ng et al (2020)[20] London	Case report	Medication administration; care of extension lines, arterial lines, and catheters; positioning; wound care; and skin protection.	A trained team favored the safe implementation of proning, with positive evaluation by the professionals.
S10	Intensive Care Society (2019)[21] London	Clinical guideline	Adequate number of professionals; difficult airway cart; ETT securement; closed-circuit airway suctioning; pre-oxygenation; arterial blood gas analysis; suspension of non-essential infusions and monitoring; adequate sedoanalgesia; muscle relaxant; skin assessment; eye care; diet suspension; chest tube care.	Proning requires rigorous nursing care to prevent complications, ensure patient safety, and optimize clinical outcomes.

(the Figure 3 continue in the next page...)

N	Author, year, country	Method	Main care practices performed during patient proning	Conclusion
S11	Oliveira et al (2017)[22] Brazil	Qualitative	Pausing the diet; opening the nasoenteral tube two hours beforehand; pausing continuous hemodialysis; ensuring airway suctioning; checking ETT securement and cuff pressure; pre-oxygenating with 100% FiO_2; ensuring analgesia, sedation, and neuromuscular blockade; testing equipment, emergency cart, and intubation kit; skin and eye care; positioning and checking pillows; team positioning; adjusting ETT positioning; repositioning invasive devices and electrodes; maintaining the swimmer's position with alternation every 2 hours; reverse Trendelenburg.	Applying a checklist during the maneuver added reliability and safety. Patient safety and team training are necessary for its success.
S12	Oliveira et al (2016)[23] Brazil	Descriptive	Minimum team of 5 professionals; ETT securement, cuff pressure; closed suction system; pre-oxygenation at 100% FiO_2; skin protection; pillows; reverse Trendelenburg; alternating swimmer's position every 2 hours; pausing enteral nutrition; head-of-bed elevated at 25°; continuous monitoring of SpO_2, hemodynamics, and pressure points.	Early and prolonged proning reduces ARDS mortality when combined with protective ventilation, with few complications when managed by a trained team.
S13	Drahnak; Custer (2015)[24] France	Clinical guideline	Team of four to six people; airway and device care; skin protection; pressure points; eye and ear care; swimmer's position; alternating every 2 to 4 hours; monitoring vital signs, respiratory parameters, and skin; observing for complications and device dislodgment.	Proning can significantly improve oxygenation and outcomes when initiated early.

S: Study; ETT: Endotracheal tube; FiO_2: Fraction of Inspired Oxygen; SpO_2: Peripheral Oxygen Saturation; ARDS: Acute Respiratory Distress Syndrome

Figure 3 – Synthesis of selected studies. Florianópolis, SC, Brazil. 2025

The included studies allowed the identification of a set of nursing care practices related to assisting patients in the prone position. The figure below presents a synthesis of the identified nursing care practices, distributed by category and accompanied by descriptions of the corresponding interventions (Figure 4).

Care category	Intervention descriptions
Nursing assessment	Vital sign measurement (monitoring heart rate, respiratory rate, temperature, and invasive blood pressure), checking the positioning of monitoring devices (electrodes in prone and supine positions and the invasive pressure transducer); assessment of gastric residual volume prior to the maneuver, following the suspension of the enteral diet[7,10,18-19,21-24].
Complications assessment	Verification, both before and after the supination maneuver, of the occurrence of pressure injuries, facial edema, drug extravasation, catheter lumen dislodgment and obstruction, aspiration, and accidental extubation[5,7,18].
Skin assessment	a) skin inspection in areas with bony prominences, such as knees, ankles, elbows, and face, before and after each repositioning; assessing the skin under medical devices and repositioning them[7,9-10,16,18,20,23-24]; b) Pressure injury prevention: repositioning every 2 hours, using pillows and/or cushions for pressure redistribution; applying prophylactic silicone or thin hydrocolloid dressings over bony prominences[8-9,16,18,20,22-24]; c) Securement: assessment of the labial commissure, endotracheal tube securement before and after the maneuver; evaluation of tube length and securement; vascular catheter securement[8-10,16,18-19,21-24]; d) Cuff pressure: verifying the endotracheal tube cuff pressure, maintaining it between 20-30 centimeters of water, prior to the maneuver and at each mobilization[8,10,19,22-23].
Reintubation equipment and emergency cart	Keep an endotracheal tube, laryngoscope, guidewire, and the emergency cart near the bedside during the proning maneuver[8,19,21-22].
Sedation and neuromuscular blockade	Ensure the patient is deeply sedated, verify the dosage, the need for a sedative bolus, and the use of neuromuscular blocking agents[19,21-22].
Pre-oxygenation	Pre-oxygenate the patient with 100% FiO_2 for at least 10 minutes before proning, particularly in cases with a risk of desaturation[19,21-23].
Arterial blood gas analysis	Perform arterial blood gas sampling before and after the proning maneuver, and document the results to evaluate the effectiveness of mechanical ventilation[21].
Suctioning equipment	Check the vacuum system, use a closed system, keep suctioning equipment open and accessible, and suction the patient prior to the proning maneuver[7,21,23].
Head-of-bed elevation	Maintain the head-of-bed elevated between 15° and 30° until the proning is executed[7,23]; while in the prone position, utilize the reverse Trendelenburg position[22-23].

(the Figure 4 continue in the next page...)

Care category	Intervention descriptions
Eye care	Prior to the maneuver, perform an eye assessment, clean with gauze and saline, lubricate, and tape the eyelids shut to prevent corneal abrasion, ulcers, and keratitis[8,16,21-22,24].
Oral hygiene	Perform daily oral hygiene with 0.12% chlorhexidine. Oral hygiene helps reduce the microbial load lingering in the oral and subglottic cavities[8,18].
Enteral nutrition	Suspend the enteral diet one hour before proning and restart it after the maneuver is completed[8,16,21-23].
Patient positioning	a) reposition the patient in the swimmer's position every 2 to 4 hours[7,10,17,20,24]; b) use of pillows: utilize cushions and pillows for patient repositioning across the thorax, pelvis, and upper and lower limbs for pressure relief[7,9,17-18].
Team staffing for the maneuver	a) the involvement of at least five professionals is necessary: one at the head of the bed (usually the physician responsible for the airway and maneuver coordination) and two on each side (physical therapist, nurse, and nursing technicians), responsible for enveloping the patient and executing the turning maneuvers[8,10,17,19,21-24]; b) Log-rolling: perform a log-roll using double sheets (one under and one over the patient), placing pillows on the pelvis and thorax, and executing the turn in three stages: lateralization, rotation, and final adjustment[8].
Team training	Promote prior training focused on team safety and action standardization for prone positioning[16-17,20].

Figure 4 – Synthesis of nursing care related to the prone position. Florianópolis, SC, Brazil. 2025

Discussion

Upon analyzing the studies, a predominance of publications during the COVID-19 pandemic period was observed, emphasizing the multidisciplinary team's care during the prone positioning of ARDS patients as a fundamental therapeutic strategy in their management. In this scenario, recommendations intensified[21] regarding the care delivered by the multidisciplinary team during the maneuver's execution, reinforcing its role in improving oxygenation and patient safety.

Nevertheless, it is recognized that the prone position is an effective strategy capable of improving oxygenation in cases of acute respiratory failure, particularly in COVID-19 patients [5-6]. However, its use requires a careful evaluation of the nursing team's care, making continuous monitoring of vital signs and respiratory, circulatory, and neurological parameters indispensable to quickly identify significant clinical and hemodynamic alterations[25-26].

Regarding skin-related care in the prone position, a predominance of recommendations aimed at pressure injury prevention and device securement was identified. Pressure injury prevention presents more structured descriptions in the literature, including interventional studies[8], while device securement, despite being covered by more publications, proved heterogeneous in its adopted recommendations[16,23].

Conversely, skin assessment and cuff pressure monitoring, while widely described in the literature, exhibit variations in recommendations and operational methods. These findings reinforce the importance of organizing and systematizing these practices within the context of nursing care[27].

Critical patients on mechanical ventilation in the prone position are at a high risk of compromised skin integrity, demanding systematic skin assessment, especially in high-pressure areas like the face, thorax, and knees. Adopting preventive interventions, such as protecting bony prominences and using prophylactic dressings under medical devices, helps reduce the incidence of pressure injuries, reinforcing the importance of standardizing care protocols in nursing practice[28-29].

Furthermore, medical device securement can hinder proper skin inspection[30]; therefore, the use of prophylactic foam or hydrocolloid dressings under contact points is recommended to prevent device-related pressure injuries in proned patients[31].

Care related to enteral nutrition includes temporarily suspending the diet before the maneuver and restarting it post-repositioning, serving as strategies to reduce the risk of aspiration and food intolerance in critical patients[16,21-23]. Gastrointestinal tolerance monitoring and the adoption of preventive measures—such as individualized risk assessment, maintaining head-of-bed elevation between 10° and 30°, and using the reverse Trendelenburg position during proning—

are highlighted, contributing to a reduction in gastric reflux, aspiration, and other complications associated with enteral nutrition in mechanically ventilated patients[32-36].

Regarding care related to maintaining the cuff pressure between 20-30 cmH_2O, especially prior to proning and at each bed mobilization, systematic manometric monitoring and standardized checks during the peri-proning period are highly recommended[8,10,19]; this practice aims to balance the risk of microaspiration against airway injury[22-23].

In this regard, maintaining appropriate endotracheal tube cuff pressure in adult proned patients is essential to guarantee ventilation efficacy and prevent Ventilator-Associated Pneumonia (VAP) and enteral diet aspiration, with measurement recommended at every patient mobilization[10,22]. Monitoring cuff pressure following interventions and mobilization reveals a high frequency of values exceeding 30 cmH_2O, which are associated with an increased risk of tracheal injury and aspiration[37].

It was also found that recommendations ensuring deep sedation, the need for a sedative *bolus*, and the use of neuromuscular blocking agents during proning are strategies that favor mechanical ventilation adaptation and prevent movements that compromise the airway[19,21-22]. Using neuromuscular blocking agents, preferably for short periods and coupled with deep sedation, enhances patient safety during the maneuver[38]. Administering these drugs requires strict vigilance, given the possibility of complications like agitation and ventilator disconnection[38-39].

The recommendation to keep emergency reintubation equipment at the bedside during the maneuver was identified as an anticipatory preparation strategy for safely executing the procedure. This practice aims to reduce the risk of adverse events, such as accidental extubation or airway failure [8,19,21-22].

In complication scenarios, readiness for reintubation is an essential measure against the increased risk of accidental extubation or tube obstruction. Keeping the emergency cart and airway equipment immediately accessible is recommended, as reintubation in the prone position is technically challenging and demands a rapid, coordinated team response[40].

Performing arterial blood gas analysis before and after the proning maneuver is crucial to monitor mechanical ventilation effectiveness and the patient's clinical response[21]. Arterial blood gas analysis is vital for assessing oxygenation, ventilation, and acid-base balance, guiding ventilatory adjustments, evaluating the response to the prone position, and identifying complications early[41].

Pre-oxygenation is also an essential care step prior to the proning maneuver. Ensuring adequate oxygenation levels before the position change is recommended, since manipulating the patient can trigger hemodynamic instability and hypoxemia. Elevating FiO_2 to 100% immediately prior to proning, even for brief periods (3 to 5 minutes), is indicated to build an oxygen reserve and mitigate risks during mobilization[42-43].

Regarding checking the vacuum system, using closed systems, and suctioning the patient prior to proning, these measures are outlined as strategies to reduce the risk of tube obstruction and respiratory complications. Such care practices frame suctioning as a preventive measure during proning[7,21,23]. Before the maneuver, tube suctioning is essential to prevent obstructions and complications such as VAP. Verifying the suction system must be ensured to reduce contamination risk, prevent loss of positive end-expiratory pressure, and facilitate the procedure in proned patients, while subglottic suctioning helps lower VAP incidence[44].

Eye assessment, cleaning with gauze and saline, lubrication, and eyelid occlusion prior to proning are described as preventive care to reduce complications like corneal abrasion, ulcers, and keratitis, particularly given the elevated risk of ocular injury linked to deep sedation and prolonged mechanical ventilation time[8,16,21-22,24,34,36].

The recommendation to perform daily oral hygiene with 0.12% chlorhexidine is outlined as nursing care aimed at reducing the microbial load in the oral and subglottic cavities, aiding in respiratory complication prevention in critical proned patients[8,18,35].

Adequate team staffing for the proning maneuver, with a minimum participation of five professionals distributed between the head and sides of the patient, is described as a strategy for safe execution. Log-rolling, employing double sheets, pillows, and a three-stage turn, is utilized to reduce complications such as accidental extubation, joint trauma, and hemodynamic instability[8,10,17,19,21-24].

The literature recommends that the proning maneuver be performed by a team of at least five professionals, ensuring safety. Techniques such as log-rolling with double sheets and a three-stage turn, coupled with the "swimmer" posture and head and limb repositioning every 2 to 4 hours, are effective measures to mitigate risks of accidental extubation, trauma, pressure injuries, facial edema, and nerve damage[45-46].

However, in the clinical practice of many ICUs, particularly in scenarios of overload or staffing shortages, the availability of this number of professionals is not always feasible. In such situations, limited staffing can compromise the maneuver's safety and increase the risk of adverse events like device dislodgment or accidental extubation[10,20,45-46]. Standardizing protocols with clear role definitions among team members and conducting prior training are strategies that bolster safety during proning execution, even in resource-limited contexts[8,10,20].

Finally, the recommendation to promote prior team training, focused on safety and action standardization during prone positioning, stands out as a strategy to reduce errors, optimize maneuver execution, and prevent complications[17-17,20]. Prior training, continuing education, simulations, and the use of *checklists* are described as measures aimed at patient safety and maneuver standardization[20,46].

Study limitations

This study presents as limitations the methodological heterogeneity of the included studies and the concentration of publications during the COVID-19 pandemic—factors that may restrict the generalizability of the findings by tailoring them to a specific context, rather than reflecting other clinical scenarios. Additionally, no formal assessment of the methodological quality or risk of bias of the included studies was performed, which may pose a limitation in interpreting the synthesized evidence.

Contributions to practice

This study's contribution involves systematizing nursing care for adult patients on mechanical ventilation in the prone position. By synthesizing safe practices and evidence-based recommendations, the findings provide a foundation for standardizing care protocols, strengthening clinical decision-making, and enhancing critical patient safety. It is recommended that future research evaluate the implementation of standardized protocols and their impact on clinical outcomes in critical patients undergoing prone positioning. Such aspects can guide future research and contribute to advancing care in intensive care units.

Conclusion

Nursing care practices related to the prone position were identified, particularly those focused on patient safety and complication prevention in adults on mechanical ventilation. Interventions linked to continuous monitoring, pressure injury prevention, proper invasive device management, cuff pressure maintenance, airway suctioning, attention to enteral nutrition, and eye care stand out as fundamental to qualifying care and minimizing adverse events. Systematizing these care practices contributes to the development of standardized care protocols and reinforces the importance of ongoing nursing team training, highlighting literature gaps that signal the need for further investigation on the topic.

Authors' contributions

Conception and design or analysis and interpretation of data: **Santos DS, Nascimento ERP, Malfussi LBH**. Drafting of the manuscript or critical re-

vision of intellectual content: **Amante LN, Manfrini GC, Sebold LF, Busanello MP**. Final approval of the version to be published, and all authors agree to be accountable for all aspects of the manuscript to ensure that issues related to accuracy or integrity are properly investigated and resolved. **Santos DS, Nascimento ERP, Malfussi LBH, Amante LN, Manfrini GC, Sebold LF, Busanello MP**.

Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

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