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**Nurses' Perceptions of Caring for Patients in the Prone Position**

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Senior Undergraduate Honors Thesis

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### Abstract

**Introduction:** Prone positioning has been used for decades to supplement the treatment of patients diagnosed with Acute Respiratory Distress Syndrome (ARDS). The effects it has on improving lung aeration, reducing compression, and increasing alveolar recruitment, have become evident through continued research. As a result of the H1N1 and COVID-19 pandemics, proning has become a popular and effective adjunct to treatment. Despite its increased use, there continues to be minimal research regarding nurses' perceptions of the maneuver and patient care.

**Objectives:** The purpose of this study is to understand the perceptions of nurses caring for patients in the prone position. Identifying implications and considerations for practice can guide improvements in patient care, outcomes, and future research. **Methods:** A questionnaire was created using similar questions from a 2001 study with approval from authors McCormick and Blackwood. The questionnaire was shared online with critical care nurses. The final sample consisted of 99 critical care nurses who met inclusion criteria. Data were analyzed by descriptive statistics. **Results:** The results showed a general understanding of how to perform the maneuver. Participants reported concerns related to inadequate staffing and difficulty performing the maneuver. Additional concerns included troubles caring for prone patients, particularly related to patient injury. Ultimately, many respondents voiced the need for implementation of evidence-based guidelines. **Conclusion:** From the data collected and a review of recent literature, the primary recommendations for practice are the development of foundational guidelines relative to the technique, patient care, and prevention of complications. Future research should address prevention of complications.

*Keywords:* acute respiratory distress syndrome, ventilation, prone position, nursing

## Nurses' Perceptions of Caring for Patients in the Prone Position

### Introduction

Prone positioning is the technique of placing patients with breathing difficulties on their stomachs, face-down, in a flat lying position to improve gas exchange in the lungs (Hadaya & Benharash, 2020). The knowledge of mechanics associated with this position are important in order to fully understand how and why this can be an effective treatment modality. When a patient is supine, the weight of the heart, lungs, and abdominal viscera increase the pleural pressure, reducing the pressure in dorsal lung areas. In patients with Acute Respiratory Distress Syndrome (ARDS), the ventral-dorsal pressure gradient is increased, which reduces ventilation capabilities in dependent dorsal regions (Scholten et al., 2017). For effective ventilation to occur, the alveolar pressure must be greater than the pleural pressure. Ultimately, when a patient is placed in the prone position this “reduces the pleural pressure gradient from nondependent to dependent regions, in part through gravitational effects and conformational shape matching of the lung to the chest cavity (Scholten et al., 2017, p. 216 ),” producing improved lung aeration of the larger posterior surfaces of the lung, reduced compression, and increased alveolar recruitment.

Based on this knowledge and through expansions in science and medicine, the understanding surrounding implications and use of the prone position have developed. Additionally, due to the occurrence of the 2009 Influenza A (H1N1) pandemic and current COVID-19 pandemic, the search for effective treatment for ARDS has surged. From these worldwide events proning has become a popular and effective adjunct to treatment with a decline in the rate of associated complications (Guerin, 2017).

While current literature addresses the use of the prone position, a gap exists in the understanding of nursing perceptions regarding this modality of care. The aim of this mixed-methods study is to understand the perceptions of critical care nurses related to caring for patients in the prone position, with the objective of identifying implications and considerations for nursing practice. These findings can be used to guide and improve patient care, outcomes, and future research.

### **Background**

The use of the prone position in medicine dates back to the 1970s as a salvage therapy for refractory hypoxemia. More recently it has been used as a strategy to improve oxygenation in patients with acute respiratory failure (Scholten et al., 2017). In addition to this short-term effect, studies have shown that this position is effective in significantly reducing mortality in patients with severe respiratory distress (Scholten et al., 2017).

### **History of and Research on Use of the Prone Position**

Following the H1N1 outbreak, a 2013 prospective, multicenter, randomized controlled trial (RCT) by Guerin et al. (2013), *Prone Positioning in Severe Acute Respiratory Distress Syndrome* (PROSEVA), assessed the effectiveness of the early application of prone positioning in patients with severe ARDS. Severe ARDS was defined by a ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen ( $\text{PaO}_2:\text{FiO}_2 \leq 150$ ,  $\text{FiO}_2 \geq 0.6$ , or positive end-expiratory pressure (PEEP)  $\geq 5$ cm of water (Guerin et al., 2013). The trial assigned approximately half of its participants to a prone group while the other half were used as the control group and kept in the supine position. Patients assigned to the prone group were placed in the position within 24-33 hours of being intubated and kept in the position for at least 16

consecutive hours (Guerin et al., 2013). Within the first week the PaO<sub>2</sub>:FiO<sub>2</sub> was significantly higher and the PEEP and FiO<sub>2</sub> were significantly lower in the prone group. The results showed a 16% decrease in 28-day mortality rate and 17% decrease in 90-day mortality rate, within the prone patients. This study concluded that patients with severe ARDS had significantly decreased mortality rates when placed in the prone position early in treatment and for long sessions, compared to the control group (Guerin et al., 2013).

Similar results have been recorded through systematic reviews and meta-analyses of numerous RCTs (Bloomfield et al., 2015; Mora-Artega et al., 2015; Munshi et al., 2017; Teng et al., 2018). The reviews looked at RCTs comparing prone and supine positioning among adult (18 years and older) patients diagnosed with ARDS. Each review concluded that the use of the prone position in patients with severe ARDS effectively decreased mortality rates when used for extended periods of time, early in treatment.

The review by Bloomfield et al. (2015) included nine RCTs, enrolling over 2,000 patients with moderate to severe hypoxemia. Overall findings showed a reduction of mortality, in favor of the prone position, however, the result was not statistically significant. Authors further stratified patients into subgroups and found statistically significant mortality rate reductions in patients recruited within 48 hours of meeting criteria, patients placed prone for at least 16 hours per day, and patients with severe ARDS. Authors describe a 40.6% short-term mortality rate in the prone group, compared a rate of 50.1% in the supine group. Similar findings were reported relative to long-term mortality, with a rate of 41.5% in the prone group and 54.7% in the supine group. From the review, authors noted an increase in pressure sore occurrence (RR of 1.37) and tracheal tube obstruction (RR of 1.78). Authors described the positive effects the prone position

can have on patients with severe ARDS and implications for future research regarding associated complications (Bloomfield et al., 2015).

Mora-Artega et al. (2015) also assessed the effect of prone positioning on mortality rate, as well as adverse effect occurrence. Cumulative findings from the seven RCTs showed a statistically significant decrease in mortality among patients who were placed prone for twelve or more hours per day. The OR for this event was 0.6 with a p-value of 0.002. Additionally, when patients were placed in the prone position within 45 hours after initiation of mechanical ventilation, a greater outcome was observed with an OR of 0.49 and p-value of 0.0001 (Mora-Artega et al., 2015).

Similar to other studies, increased adverse effects were associated with the prone position. Pressure sore occurrence was the most common, followed by ventilator-associated pneumonia, orotracheal tube obstruction, accidental extubation, venous access loss, pneumothorax, and displacement of orotracheal tube. A statistically significant increase in occurrence was found with pressure sores and orotracheal tube obstruction. Authors concluded that while this intervention may provide reductions in mortality rates, it does pose some risks (Mora-Artega et al., 2015).

Munshi and colleagues (2015) identified eight RCTs, also comparing mortality rates between prone and supine patients. The resulting RR from their data was 0.84, which did not demonstrate statistical significance. Looking into subgroups, authors found that when patients were placed prone for 12 or more hours per day, mortality was significantly decreased (RR 0.74). Authors note the benefit from prone positioning was present in patients with more severe hypoxemia, likely due to, "more severe and heterogenous lung injury and greater ventilation-

perfusion heterogeneity in dependent lung zones when supine” (Munshi et al., 2017, p. S286). Authors also reported an increase in pressure sores by 75 per 1,000 patients and an increase in endotracheal tube obstruction by 74 per 1,000 patients, both compared to patients in the supine position. This data again highlighting the effective reduction in mortality is not without complications. The authors recommend further research on the causes of these complications and interventions to decrease their occurrence (Munshi et al., 2017).

Teng et al. (2018) compared mortality rates and PaO<sub>2</sub>:FiO<sub>2</sub> in patients in prone versus supine positions. Through reviewing six RCTs, authors noted a significant decrease in mortality in patients placed in the prone position. The resulting OR was 0.59, with a p-value of 0.009. Additionally, a more rapid recovery of pulmonary function was found in the prone group who had a significantly higher PaO<sub>2</sub>:FiO<sub>2</sub> on Day 4, with a mean difference of 24.4. Authors concluded that prone positioning is effective in decreasing mortality which is evidenced by vast improvements in PaO<sub>2</sub>:FiO<sub>2</sub> (Teng et al., 2018).

From these articles it is clear that the prone position can be effective in decreasing mortality rates in patients with severe ARDS when compared to traditional supine positioning. Statistical significance was found particularly in patients who were placed prone early in treatment and for at least 12 hours per day. Complications such as tube obstruction and displacement, as well as pressure injury were identified. Tubing issues were considered to be associated with turning patients, increased inspissated secretions, or kinking due to unusual positioning (Bloomfield et al., 2015). With this knowledge, Scholten et al., (2017) recommend prophylactic preoxygenation prior to position changes. It is also recommended that staff focus

on preventing pressure injuries through offloading and position changes, paying close attention to the face, shoulders, and pelvis (Scholten et al., 2017).

Berry (2015) presents a case study of patient “T”, a middle-aged male who presented with shortness of breath, escalating to the need for emergent intubation and ventilation. The patient was found to have severe ARDS. Over the course of three days, ventilator and paralytic weaning were both unsuccessful. On the seventh day of ventilation, the patient was proned. The author explains immediate improvements in aeration within both lungs following the initiation of pronation. 36 hours into pronation, the patient was able to be positioned supine for nine hours without decompensating and prone positioning was discontinued. Three days later the patient was extubated without difficulty, transferred out of the critical care unit, and discharged from rehabilitation 30 days after being admitted, without any mental or physical deficits that would impact daily living or work. The author reflects on the events that occurred and mentions the increased benefit that may occur if pronation is initiated earlier, potentially resulting in decreased ventilator days (Berry, 2015).

A more recent study by Coppo et al. (2020) looked at the effects of prone positioning in non-ventilated patients diagnosed with COVID-19. The single-center, prospective, feasibility, cohort study enrolled patients who had been diagnosed with COVID-19-related pneumonia, requiring supplemental oxygen or non-invasive continuous positive airway pressure. Findings showed that prone positioning resulted in statistically significant improvement in participants' oxygenation (Coppo et al., 2020). In addition to study findings, the authors discussed similar studies that had comparable results such as that of Ding et al. (2020) and Caputo et al. (2020). Ding et al. (2020) found that prone positioning in patients with moderate-to-severe ARDS helped

reduce the incidence of intubation while improving pulmonary function (Coppo et al., 2020). Caputo et al. (2020) also found that when patients diagnosed with COVID-19 were placed in the prone position, this resulted in significant improvements in peripheral oxygen saturation (Coppo et al., 2020). This finding is important as although proning is most typically used in ventilated patients, these initial data suggest that proning may become more utilized in non-critical care patients.

### **Procedure of Prone Positioning**

Based on this knowledge it is apparent that prone positioning is a substantial adjunct to current treatment. Due to this, it is imperative that nurses have adequate understanding of how to implement this evidence-based intervention. In a cross-sectional study, McCormack and Blackwood (2001) explored nursing experience with prone positioning. Their study included a two-part questionnaire: gathering demographic data and six open-ended questions which addressed the proning, including technique of turning, problems encountered, and perceived advantages. The questionnaire was sent to registered nurses in four large Intensive Care Units (ICUs) resulting in a sample size of 121 (McCormack & Blackwood, 2001).

Authors discussed participant reports of the turn in detail. First, a leader would be identified to plan and coordinate the turn. While participants reported greater management when the coordinator was not involved in the turn, they also explained this was not always feasible in practice. A physician was reported to manage the patients head, tubes, and coordinate the turn. The number of staff required for the turn varied, ranging from five to eight, with five being the most common. The turn was then described as a two-stage process where the patient would be moved onto their side, moved across the bed, and then lowered to their abdomen. A lack of

guidelines was mentioned as authors explain, “the body position whilst prone was based on general principles such as maintaining access to the head and tube” (p. 335). A common final position was described with the patient’s head facing the ventilator, one arm bent up and the other straight. It was also mentioned that the head would be kept in one position due to fear of tube displacement (McCormick & Blackwood, 2001).

During the turn, participants reported problems related to manpower, arterial/venous lines and drains, and endotracheal tubes. Results show the most common problem being the technique of turning. Despite the problems, participants mentioned improved oxygenation, pulmonary gas distribution, and removal of secretions, as well as decreased respiratory support, as advantages of the position. Four nurses however, reported no perceived advantages and explained it was rather stressful for the nursing staff. Caring for prone patients was another area of interest as numerous problems were identified with 94% of participants reporting difficulties. 49% reported pressure sore development, 34% reported accidental injury, and 32% reported difficulty performing procedures. 11% of participants reported not encountering any problems while prone (McCormick & Blackwood, 2001).

The study determined that difficulties were experienced related to “the maneuver, including the timing of the move, number of personnel and the co-ordination required.” (McCormick & Blackwood, 2001). Additional problems were discovered related to pressure areas, suctioning, accidental injuries, and emergency management. Nursing-specific knowledge deficits were also identified through this study. From this study it was concluded that there were clear gaps in guidelines for turning and caring for patients in the prone position and a great need for teaching and training in order to improve the effectiveness of this intervention. Due to the

increased use of the position and advancements in technology and medicine since this study was completed, it can be hypothesized that if their questionnaire was completed by ICU nurses today, results may differ.

## **Methods**

### **Survey Development**

With approval from McCormick and Blackwood, questions from the 2001 study were utilized. A two-part questionnaire was created using UNH Qualtrics software. The study collected qualitative and quantitative data to allow for greater capture of information, characteristics, and attitudes of participants, while avoiding generalizations that may be associated with alternative study methods. A phenomenological design was used to evaluate nurses' perspectives regarding the care of patients in the prone position, including their personal comfort, knowledge, and common obstacles associated with nursing care. The use of this design assisted in the focus on self-reported nursing experiences. Additionally, the questionnaire was set to "Anonymize Responses" in order to maintain anonymity, and did not collect any identifying information, including IP address.

The first part of the questionnaire included questions regarding nursing experience, degrees and certifications achieved, and prior care of patients in the prone position. Participants who reported caring for a patient in the prone position were brought to part two of the survey. This section included open-ended and select all that apply questions to gain information regarding who is "in charge" of proning, how patients were turned, problems encountered during turning or while the patient was prone, and perceived advantages associated with the use of this

position. The study protocol was reviewed and approved by the University of New Hampshire Institutional Review Board (IRB #8421).

### **Sample**

The target population for this study was registered nurses working in a critical care setting with experience caring for patients in the prone position. The study's accessible population included nurses who were part of the Facebook groups, "Trauma ICU/Critical Care Medicine" and "UNH Nursing". Inclusion criteria for this study consisted of male or female, English-speaking nurses from any ethnic background with proning experience in the United States, and completion of parts one and two of the questionnaire. There was no incentive or compensation for participation. After gaining consent from the UNH IRB, the Qualtrics questionnaire link was shared to the Facebook nursing groups. Participants accessed from the posted link and completed the questionnaire. In total 201 possible participants completed the inclusion criteria questions.

### **Procedures**

Upon accessing the questionnaire, a letter of informed consent appeared before participants could begin, informing them of the study's aim, how their responses would be used, and risks and benefits associated with questionnaire completion. If participants declined consent, they were thanked for their time. If participants gave consent, they began the questionnaire which gathered background information including their highest level of education, certifications and qualifications, nursing experience, and experience in caring for patients in the prone position. Of the 201 total participants, 99 respondents met inclusion criteria. Two participants were excluded due to not having experience nursing prone patients. The remainder of excluded

participants did not complete the questionnaire in its entirety. See Appendix A for questionnaire and consent.

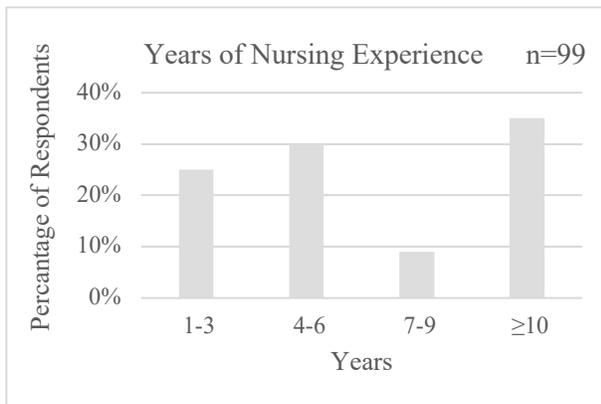
## Data

Data collection occurred between February 2021 and March 2021. Following data collection, information was stored on UNH Box, a secure online storage service. Data analysis was completed after collection concluded. Descriptive statistics were analyzed in order to gain an understanding of the respondent's experiences and further interpret and identify key themes. Thematic analysis was used to summarize the open-ended responses provided by participants. Data was then compared to prior research, specifically that of McCormack and Blackwood (2001). Results from the overall analysis were then used to address the study's aim, with the goal of improving the nursing process and patient care.

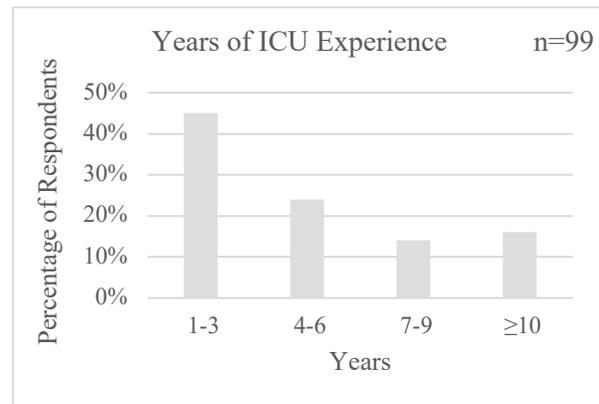
## Results

The demographic items gathered data about nursing experience, degree levels, and additional certifications. The average years of nursing experience within the group of participants was 8 years (SD=2.5). The average years of experience in a critical care setting was 6 years (SD=1.9). See *Figure 1* for dispersion of nursing experience and *Figure 2* for ICU experience. Of the included participants, 13% (n= 13) reported their highest level of education was an Associate's Degree in Nursing (ADN), 67% (n=66) reported earning a Bachelor of Science in Nursing (BSN), and 18% (n=18) reported earning a Master's of Science in Nursing (MSN). In addition to their degrees, 56% (n=55) of participants reported holding additional certifications in either trauma and/or critical care nursing, with 45% (n=45) specifically reporting critical care

nursing (CCRN) certification. Additional certifications included areas such as pediatrics, emergency medicine, cardiac medicine, and National Institute of Health stroke scale training.

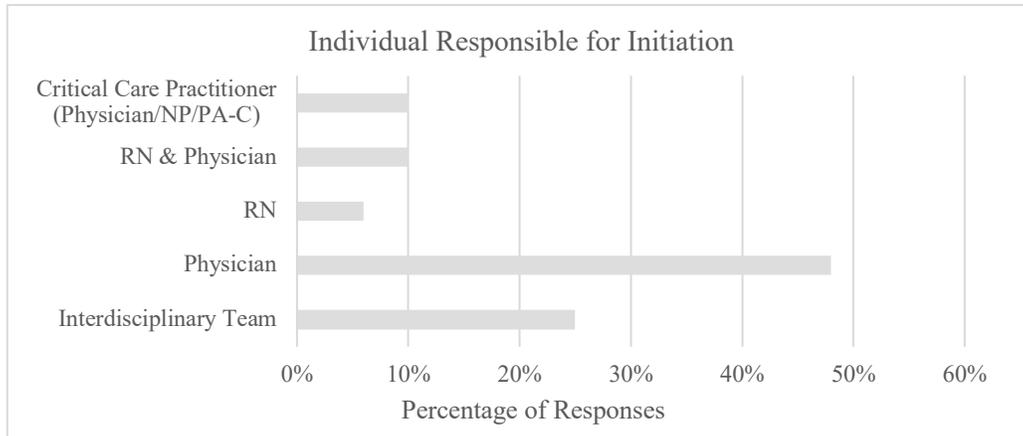


**Figure 1: Years of Nursing Experience**



**Figure 2: Years of ICU Experience**

Part two of the questionnaire gathered information about experiences related to proning patients, including the initiation, reason for positioning, the process, complications encountered, individual understanding, and additional comments or concerns related to proning. Regarding the initial idea of proning in the participants experience, 25% (n=25 ) reported it being a team effort put forth by mixed members of the interdisciplinary care team which consists of Registered Nurses (RNs), Respiratory Therapists (RTs), physicians, Nurse Practitioners (NPs), and Physician Assistants (PAs). One respondent described it as “a collaborative decision based on respiratory status, vent settings, and Arterial Blood Gases (ABGs)”. On the other hand, 48% (n=48) reported initiation by the physician alone, while some reported pronation would often be ordered by a physician, however, initiated by RNs and RTs. The majority of participants reported the use of proning as a medical intervention due to the dangers and “associated components”. See *Figure 3* for total responses.



**Figure 3: Individual Responsible for Initiation**

One participant explained that while physicians are commonly responsible for initiating the idea, they work with the RN to evaluate ABGs together and discuss possible outcomes for the patient if they decide to prone. Respondents also highlighted the importance of a physician or another professional capable of reintubating, being present for all turns in case of accidental extubation. Additionally, it was mentioned that “at different times different personnel have initiated the idea.” Usually anyone with a  $\text{PaO}_2:\text{FiO}_2 < 125$ , unresponsive to ventilator titrations, sedation changes, or paralytics gets prone so it’s part of our protocol that all team members are well versed in” and “the majority of decisions come from protocols lately if the patient meets criteria”.

Participants also reported numerous reasons for patients needing to be placed prone throughout their experiences. Many respondents reported it being used regularly for patients with ARDS, a  $\text{PaO}_2:\text{FiO}_2$  less than 150, or abnormal ABGs. Others specified different instances where this positioning was implemented including patients with suboptimal oxygenation despite having maximum ventilator settings, failure to progress with ventilator weaning while supine, evidence of poor lung compliance, persistent atelectasis and inability to ventilate optimally based on ABGs, or consistently low peripheral oxygen levels not improved with other interventions.

The next component of the questionnaire focused on the process of turning a patient to the prone position. Responses varied greatly, however key themes were identified in terms of preparation, role assignment, the physical turn itself, and repositioning thereafter. Preparation began by placing foam dressings over bony prominences (chin, forehead, shoulders, knees, iliac crests, etc.), taping eyes shut, taping endotracheal tubes (ETTs) and removing Ballard's to prevent breakdown, planning which direction the patient would be turned, disconnecting all possible lines and removing securement devices (e.g. those used for foley catheters). It was also noted that any gastric or oral feedings should be stopped at least one hour prior to the turn.

The number of staff needed to perform the turn also varied, ranging from four to seven team members. The most common reported number of individuals needed for the turn was five, with two being on each side of the patient, and one at the head of the bed. If additional members were available, they would be responsible for reading step-by-step instructions or monitoring the patient's hemodynamic status. The leader for the turn would need to be designated before beginning and this individual would be responsible for counting down to initiate the turn, to ensure all team members would perform in sync. This leader was reported as being a physician, RT, charge RN, or the RN assigned to the patient.

A common theme identified was that RT would be at the head of the patient's bed, holding the ETT and sometimes holding other lines. Two nurses or other trained assistive personnel would be on each side of the bed. The bed would be set to inflate maximally, and an absorbent pad would be placed over the patient's pelvis. The patient's body would be positioned strategically with one arm being kept down, against the body, while the arm on the side of the body of which the patient would be rolling towards, would be kept straight up. Pillows would then be placed over the patients' chest, thighs, shins, and hips before a flat sheet was placed over

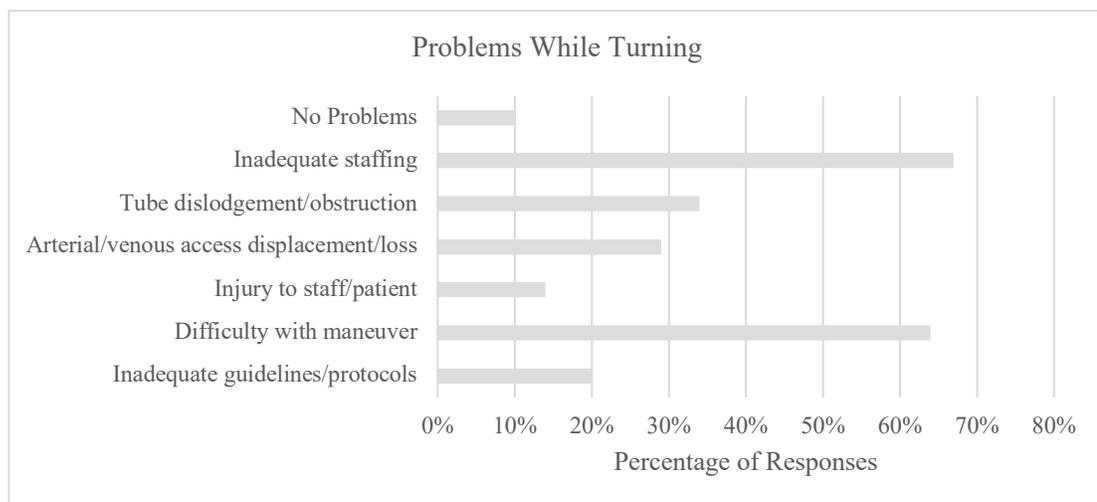
the anterior surface of the body. The edges of the sheet that were already under the patient, would then be rolled together with the new sheet on top of the patient, described as a “burrito”. The patient would then be slid horizontally, away from the side to which they would be turning (towards the ventilator) and on the leader's count, the patient would then be turned half-way, so they are in the lateral position. At this point there is a pause so lines and the ETT can be quickly assessed and cardiac monitoring electrodes can be removed from the chest and placed on the back. Once this has been done, the leader counts again, and the patient will be lowered to the prone position. From here, the lines and ETT should be assessed again, as well as the patient's response to the turn as evidenced by vital signs, oxygenation, and hemodynamic status.

Alternatively, participants reported the use of an automated proning bed to mechanically turn the patient, however this modality was only reported by 10% of respondents (n=10). It was also mentioned multiple times that due to the high number of individuals that need to be prone, particularly during the COVID-19 pandemic, there is often a lack of availability of these beds. Participants also reported the use of assistive devices such as the Molinlyke tortoise turning and positioning system and Prevalon sheets.

After the turn, patient positioning techniques were reported by numerous respondents. A common position mentioned was the “swimmers' position”. The arm on the side of which the head is facing should be extended upwards, while the other arm remains at the body-side. The knee on the side the head is facing should be flexed and brought upwards, abducting the leg. The use of a foam head piece with a hole in the middle to protect the patient's face was also mentioned. Every two hours the head was turned and the arms and legs readjusted to maintain “swimmers' position”. It was also reported that patients should be placed in the Reverse Trendelenburg position (15°-30°). The reported time patients spent in the prone position ranged

from 12-16 hours. One participant reported, “MD must be present to talk through what needs to be done next, like a code situation”. While this response and a previously mentioned response state that a physician or another professional capable of reintubating in case of accidental extubation, be present for all turns, some participants reported using only RNs and RT for the turn.

Participants were asked about complications encountered while turning the patient. The most common problem during the turn was inadequate staffing (64%, n=63). This issue was followed by reports of difficulty performing the turn itself (67%, n=66). Additional problems are reported in *Figure 4*. As shown in the Figure 4, 10% (n=10) did not experience any problems while proning patients.

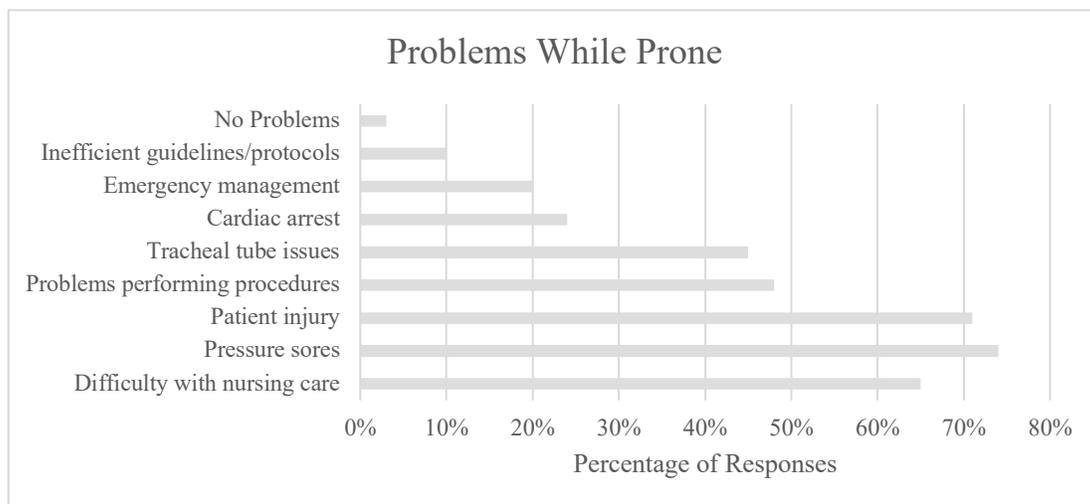


**Figure 4: Problems While Turning**

In addition to these complications, one individual also mentioned obstacles in their personal experience stating, “high peak pressures or patients not tolerating unless they have a RASS (Richmond Agitation and Sedation Scale score) of -3 or less, or with paralytics”. This indicates the high level of sedation some patients may require in order to endure the position. Further complications included emesis, inadequate staff training, and lack of supplies,

particularly that of proning beds. Lastly, the complication of patients going into cardiac arrest during the turn was brought up by two respondents. Due to the atypical position these patients may be in, beginning timely cardiopulmonary resuscitation (CPR) may present a challenge.

After considering the turn of a patient, the nurses were asked about problems encountered while the patient is prone. Pressure sores were the greatest problem with 74% (n=73) of the sample reporting this occurrence. In addition to pressure sores, the report of patient injury was 71% (n=70). Few (3%, n=3) encountered no problems while the patient was prone. *Figure 5* provides additional data regarding problems encountered while patients were prone. In addition to the listed problems, one participant explained, “tongue edema so bad the teeth cut into the protrusion which then became necrotic”. Another participant reported the occurrence of a spontaneous pneumothorax in a prone patient.



**Figure 5: Problems While Prone**

From the issues encountered, the participants were then asked about perceived advantages of placing patients in the prone position. There was repetitive mention of improvements in the pleural pressure gradient via gravitational effects, allowing for improved

alveolar recruitment in dorsal lung areas. Numerous participants also mentioned improvements in the loosening, mobilization, and drainage of dependent secretions. Other responses included improved aeration, gas exchange, ABGs, lung function, oxygenation, perfusion, and ventilation. Additionally, one participant explained the position allows for ventilation in “areas of the lungs that would otherwise be susceptible to persistent atelectasis”. This was also described in another response as “respite for some lung areas and utilization of others”. Conclusively, participants reported decreased mortality rates as a perceived advantage.

The final section of the questionnaire asked about any additional questions or concerns. The need for guidelines and protocols was mentioned by various participants, explaining, “we need more evidence-based protocols for nurses to follow so we don’t cause more harm to our patients”. Another concern was when to consider a patient as having failed the treatment. Furthermore, the concern of performing effective CPR was also brought up numerous times, highlighting the need for guidelines for code situations and additional education and training for other possible emergencies.

The use of proning beds was seen as a helpful tool that could decrease physical demand, however participants reported lack of access in their facilities. Additionally, fevers were a problem in patients proned using these beds, which were hard to manage due to the materials and padding required for the beds. Lack of staffing was mentioned repeatedly, with one participant mentioning, “in order to flip a patient it takes almost half of the staff we have on the floor”. Regarding this concern, another individual mentioned the need for administrative support in order to provide ample staffing for nursing care and the multiple turns that are required per day. The immense care these patients require was brought up with one participant who stated, “it is nearly impossible or should be impossible to care for more than one proned patient at a time.”,

explaining they would sometimes require care from two nurses. The issue regarding patient injury was also brought up, with one respondent stating, "Usually these patients have cardiovascular issues, requiring vasopressors which can also lead to ischemia and increased risk of pressure injuries". Lip ulcers, ocular damage, edema, and genital pressure sores were also mentioned as areas of concern. One participant commented, "Don't forget to tilt the hips to avoid pressure on genital areas and breasts. Pressure sores from Foley catheters on the genitals have been a problem".

A variety of concerns were reported included obesity, small body mass, and sedation. In concern for patient BMI, one nurse explained "obese patients may actually be harmed due to larger abdomens, causing increased abdominal thoracic pressures, therefore worsening oxygen delivery". Alternatively, a respondent mentioned their concern for "small patients with significant bony prominences". Additionally, one nurse stated, "they have to remain very heavily sedated in order to assure that they tolerate the prone position for approximately 16 hours at a time. Most of them are a have RASS of -4 which can make it difficult when it comes to weaning sedation and can cause further complications associated with prolonged paralysis, including decreased motor function". Finally, multiple participants mentioned the prone position being used as a "last resort", while they are aware when proning is initiated earlier, there are better outcomes. One comment stated, "I have seen patients who were not prone early in ARDS decompensate quickly to arrest".

### **Discussion**

This sample included critical care nurses with a range of experience and education. The experience ranged from novice to decades nursing in a critical care setting. The average amount of nursing experience being six years represents the competence the participants have within the

field. The majority of nurses had attained a BSN or higher. In addition to their degrees, the participants displayed advanced skills and knowledge within the area of critical care nursing, based on the 45% of nurses that reported holding additional critical care certification.

A majority of these participants felt that placing patients in the prone position was more so a medical treatment rather than a nursing intervention. This was reportedly due to the high acuity of patients and the complexity of care they subsequently require. However, as the data suggests, all team members should be aware of patients who meet criteria to be proned, in order to identify and implement proning as early as possible, increasing positive outcomes.

This study, completed 19 years after the work of McCormack and Blackwood, found that nurses reported detailed guidelines pertaining to the turn of the patient. With some variations, many participants reported teams of five healthcare professionals being used to turn patients, having one member at the head of the bed managing the airway, and two members on each side of the patient to perform the turn. This shows some improvement from the results of the 2001 study, as lack of guidelines regarding the turning process was a notable concern. Based on the responses it is apparent that there are institutional guidelines however, a lack of standard across practice. Despite the shared knowledge of turning guidelines, over 60% of participants still reported difficulty performing the maneuver. The data from this study suggests this issue may be related to lack of staffing, rather than a lack of understanding, based on inadequate staffing being the highest reported concern.

Only 3% of respondents reported encountering no problems while the patient was prone, indicating a significant area for improvement. Among the problems were: pressure sore development, patient injury, problems performing procedures, difficulty with nursing care, and emergency management. This suggests a need for improved guidelines and protocols,

specifically related to the care of prone patients. Current evidence also suggests the implementation of firm guidelines to allow for adequate nursing care and patient management.

A recent article, *Using in Situ Simulation to Develop a Prone Positioning Protocol for Patients with ARDS*, Montanaro (2021) details the implementation of prone positioning protocol and an educational program in an ICU. Montanaro explains the goal of the study being improved compliance with best practices for treating ARDS, a condition with mortality rates of up to 40% (Montanaro, 2021). A needs assessment was completed which assisted in the development of a policy and protocol for prone positioning which was further established through the use of in situ simulation. Throughout the process, a nursing checklist was created which included preparation, equipment, needed orders, and tasks to be completed before and after positioning. An additional step-by-step narrative was created for a nurse leader to use to direct the team during the maneuver. A video was also created with intended use for competency assessment. The immediate result of the training was a significant increase in confidence in not only turning the patient, but also managing them while prone. In addition to this, the procedure was able to be successfully performed with no adverse outcomes (Montanaro, 2021).

While this protocol is a step in the right direction, the inadequate staffing that has been reported also needs to be addressed. Furthermore, the use of five to six staff members, wearing full personal protective equipment (PPE) when turning or caring for these patients, creates an even greater burden (Cotton, 2020). Two recent publications explain techniques used to overcome the challenges relative to staffing issues experienced during the COVID-19 pandemic. Articles written by Cotton (2020) and Doussot et al. (2020) describe their implementations of a “prone team” to provide proper and efficient, evidence-based care to patients who meet the criteria to be prone. Cotton (2020) highlights the substantial need for additional education and

harmonization of care. Additionally, three team members are also needed every two hours to turn the patient. Even under normal circumstances this could be challenging, but especially during the pandemic due to shortages related to exposures, illness, and burnout (Cotton, 2020). The concept of a prone team is discussed as a way to alleviate the burden on the primary team, allow for safe positioning by a specialized team, and prevent adverse occurrences. The team, consisting of RNs, RTs, physicians and support staff can standardize care and support team members who have other responsibilities. Furthermore, the use of a “prone champion” is mentioned as a way to facilitate education and training, while being up to date on best practices, ensuring evidence-based practices are being used to avoid complications (Cotton, 2020).

Comparatively, Doussot and colleagues took on a similar intervention through their prospective cohort study (2020). In response to the COVID-19 pandemic, increase in ARDS cases, and subsequent staffing shortages, the authors discuss a designated team created for the proning of patients, which consisted solely of non-ICU staff. The authors discuss their practice as, “a safe and pragmatic reallocation of medical and surgical work force in response to an outbreak” (Doussot et al., 2020, p. e311). Their study began with the accelerated simulation-based training of 109 non-ICU staff volunteers which included surgeons, physicians, RNs, and physiotherapists. Through a 90-minute training course and creation of a systematic proning checklist, patients could be proned for 16 hours and supinated for 8, while avoiding complications. Despite the lack of experience with the technical aspects of prone positioning, fast dissemination of required knowledge was made possible through simulation training. Conclusively, authors explain, “this study demonstrates the feasibility and safety of reallocating health care work force to targeted medical tasks beyond their respective expertise” (Doussot et

al., 2020, p. e314). This article provides a great alternative, using non-ICU staff members to assist with proning needs, which may alleviate the already overburdened ICU staff.

While these interventions may assist with overcoming staffing concerns, participants voiced additional concerns. One common concern being the need for evidence-based protocols in regard to the turn and care of prone patients. Although the knowledge may be present and evidence is available, there seems to be a lack of translation into practice. Therefore, the need for interchangeable guidelines is warranted. Through facility acceptance of proning guidelines, education can ensue, and patient outcomes can improve.

### **Recommendations for Practice**

Implementing Evidence-Based Practice is imperative in order to improve patient outcomes. The data collected through this study pointed out some significant improvements in the implementation of guidelines in terms of proning patients and the care required thereafter. From this data and through recent evidence, the following guidelines are recommended:

- Patients should be prone within 12-24 hours after suspected ARDS when meeting criteria:  $PaO_2:FiO_2 \leq 150$ ,  $FiO_2 \geq 0.6$ , or  $PEEP \geq 5$ cm of water (Guerin et al., 2013).
- Preoxygenate patients for ten minutes with 100% O<sub>2</sub> (Oliveira et al., 2016).
- Include five team members consisting of RNs, RT, and a physician. Roles should be determined prior to initiating the turn.
- Eyes should be cleaned, lubricated with ophthalmic ointment, and taped shut (Oliveira et al., 2016).
- Apply foam dressings over bony prominences and pressure areas including knees, iliac crests, shoulders, and chin (Oliveira et al., 2016).
- Disconnect nasogastric or orogastric tubes and intravenous lines if possible.

- Secure necessary tubing and ensure lines are long enough to complete the turn (Oliveira et al, 2016).
- Individual at HOB should be responsible for the patient's head, ETT, additional lines, and guide the rest of the team.
- Apply an absorbent pad and sheet on top of the patient, rolling the edges of the top sheet and previously placed bottom sheet together.
- After designated leader initiates the turn, pull patient horizontally away from ventilator and turn laterally.
- While the patient is lateral, assess and move anterior cardiac electrodes posteriorly (Mitchell & Seckel, 2018).
- Continue to turn the patient prone, place patient in the "swimmers' position" and place a circular cushion under their face (Oliveira et al., 2016).
- Put bed in Reverse Trendelenburg position, between 15°-30° (Oliveira et al., 2016).
- Keep patients prone for 12-16 hours and supine for 8-12 hours (Guerin et al., 2013)
- Reposition patients' body and head every 2 hours, alternating swimmers' position (Oliveira et al., 2016).
- Consider turning the patient at designated times each day to allow for care and assessment to be completed.
- Discontinue when PaO<sub>2</sub>:FiO<sub>2</sub> is >150, FiO<sub>2</sub> is <0.6, and PEEP is <10cm of water, after the patient has been supine for at least 4 hours (Guerin et al., 2013).

Nurses should advocate for use of these evidence-based guidelines and for adequate staffing to alleviate the burdens of proning.

### **Limitations**

While the sample size provided an adequate representation of the perceptions in question for the purpose of this study, it may not be generalizable to the greater population. Additionally, half of the total participants were ineligible due to lack of questionnaire completion. This study took place amid the COVID-19 pandemic. Although it may have been conducted during a period with greater experience with proning, the staffing shortages, patient surge, and high prevalence of ARDS may have affected the contents of received responses. Future research should be completed in order to understand certain comorbidities that can affect patient outcomes, such as low or high body mass index and cardiovascular complications.

### **Conclusion**

In conclusion, this study has highlighted improvements in nurses' understanding of the technique of placing patients prone and perceived advantages of this modality of care. There continues to be a need for foundational guidelines relative to the technique and care of patients thereafter, as well as measures to prevent adverse effects. Through the increased prevalence of this positioning in medicine, a greater understanding has developed. The findings from this study can be used to guide and improve patient care, outcomes, and future research.

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## Appendix A

## Questionnaire Completed by Participants

**Nurse Perception of Caring for Patients' in the Prone Position**

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**Start of Block: Consent**

This consent form describes the research study and helps you to decide if you want to participate. It provides important information about what you will be asked to do in the study, about the risks and benefits of participating in the study, and about your rights as a research participant. You should:

- Read the information in this document carefully, and ask me or the research personnel any questions, particularly if you do not understand something.
- Not agree to participate until all your questions have been answered, or until you are sure that you want to.
- Understand that your participation in this study involves you to complete a questionnaire that will last about 30 minutes.
- Understand that the potential risks of participating in this study are minimal, including the potential risk of emotional distress associated with thinking of past experiences.

I plan to work with approximately thirty participants in this study. If you agree to participate in this study after reading this document, you will be asked to complete a web-based questionnaire which will ask you about prior experiences. There is no compensation for completing the questionnaire.

Although you are not anticipated to receive any direct benefits from participating in this study, the benefits of the knowledge gained are expected to create improvements in nursing care of patients in the prone position, resulting in improved patient outcomes.

Taking part in this study is completely voluntary. You may choose not to take part at all. If you agree to participate, you may refuse to answer any question. If you change your mind, you may stop participating at any time. Any data collected as part of your participation will remain part of the study records. If you decide not to participate or if you stop participating at any time, you will not be penalized or lose any benefits for which you would otherwise qualify.

I plan to maintain the confidentiality of all data and records associated with your participation in this research. However, any communication via the internet poses minimal risk of a breach of confidentiality. To help protect the confidentiality of your information, information will only be accessed by study personnel, data will be stored on a password protected computer, and no personal information will be asked for during the questionnaire. Study personnel include: my faculty advisors Clarissa Michalak, DNP, ACNPC-AG, CCRN, Kerry Nolte, PhD, FNP-C, and myself. Results from this study may be used in reports, presentations, and publications however, no identifiable information will be used.

If you have any questions about this research project or would like more information before, during, or after the study, you may contact Brianna Judkins at [bjj1005@wildcats.unh.edu](mailto:bjj1005@wildcats.unh.edu). If you have questions about your rights as a research subject, you may contact Melissa McGee in UNH Research Integrity Services at 603-862-2005 or [Melissa.McGee@unh.edu](mailto:Melissa.McGee@unh.edu) to discuss them.

Do you consent to participate in this research study?

- Yes, I consent to participate in this research study.
- No, I decline to participate in this research study.

*Skip To: End of Survey If This consent form describes the research study and helps you to decide if you want to participate... = No, I decline to participate in this research study.*

**End of Block: Consent**

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**Start of Block: Part 1**

*Display This Question:*

*If This consent form describes the research study and helps you to decide if you want to participate... = Yes, I consent to participate in this research study.*

Q1 How many years have you been a nurse?

- 1 year or less
- 2-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21 years or more

Q2 How much experience do you have working on a critical care unit?

- 1 year or less
- 2-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21 years or more

Q3 Please provide your title (ex: LPN, RN), and your highest level of education (ex: ADN, BSN, MSN)

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Q4 Please list any additional qualifications/certifications you hold (ex: CCRN, ICU course)

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Q5 Have you ever placed a patient in the prone position and/or cared for a patient in this position?

- Yes
- No

*Skip To: End of Survey If Have you ever placed a patient in the prone position and/or cared for a patient in this position? = No*

**End of Block: Part 1**

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**Start of Block: Part 2**

*Display This Question:*

*If Have you ever placed a patient in the prone position and/or cared for a patient in this position? = Yes*

Q6 When you were involved in the turn/care of a patient in the prone position, who initiated the idea and why? (ex: MD, NP, RN) and (ex: medical treatment vs. nursing intervention)

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Q7 Describe how you turn the patient from supine to prone/prone to supine (include aspects of the maneuver; control, manpower, technique, final position, individual in charge of the turn/tubing, number of staff needed, guidelines for final position?)

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Q8 Have you encountered any problems when turning patient to/from the prone position? (inadequate staffing, tubing, lines, injury, maneuver)

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Q9 Have you encountered any problems when the patient is prone? (difficulties with nursing care (ex: linens/oral hygiene), pressure sores, injury (facial edema, foot drop, corneal abrasions), problems performing procedures (CXR, dialysis, physiotherapy), tracheal tube problems (suctioning), loss of tube, cardiac arrest, emergency management, inefficient protocol, etc.)

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Q10 What do you perceive as the advantages of placing a patient in the prone position? (pulmonary gas distribution, secretion removal, respiratory support)

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Q11 Do you have any concerns/comments regarding the care of patients in the prone position

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End of Block: Part 2

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