Summer 2022

A Multi-modal Strategy to Activate Pronation for Acute Respiratory Distress Syndrome Patients

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DNP Manuscript Defense Approval

First Name: * Meredith Last Name: * McCrorie

Date: * 07/19/2022

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- ○ Adult-Gerontology Acute Care Nurse Practitioner (Doctor of Nursing Practice)
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Manuscript Title: * A Multi-modal Strategy to Ac

Date of Manuscript Approval: * 07/22/2022

Student Signature	Electronically signed by Meredith McCrorie on 07/19/2022 5:15:01 PM
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A Multi-modal Strategy to Activate Pronation for Acute Respiratory Distress Syndrome Patients

A DNP Project Submitted to the
Graduate Faculty
of Jacksonville State University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Nursing Practice

By

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Jacksonville, Alabama

August 5, 2022

Meredith N. McCrorie August 5, 2022

Abstract

Background: Acute Respiratory Distress Syndrome (ARDS) is an acute pulmonary process that compromises the health of patients in the Intensive Care Unit (ICU). ARDS can progress to irreversible fibrosis causing the lungs to become noncompliant, adversely affecting ventilation or gas exchange (Buckley et al., 2019). An ARDS diagnosis accounts for 30-40% mortality rate which is an improvement from 60% in the last two decades. The clinical course of this disease is highlighted by Acute Hypoxic Respiratory Failure (AHRF) evidenced by chest radiographs revealing bilateral dense consolidations. Manual pronation of ARDS patients has shown an increase in alveolar function with end expiratory lung volume, which leads to improvement in oxygenation and rate of survival.

Purpose: The purpose of the DNP project was to implement a proning protocol to increase pronation among all ARDS patients located in the Medical Intensive Care Unit (MICU) and Cardiac Care Unit (CCU). This protocol highlights the criteria for ARDs and systematic pronation process.

Methods: The quality improvement project implemented a multi-model approach to advocate for pronation. A Standard Operating Procedure (SOP) was adopted from existing medical facilities and approved through both the Critical Care Steering Committee and Clinical Practice Council. The protocol incorporated a checklist to assist healthcare staff for the pronation process. Pronation training sessions were conducted with 45 healthcare staff in two ICUs: MICU and CCU. The training was a multi-modal approach. First sessions were incorporated to re-introduce the staff to the SOP highlighting the criteria for ARDS and the process of pronation, along with introducing the checklist and the pronation kits. Second sessions were the formative simulation experiences, which provided hands-on learning for the staff. The simulation experiences

included an ARDS case scenario, concluded by a debriefing session to process on the event and reflect on the impact. The pronation process was initiated following the training opportunities and was tracked. The pronation checklist assisted in the activation of pronation among ARDS patients.

Results: Key results of the study concluded an increase in the number of patients pronated. Prior to the pronation intervention implementation, only 45% of ARDS patients located in MICU and CCU were mechanically proned. Fifty-five percent of patients were treated in a supinated position despite meeting pronation criteria. Once the pronation protocol was implemented, 100% of ventilated ARDS patients meeting pronation criteria were proned.

Conclusion: With the adoption of a protocol and process, pronation increased with MICU and CCU for all patient diagnosed with ARDS.

Keywords: ARDS, pronation, intensive care unit

Acknowledgments

I would like to express my gratitude to the faculty of Jacksonville State University for their instruction and support during this program. I specifically would like to thank Dr. Stephens for his support and guidance during this process. Dr. Stephens, you have truly provided a valuable learning experience through your mentorship and guidance, which I hope to continue throughout my nursing career to provide a higher level of care for my facility and patients. I would also like to express my appreciation to other VA facilities, especially the Lexington VA Health Care System, for their collaboration during development of the facility's SOP.

I would also like to dedicate the complication of this program to my grandmother. She was so supportive when I expressed my desire to return for my DNP. Being my biggest cheerleader, she would have been so pleased to see this to fruition. I would also like to thank my husband, children, parents, and friends for their support and patience during this process.

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A Multi-Modal Strategy to Activate Pronation for Acute Respiratory Distress Syndrome Patients

Acute Respiratory Distress Syndrome (ARDS) is caused when a patient experiences diffuse lung injury. Alsaghir and Martin (2008) define ARDS as "a diffuse heterogenous lung disease that results in progressive hypoxemia because of ventilation/perfusion mismatching causing intrapulmonary shunt" (p. 603). ARDs occurs when neutrophil-dependent and platelet-dependent damage is caused to the endothelial and epithelial barriers of the lung, which, in turn, initiates a cascade effect of inflammatory reactions with cytokines (Buckley et al., 2019). Clinical disorders associated with the development of ARDS include sepsis, pneumonia, aspiration, post-surgical complications, incorrect ventilator strategies, and trauma (Mitchell & Seckel, 2018). The use of incorrect ventilator strategies can contribute to pulmonary barotrauma leading to inflammatory response which activates the ARDS process. As ARDS progresses, bronchial alveolar fluid accumulates, contributing to worsening pulmonary edema. As the edema increases, there is an increased squeeze to the lungs, which in turn ultimately causes complete atelectasis (Gattinoni et al., 2019). Some scholars pose that those ventilated ARDs patients supinely positioned develop atelectasis as a result (Alsaghir and Martin, 2008). The progression of these events ultimately leads to severe hypoxemic respiratory failure and, if the progression continues, patients will also experience hypercarbic respiratory failure. Despite advances in different therapies, patients still face a 30-40% mortality rate (Mitchell & Seckel, 2018).

The first description of pronation in ARDS patients occurred in 1976 by Piehl and Brown. Both observed the use of a specialty bed (CircOlectric bed) that allowed for a 180-degree turn, which resulted in five patients showing an increase in PaO_2 (actual oxygen content in the arterial blood) by an average of 30 mmHg (Piehl & Brown, 1976; Gattinoni et al., 2019).

Following this study, Douglas et al. (1977) found an average increase of 69 mmHg of $PaCO_2$ in six patients undergoing pronation. Maunder et al. (1986) described the first radiographic lung changes related to ARDS showing consistent and increased density in the dependent lung regions. The trial of Proning Severe ARDS Patients (PROSEVA) established the correlation between proning of patients with ARDS and decreased mortality (Guérin et al., 2013).

Pronation of ARDS patients at the medical facility did not occur until the COVID-19 pandemic and prior pronation, ARDS patients were only pronated if COVID positive. Non-COVID patients did not receive pronation as a part of their care. Prior to the emergence of COVID-19, patients who presented with concomitant ARDS received conventional mechanical ventilation or were transferred to a local tertiary hospital to receive a higher level of care. Transferred patients received pronation interventions or extracorporeal membrane oxygenation (ECMO). As a result of the pandemic, the medical facility examined their current practices with the influx of COVID-19 patients and the inability to transfer to facilities that offered such services. During this time, many of the local tertiary facilities were at full bed capacity and unable to accept outside hospital transfers. This unique and complicated situation presented an opportunity that would enhance patient care and patient outcomes. In turn, the medical facility could offer more comprehensive and quality care for their patients.

The project aimed to increase proning by adopting a protocol, which highlights criteria and process for pronation. A lack of a pronation protocol has led to decreased usage related to the pronation process. According to Giovanni et al. (2021) critical care providers benefit from focused knowledge transfer specifically using a “combination of protocols, guidelines, or bundles with or without education to implement best practices” in these types of units (p.7). Prone positioning among patients with ARDS is one of the most effective non-invasive therapies

and strategies to decrease mortality (Gattinoni, et al., 2019). The addition of the pronation protocol in the facility will result in more positive patient outcomes with increased quality of care.

Background

ARDS has been described in the medical community since the 1800's usually in the context of pulmonary edema or super imposed multifocal pneumonia in the absence of heart failure. In 1967, a landmark article was published in *The Lancet* by Ashbaugh et al. that describes ARDS as a collection of physiological abnormalities including compromised lung compliance, hypoxemia, hypercarbia, and hemodynamic alterations (Ashbaugh et al., 1967; Mitchell & Seckel, 2018). The study identified 12 patients that had similar characteristics to infant respiratory distress syndrome and is considered one of the first publications to name ARDS as a syndrome. In 1992, a standard criterion for ARDS was created at the American European Consensus Conference. These criteria identified risk factors such as sepsis, gastric aspiration, severe hypoxemia, and bilateral lung infiltrates on chest radiographs; however, no evidence of edema related to heart failure was identified (Mitchell & Seckel, 2018; Villar & Kacmarek, 2012).

During the Vietnam War, ARDS was first described as hypoxemic respiratory failure affected by bilateral pulmonary consolidations (Koulouris et al., 2016). Characterized by pulmonary edema not related to heart failure and refractory hypoxemia despite the use of oxygen therapy (Pugliese et al., 2018). ARDS is also associated with both increased mortality and morbidity. ARDS is associated with observed with extended ventilated days, long hospitalizations, and long-term impact on overall health. The incidence of ARDS represents approximately 10% of ICU patients with 23% of mechanically ventilated patients developing

ARDS (Buckley, et al., 2019). With the increase of alveolar edema, the patient will require increased FiO_2 and positive end-expiratory pressure (PEEP) with mechanical ventilation to maintain proper oxygenation. The increased volume and PEEP will place the patient at greater risk for lung injuries known as ventilator-induced lung injury (Alsaghir & Martin, 2008). With ventilation in the supinated position, the patient will develop atelectasis in the dependent areas of the lungs which is associated with edema, secretions, and compression of alveoli (Alsaghir & Martin, 2008). The physiologic alterations contribute to decreased oxygen and carbon dioxide exchange leading to hypoxemia and hypercarbia. The Berlin definition, which was created in 2012, help to categorize ARDS to mild, moderate, and severe (Makic, 2020). The criteria leaned on ratio of PaO_2/FiO_2 (PF). The fraction of oxygen content in the patient's arterial blood is represented by partial pressure of oxygen (PaO_2). The oxygen fraction in which the patient is receiving from the ventilator is the fraction of the inspired oxygen (FiO_2). The ratio calculation of PaO_2/FiO_2 provides the PF ratio which equate to the severity of ARDS. Criteria for mild ARDS, the PF ratio is 200-300 mmHg. Moderate is 100-200 mmHg and severe ARDS diagnosis is less than 100 mmHg (Koulouras, et al, 2016; Makic, 2020).

A consequence of ARDS is ineffective gas exchange. The process of gas exchange is also known as ventilation, which encompasses inhalation and exhalation. ARDS creates a ventilation-perfusion (V/Q) mismatch this occurs when either the ventilation (airflow) or perfusion (blood flow) in the lungs is impaired, preventing the lungs from optimally delivering oxygen in the blood. The first phase, known as the exudative phase, occurs when the lungs are initially injured from pulmonary or extrapulmonary means. The injury to the lung activates a release of alveolar macrophages, which initiates the cascade of cytokines. Cytokines damage the lung's normal tissue, which causes edema to the cells. This edema causes alveolar collapse and increases lung

injury (Buckley et al, 2019; Swenson & Swenson, 2021). The second phase is proliferation, which is characterized by the body's attempt to repair and restore to homeostasis. This involves death of neutrophils, fibroblast expansion, interstitial restructuring, and alveolar regrowth. If the proliferation phase is elongated, then overall functional recovery will be impaired. The third phase is the fibrotic phase, which is not observed in all patients. The phase is seen with the formation of fibrosing alveolitis and is associated with long-term consequences from the overall lung injury (Swenson & Swenson, 2021).

ARDS is associated with 30-40% mortality rate and results in increased morbidity (Mora-Arteaga et al, 2015). "Annually, nearly 200,000 patients in the United States are diagnosed with ARDS; worldwide, the syndrome is responsible for 10% of all ICU admissions and occurs in 23% of patients requiring mechanical ventilation" (Mitchell & Seckel, 2018, p. 415).

Needs Analysis

A near quarter of a million patients in our healthcare system are afflicted by ARDS (Parcha et al., 2021; Yale Medicine, n.d.). According to Parcha et al. (2021), 21,753 individuals in the Southern region died from ARDS, which is nearly doubled from individuals in the Northeast and Midwest regions. The age adjusted mortality rate for the South is 3.4 per 100,000 with Alabama showing an increased age adjusted mortality rate of 4.7 per 100,000 patients between 2014-2018 (Parcha et al., 2021). ARDS related mortality rates remain the highest among older adults 65 and older, men, rural communities, and the South (Parcha et al., 2021).

From October 2020 to October 2021, there were 457 admissions for both the Medical Intensive Care Unit (MICU) and Coronary Care Unit (CCU) with 9.8% of patients having the diagnosis of ARDS that would benefit from pronation. An alarming 4.5% of those patients were proned resulting in 45% of patient being proned. Mechanically ventilated patients who met

criteria for pronation but were treated in the supine position was 55%. Within the medical facility, pronation had not been offered for patients diagnosed with non-COVID related ARDS. Pronation was a standard of care only to patients with a diagnosis of COVID-19.

Between October 2020 to January 2022, there were 25 patients who were proned in the facility. Throughout 2020-2022, there has been a subset of 20 non-COVID patients who had developed ARDS. While these patients met criteria for pronation, they were mechanically ventilated and treated in a supine position. These supined patients experienced longer hospitalizations and increased mortality of 90%.

Prior to implementation, a review of the existing literature was conducted, and other medical facilities were contacted within the Veteran Healthcare Administration system for current best practices and existing protocols. A standard operating procedure (SOP) was adopted from the Veteran Affairs (VA) Lexington, Kentucky facility's existing SOP, which is a translation of evidence-based practice. The SOP was further influenced by the PROSEVA trial as it confirmed the benefits of proning with decreased mortality (Guerin et al, 2020). A study by Maunder et al. (1986), and Peidel and Brown (1976) were also the foundations to which the SOP was modeled and initiated within the medical facility.

The SOP set forth a protocol for all healthcare providers to guide the process of pronation. The pronation process is an interprofessional collaboration which incorporates nursing, respiratory therapy, pharmacy, nurse practitioners, and physicians. Along with an SOP guideline, hands-on training that included formative simulation was implemented to prepare staff for activation of a pronation protocol. Giovanni et al. (2021) noted that the employment of multiple training strategies is essential to promote knowledge transfer and increase likelihood of long-standing implementation. According to Giovanni et al. (2021) the multi-modal approach

was designed to support the nursing staff through preparation for proning within the ICUs (see Appendix A).

Gap Analysis

A gap analysis was conducted in the MICU and CCU and identified a gap with a utilization deficit with pronation among patients with non-COVID ARDS. During 2021, 9.8% of admissions to the MICU and CCU met criteria for pronation, but the intervention was not utilized for every patient diagnosed with ARDS. As pronation leads to a decreased mortality rate among this population of patients, addressing this gap would implement the necessary standard of care.

Proned positioning of moderate to severe ARDS patients are considered a noninvasive treatment option (Parcha et al., 2021). Pronation for ARDS patients have several benefits. Those benefits are increased oxygenation, ventilation perfusion matching, reduced lung injury, and increased survival rate (Parhar et al., 2020). Initiation of pronation should not be delayed based on findings identified in the PROSEVA trial to minimize pulmonary barotrauma.

There is a lack of standardization when proning ARDS patients in the medical facility. Early recognition and increased advocacy for pronation will increase its use with this population. Having a standardization protocol utilizing a holistic approach will streamline the process and increase quality outcomes for the patient. Along with the protocol, training opportunities will allow staff to perform pronation in a safe environment to foster formative guidance.

Problem Statement

Pronation was not currently an intervention offered to patient with ARDS who do not have COVID-19. The DNP project focused on the implementation of an evidence-based pronation protocol to offer an intervention for ARDS patients. The primary inquiry focused on answering

the question of among adult patients hospitalized with ARDS requiring mechanical ventilation, does the implementation of a manual pronation protocol increase the rate of pronation over a 45-day period.

Aims and Objectives

The goal of this pronation protocol was to increase the number of patients proned within MICU and CCU. As only 30% of patients with moderate-to-severe ARDS receive proned positioning, it is essential for healthcare providers to be able to recognize ARDS (Pugliese et al., 2018). The aim of this project increased usage of pronation for all ARDS patients by implementation of a proning protocol.

The objectives for this project focused on an expansion of the existing SOP to include all ARDS patients, increased ARDS recognition by healthcare providers, earlier utilization of pronation, and advocacy for pronation from the nursing staff. These four objectives align with the existing literature which advocate for increased awareness of ARDS identification, appropriate therapeutic strategies, prompt initiation of pronation, and stakeholder buy-in (Giovanni et al., 2021; Munshi et al., 2017; Oliveira et al., 2016).

Review of Literature

Search Parameters

A literature review was performed with the following primary considerations: a) best practice with ARDS patients; b) standardization including exclusion and inclusion criteria for proned patients with ARDS; and c) literature published within the last five years. The databases utilized for this literature review included both CINAHL and Ovid MEDLINE using master and mesh headings. The following key terms were used in CINAHL: ARDS, prone, and ventilation.

This search yielded 471 studies. However, when using prone protocol, ARDS, and ventilation, this search yielded 14 results.

The following mesh key terms were applied in Ovid MEDLINE: prone position, ARDS, and mechanical ventilation. This research yielded 2,154 results. However, using prone position, protocol, ARDS, and ventilation, this research yielded 171 results. Many of the key findings within the literature review revealed information gathered from surveys, meta-analysis, guidelines, and systematic reviews. Within this manuscript, additional articles were reviewed, if cited, within an article identified through the literature search results.

Criteria for Diagnosis of ARDS

The criteria for ARDS has evolved throughout the years. At the American and European Consensus Conference (AECC), which occurred in 1994, an initial criterion was developed for ARDS. The criteria developed included rapid onset, chest x-ray revealing bilateral opacities, detrimental hypoxemia, and no evidence of heart failure (Bernard et al., 1994; Koulouras et al., 2016). The AECC's definition was the benchmark for more than 20 years until development of the Berlin Criteria in 2012 which includes timing of symptoms, chest imaging, edema, and oxygenation.

For a patient to be diagnosed with ARDS, the onset of symptoms must occur within one week of clinical presentation, bilateral opacities are observed on chest imaging, respiratory failure not associated with heart and pulmonary decompensation, and use of oxygenation (Buckley et al., 2019). Severity of ARDS is associated with the PaO_2/FiO_2 ratio with severe ARDS being associated with a ratio of less than 100 mmHg and PEEP greater than five. Oftentimes, a patient's death is associated with multiorgan failure (Pugliese et al., 2016).

In 2013, the PROSEVA study occurred. A randomized trial that included 466 patients from multi hospitals in Europe, the study examined mortality-related pronation on moderate to severe ARDS (Guerin et al., 2013). The trial found that patients treated in a prone position survival rate was significantly higher than the group treated in the supine position. At the 28-day mark, prone patients had a mortality rate of 16% compared to 32.8% of patients treated supinely (Guerin et al., 2013).

Manipulation of Body Position

Researchers began to study the benefit of pronation to alleviate the potential for long-term mechanical ventilation usage among patients with ARDS (Munshi et al., 2017). Pronation initially focused on improving the patient's overall oxygenation and was attributed to a redistribution of the patient's perfusion (Munshi, et al., 2017; Gattinoni, et al., 2019). In early trials, the correlation between proning patients with moderate to severe ARDS and increased mortality was limited due to inconsistent variables across studies. Yet, Munshi et al.'s (2017) systematic review of eight clinical trials examining prone positioning in ARDS patients found evidence to support the benefits of proning patients with more severe respiratory failure, during their post-hoc analysis. Furthermore, these researchers believed the findings from more recent trials utilizing more modern proning protocols showed more promising results for mortality rates. An essential finding from the systematic review was the importance of the number of hours patients were proned for moderate to severe ARDS. The authors noted that patients should be proned 12 hours or longer per day to result in lower mortality (Munshi, et al., 2017). This finding was further supported by Elpern et al., (2021), during the rise of COVID-19 who extended prone positioning to 12-16 hours for patients who were mechanically ventilated with COVID-19 and severe ARDS.

Since 1976, pronation has been increasingly used to treat patients with ARDS. Pronation as the primary intervention for ARDS patients is not universally accepted as researchers have found varying results (Munshi et al., 2017). Over the last 50 years, there have been numerous studies to include systematic reviews, meta-analyses, and clinical trials that explore how prone positioning impacts this patient population (Benson & Albert, 2014; Buckley et al., 2019; Gattinoni et al., 2019; Giovanni et al., 2021; Oliveira et al., 2016).

One of the more dynamic studies by Munshi et al., (2017) evaluated existing literature published from a 2010 systematic review and updated the findings with literature through 2016 to evaluate the impact of proning on a 28-day mortality verses those patients treated with conventional mechanical ventilation in a supinated position. Authors identified eight randomized control trials across a 12-year span that indicated no mortality difference; however, the *a priori* subgroup analysis showed decreased mortality when proned 12 hours or longer per day for studies with moderate to severe ARDS (Munshi et al., 2017). The takeaway from this study is the greatest benefit for ARDS patients is longer pronation. In Elpern et al., (2021), a more recent study, the researchers confirmed previous findings as they evaluated proned positioning with ARDS and COVID-19. These authors theorize that extending pronation periods beyond 12 hours may be needed to further support positive patient outcomes. They suggested extending pronation periods to 16 hours and returning patients to supine position for 4 hours (Elpern et al., 2021).

Koulouras et al. (2016) further confirms the current evidence that supports prone positioning as beneficial for ARDS patients due to improved gas exchange, redistribution of pulmonary pressure, and protection to the lungs. Both observational and randomized trials, according to Benson and Albert (2014), have “shown that oxygenation improves in 66% to 75% of patients with ARDS who are turned from supine to prone” (p. 744). Benson and Albert (2017)

note that there is evidence that indicates supinated positioning for humans is unnatural since patients who are supinated experience additional strain on the lungs. Most individuals sleep proned or semi-proned (Benson & Albert, 2017), yet most ICU patients are treated in a supinated position. Additionally, the PROSEVA trial found a reduction in mortality rate at the 28-day mark when patients were in prone (16%) vs supine (32.8%) positions (Guérin et al., 2013), thus supporting this proposed practice change.

Pronation is not without complication for the patient, medical staff, and facility. Studies noted varying levels of potential complications including pressure injuries, facial edema, dislodgement of medical devices, and transient desaturation. Although rare with a prevalence rate of 2.4%, the greatest risk of fatality is accidental extubation (Oliveira et al., 2016). Other complications observed were cardiovascular events and ventilator associated pneumonia. Transient deoxygenation can occur immediately following the pronated process and lasts, on average, 15 to 60 seconds. This transient desaturation requires no immediate intervention by the medical staff, and the patient should recover with no lasting effects (Benson & Albert 2014). Therefore, despite potential complications, the existing literature supports the implementation of a pronation protocol for this patient population.

Pronation within the ICU setting is relatively safe and inexpensive; however, this technique requires teamwork among the staff to manage unforeseen complications. According to Oliveira et al. (2017), the addition of protocols and guides can also alleviate this risk. For the pronation process to become integrated into the daily routine of the staff, a multi-modal approach including dissemination of various educational materials and tools should be implemented. Giovanni et al. (2021) noted that various studies have described numerous tools including protocols, guides, and/or bundles that should be used to implement best practice techniques in an

ICU setting. An educational tool utilized to prepare staff is simulation. The use of stimulation has steadily grown and has numerous benefits such as greater acquisition and retention of knowledge and collaboration among staff when compared to traditional educational approaches (Poor et al., 2020). This gives nursing staff the opportunity to identify errors in the pronation process that may result in unforeseen outcomes for the patient (Poor et al., 2020).

Strategies for ARDS Management

Although pronation has been used for decades, there are other means used by the medical community in the management of ARDS. One of the means is the administration of neuromuscular blockages (NMBA). Per Buckley et al. (2019), the use of NMBA specifically cisatracurium saw a reduced rate of ventilator-associated lung injury with continuous infusion within early on-set ARDS. However, the use of NMBA has been unable to show a decrease in overall mortality. Per Giovanni et al. (2021), NMBA showed little significance regarding 90-day mortality when NMBA was initiated early on in the ARDS diagnosis.

Another strategy used is the administration of corticosteroids. This usage remains controversial with limited outcomes and without clear consensus on doses from the scientific community. Per Yang et al. (2017), early administration of low dose corticosteroids is recommended during the early period of ARDS "based on reduced mortality, improvements in PaO_2/FiO_2 ratio and mechanical ventilation-free days without increasing the risk of incident infection" (p. 1224). Another study by So et al. (2020) examined the use of high-dose corticosteroids in seven patients with ARDS of which all were mechanically ventilated. Patients were administered 1,000 or 500 mg/day of methylprednisolone intravenously for three days then tapered for a median of 13 days (So et al., 2020). The patients who received the high dose methylprednisolone were extubated within 7 days. Due to the limited literature available on this

topic, further research is needed for a generalized consensus for proper usage and dosage of corticosteroids.

Extracorporeal membrane oxygenation (ECMO) can be used after pronation has occurred with little to no effect on patient improvement. According to Weigand (2017), ECMO is indicated when the mortality of the patient is greater than 50% with a PF ratio of less than 150 on FiO_2 greater than 90%. Yet, Buckley et al., (2019) note that the utilization of ECMO to manage severe ARDS is not supported in the literature as a means of rescue therapy.

Protocol Adoption

Protocols and checklists for the process of pronation play an important role in the overall success of pronation adherence (Pahar et al., 2020). This protocol and checklist should outline the process step-by-step to ensure the safety of the intubated patient when placed in a proned position (Pahar et al., 2020). Per Giovanni et al. (2021), "studies specifically focused on knowledge transfer in critical care suggest benefit in using a combination of protocols, guidelines, or bundles with or without education to implement best practice in the ICU" (p. 7). Along with protocols and checklist, simulation also plays an important role in ICU training. When using simulation, this gives the learners the opportunity to identify potential errors that could affect patient outcomes and care (Poor et al., 2020). When using protocols, checklists, and simulation, there is a focus on promoting knowledge and practical implementation of pronation.

Theoretical Model

The theory of planned changed was posed by Kurt Lewin who was considered "a pioneer to the study of group dynamics and organizational developments" (Shirley, 2013, p. 69). Planned Changed theory is driven by the idea of factors or forces that influence or impact the situation. These forces can be either driving (i.e., helping forces) or restraining (i.e., hindering forces).

Lewin proposed that an individual who could determine the impact of their driving forces (both driving and restraining) would have the ability to understand how entities act and adapt to utilize these forces to change accordingly.

Lewin's Theory of Planned Change helped shape future generations of researchers interested in the dynamics of groups and change implementation (Burnes, 2004). Initially published in 1947, Lewin's model was not designed with organizational issues as the primary entity considered. Instead, he saw its alignment with his previous works dedicated to Field Theory, Group Dynamics, and Action Research. Burns posits that "Lewin saw the four concepts as forming an integrated approach to analysing [sic], understanding, and bringing about change at the group, organizational, and society levels" (Burns, 2004, p. 985).

Havelock was heavily influenced by Lewin's Theory of Planned Change. Havelock modified Lewin's work to formulate strategies that change agents could utilize to arrange work initiatives and integrate a cycle of innovation within the working environment (White, 2019). Havelock's Stages of Planned Change theory was utilized for this pronation project since it clearly outlines strategic steps for implementation of a process change. While many consider Havelock's theory to contain six stages, White (2019) theorizes the inclusion of a seventh stage as a precursor to the change process. The stage is known as care step. The other stages to Havelock's Theory are relate, examine, acquire, try, extend, and renew. Using Havelock's theory, this PI utilized this framework to develop and implement the project's pronation process and protocol. The following sections will explore each step of Havelock's theory in relation to project implementation.

In preparation for project development, there was a need for change for enhanced interventions for ARDS patients with the lack of pronation occurring within this patient

population. To foster this change, collaboration with stakeholders was conducted to support the pronation protocol. The collaboration aided in fostering relationships with stakeholders and to support the integration of the pronation protocol. To achieve buy in from the stakeholders, the PI had to acquire the most up-to-date literature and best-practices to inform SOP development. Once the SOP was finalized, identifying the appropriate mechanism for educating the staff of MICU and CCU was needed. This dissemination (extend) was achieved through intentional staff engagement in the form of pronation training opportunities. The PI integrated intentional opportunities for staff feedback within the real time training to address concerns regarding SOP and training. Following implementation, the PI collaborated with the existing unit educator to develop the sustainment (renew) of pronation training with new and existing staff.

Havelock's theory provides the framework necessary for any process change and implementation. This multi-modal pronation project is focused on bringing evidence-based practice to both the MICU and CCU settings. Both the nursing staff and patient population were positively impacted by the planned-out interventions with the incorporation of Havelock's Stages of Planned Change. This theory supports evaluation at every stage to ascertain rising issues and gives the PI the opportunity to rectify. This theory also gives the opportunity for the PI to plan for sustainment beyond this project.

Methodology

This is a quality improvement project based on a pre-post design by employing a multi-modal strategy. A pre-post design was selected for this project to assess the impact of implementing the pronation protocol through a comparison process. Data were evaluated pre and post implementation to ascertain the percentage of ARDS patients who were proned. The

percentages were compared to evaluate the effectiveness of activation using the pronation protocol.

This project utilized and initiated a SOP and pronation training sessions to increase the practice of pronation. The expectation of this study was to observe an increase in utilization of pronation within the identified population to ascertain the success of this multi-modal strategy. Outcome data for this project was derived from the number of patients that meet pronation criteria that were proned as compared to those that met criteria that were not proned. The selection of this outcome measurement for this project was supported within the literature. D'Souza et al. (2021) examined the role of training interventions to increase proning within the COVID-19 population and evaluated the success of the intervention by examining the number of patients proned as compared to the number that were not.

Following query of the Educators Integrated Network, the SOP was adopted from other facilities using evidence-based protocols. The Educator Integrated Network allows for healthcare professionals to collaborate on current issues facing the healthcare community. Other facilities using similar validated pronation processes include VA Puget Sound Health Care System and Lexington VA Health Care Facility. However, as the VA Puget Sound Health Care System utilizes lifting equipment, this pronation process was not considered. Information was also gathered from the Office of Nursing Services regarding the process and procedures related to pronation. Buy-in from key stakeholders was established including the Director of the MICU, Critical Care Steering Committee, and the Executive Leadership Team. The purpose of this intervention was to compare the number of patients pronated to those that met criteria but were treated strictly in a supine position. Data were gathered from an Excel data collection

spreadsheet, which was kept on the unit. This spreadsheet included information regarding admission date, intubation status, days proned, and any complications related to pronation.

The intervention for this quality improvement project was the implementation of a validated protocol to assist with the pronation process following approval from both the Clinical Practice Council (CPC) and the Executive Leadership Team (see Appendix B). According to Oliveira et al. (2016), protocols create using an organized and standardized format improves process safety. The protocol consisted of a process checklist designed to assist the healthcare staff in the pronation process. By outlining resources needed prior to the procedure and outlining the process itself. The checklist was dated and timed per intervention. The units were also equipped with pronation equipment kits to streamline the process. The equipment kits include resources such as Mepilex® Ag, face foam cushion, Ultrasorb pads, additional pillows, sheets, and cardiac electrodes. Prior to implementation, training opportunities were conducted on the unit in collaboration with the unit and simulation educators. Simulation scenarios were conducted to give the healthcare team the opportunity for hands-on learning and to pose questions in a safe learning environment. The design for this pronation training initiative aligns with existing literature that supports this multi-modal strategy (Elpern et al, 2021; Giovanni et al., 2021).

Following training a debriefing session occurred during this time participants were asked the open-ended questions. The questions focused on whether the session was beneficial to practice, learning objectives were met, and if the participants would recommend the sessions to others. Participation in the debriefing was voluntary. Data were analyzed for common themes. During the debriefing sessions, healthcare staff voiced the simulation training was beneficial to their work performance and would recommend the sessions to other healthcare staff.

Setting

The healthcare system serves the Veteran population and hosts 313 beds. The facility provides primary and specialty care to 71,000 patients in Alabama and the surrounding states. The healthcare system is a tertiary medical and surgical care center with nine community-based outpatient clinics (US Department of Veteran Affairs, 2021). It offers both inpatient and outpatient care including primary, emergency, surgery, and intensive care. The main inpatient hospital is located in an urban area, and contains three intensive care units including MICU, CCU, and Surgical Intensive Care Unit (SICU). The focus of the project occurs in MICU and CCU due the acuity of ARDS and these units being designated for intensive care patients.

These two units include a total of 18 beds across both units. Diagnosis associated with admissions include, but are not limited to, sepsis, respiratory failure, COVID-19, and acute coronary syndrome. Within the medical center, there are multiple key stakeholders including the Executive Leadership Team, MICU Director, MICU and CCU Managers, nurses, and patients. The facilitator for this project is the Principal Investigator (PI).

Participants

The population for this study were patients admitted to the MICU and CCU. They were male (100%) and patient ages ranged from 30 to 92 years. Common diagnoses observed were sepsis, pneumonia, and chronic obstructive pulmonary disease with concomitant ARDS. Inclusion and exclusion criteria for this population were outlined in the SOP.

Inclusion. For patients to be considered for pronation all of the following criteria must be met: new onset (within 36 hours of intubation) and severe ARDS, arterial oxygen/fraction of inspired oxygen (PaO_2/FiO_2) ratio < 150 mmHg, a FiO_2 of at least 0.6 (60%), and a PEEP of at least 5 cm H_20 (Guerin et al., 2013).

Exclusion. Patients excluded from the pronation therapy include any trauma related injury, for example, unstable spine, femur, pelvic, or rib fractures or other skeletal limitations, open chest or unstable chest wall injuries, substantial facial trauma, or facial surgery during the previous 15 days. Additional exclusion criteria include surgical interventions like open abdomen, substantial acute bleeding (i.e., requiring immediate endoscopic, surgical or IR procedure), tracheal surgery or sternotomy during the previous 15 days, Intra-Aortic Balloon Pump (IABP) therapy, ventricular assist device, or cardiac pacemaker inserted in the last two days. Other exclusion criteria include pregnancy, intracranial pressure greater than 30mm Hg or CCP less than 60 mm Hg. Lastly, if the goals of care for the patient are incompatible with aggressive therapy.

Consent

Before initiation of the project intervention, consent was obtained from all nursing participants to obtain data from the simulation debriefing. The briefing sessions would contain open ended questions to ascertain the participants' viewpoint of the simulation including being beneficial, meeting learning objectives, and staff recommendation. Consent discussions contained an overview of the purpose of the study as well as potential risk and benefits of participation. The dialogue emphasized the need for standardized protocol and procedures for pronation of ARDS patients. The principle investigator overseeing this project had no influence administratively over any of the nursing staff in the ICUs including annual competencies, disciplinary actions, staffing, or performance evaluations. Information was also communicated to the nursing staff that the Executive Leadership Team or Administration had no influence or participation in this student-led project. It was communicated that privacy and confidentially of all identifiable data collected would be maintained throughout the project (see Appendix C).

Risks and Benefits

With the use of pronation for ARDS, there are several complications that can occur during transitions to and from prone positioning. Complications have been described as displacement of various devices including venous access and extubations (Guerin et al., 2020). Other complications observed during prolonged positioning are increased intra-ocular pressure and pressure injuries to the facial structures (Guerin et al., 2020). With collaboration and routine training, many complications associated with pronation can be alleviated.

Pronation Training

The training opportunities were offered to staff within the MICU and CCU. There was a total of 45 nurses who completed both sessions. Participants range from novice to expert with years of service ranging from less than one year to greater than 25 years. This population was comprised of all frontline staff.

The initial pronation training sessions included an introduction to the SOP, checklist, and pronation kits. A comprehensive discussion occurred covering the components of the SOP and checklist and emphasized the characteristics of ARDS for nursing staff to better support identification within their patients. The pronation kit was available for staff to review and touch to support tactile learning and to encourage familiarization. An essential component for the training experience was the integration of engaged discussion, which allowed for real-time questions and answers as well as feedback.

As a part of the training sessions formative simulation scenarios were conducted to provide the healthcare staff with additional hands-on learning. Sessions began with a pre-brief of the simulation and to encourage and to facilitate understanding of a safe learning environment for the nursing staff. The scenario was performed with participants and the checklist was

provided to further reinforce the process of pronation. Once the scenario was completed, a debriefing was offered to support the learning process and engage participants in what-if scenarios. During this time, feedback and critiques were welcomed focusing on the overall simulation experience in real time.

Intervention

The patient population included patient with a ARDS diagnosis. Once a patient met criteria for pronation, the proning kit was gathered and the protocol was initiated by the staff. Pronation team gathered at patient's bedside including a respiratory therapist, four nurses, anesthesiologist, and the attending physician. Once the patient is prepared to turn, the pronation process begins. The anesthesiologist and respiratory therapist remain at the head of the bed to ensure patient does not lose airway access throughout turning process. Two nurses take position at each side of the bed to perform turning. Once in the proned position, the patient's arms are placed parallel to the trunk or in the swimmer's position (Guerin et al., 2020). The patient's head is placed to the right or left to ensure continued intubation. Patient's positioning is changed every 4 hours to prevent pressure injuries or brachial plexus injuries. Monitoring should include cardiac, pulse oximetry, and invasive arterial blood pressure. Patient is to remain proned 16 hours was the minimum but could remain proned for 24 hours pending no medical emergency transpires.

Timeline

The project timeline for implementing a pronation protocol and checklist occurred over a one-year period, May 2021-May 2022. This project was completed in 4 stages: design, implementation, evaluation and dissemination. The following sections outline each stage.

Design. During Summer 2021, a gap analysis and needs assessment was performed and attributed to the defining the clinical problem, the initial PICOT question drafted, and a review of literature was conducted. In Fall 2021, the PICOT question was finalized and relationship building began between the preceptor and the medical facility. The necessary preceptor paperwork was submitted to the medical facility and CITI training in preparation of implementing the project research was completed in September 2021 (see Appendix D). Meeting with keys stakeholders including the ELT and Critical Care Steering committee to gain buy-in for the process change. The relevant theoretical methodology was identified to support the project aims and objectives. In October 2021, the project transitioned to the design period as the PERC proposal was drafted. The project was presented to the PERC committee where a review was conducted, and approval was granted for this project. The Institutional Review Board (IRB) protocol for both the educational institution and the affiliated medical facility was submitted in December 2021. To complete the design phase, IRB approval was received from both entities (see Appendix E). Continued to meet with key stakeholders to finetune the process change occurring in MICU and CCU.

Implementation. In Spring 2022, the project transitioned to the implementation phase. Four sessions were offered in February 2022 for nursing staff across a two-week period. These initial sessions focused on the review of the SOP, familiarizing staff with the pronation checklist and pronation kits. Between February and March 2022, eight simulation sessions were offered over two weeks and included more training offerings than the initial period to allow nursing staff to participate across the day and night shifts. Meetings continued with key stakeholders to ensure all were informed and up-to-date on the implementation phase of the process change. Following these sessions, the project eased into the evaluation phase.

Evaluation. Late March 2022 concluded the data collection period as data analysis began, and the development of DNP manuscript was initiated. The manuscript evolved over the course of April, May, and June 2022 as feedback was gathered and addressed. In July 2022, the manuscript was finalized and approved, with findings distributed via a poster presentation and as a manuscript submission to the Jacksonville State University (JSU) Digital Commons repository.

Dissemination

The outcomes of this DNP project have been disseminated by poster, presentation, and manuscript. The DNP project was presented to the Executive Leadership Team to highlight the outcome of pronation within the two units of the facility. Due to the short time frame of the initial study and low census, the observation period will be extended an additional 6-months to reevaluate the intervention effectiveness and sustained knowledge within the participant group. The data collected from this extended observation period will further inform the Executive Leadership Team of the sustainability of the intervention to inform their decision to support regional implementation. The preliminary findings will be shared through scholarly avenues to include continuing education and article creation. The project will also be presented to the JSU's College of Health Professions and Wellness. Additionally, the DNP manuscript will be placed in the JSU digital commons.

Budget and Resources

The project was endorsed by the organization due to the potential to improve patient outcomes and mortality. The organization covered the financial costs associated with allowing full-time nursing employees to utilize their scheduled work hours towards the training sessions in preparation to implement the proning protocol. There were 45 full time equivalents (FTE) that attended both training opportunities. The facility allocated for was 1.5 hours per FTE to complete

training for the pronation protocol. The average cost per person 38.00 per hour for a grand total of $2565.00. The cost of educational materials and simulation resources were also support by the organization, which the total cost of $125.00. There was no additional cost associated with this project other than time.

Evaluation Plan

The implementation of pronation within ARDS patients, data were collected to exam the rate of pronation implementation following the protocol intervention. A comparison was made between pre and post intervention by examining all patients who met criteria for pronation. Percentages were compared with patients who meet criteria for pronation versus patients proned. Prior to implementation, the rate of pronation among ARDS patient was 45%. Post implementation of the pronation protocol, the rate of pronation was 100%. The comparison percentages reflected an increased rate of pronation intervention in the identified units. Power analysis was used to identify an acceptable sample size. A confidence level of 95% in the setting population of 7.35 with a 5% error identified a sample size of eight (n=8). Due to declining fluctuation of admissions during the time the recommended sample size was not attained. A sample size of five (n=5) met criteria for the proning protocol. Additional data should be needed to evaluate the statistical significance of long-term implementation (Mitchell & Seckel, 2018).

As a quality improvement initiative, data regarding the value of the training intervention for healthcare staff was collected for the purposes of this study. Debriefing sessions occurred post-pronation training and data from those sessions was collected by the PI in the form of meeting notes to retain privacy among the healthcare staff (Muswazi & Nhamo, 2013). Data was analyzed for broad themes to evaluate satisfaction with the training. Participants in the debriefing voiced positive feedback regarding the preparation needs for pronation

implementation. Healthcare staff viewed the training as valuable along with the pronation checklist. Participants would recommend this training and vocalized a desire for more trainings.

Data Maintenance and Security of Patient Information

All data collected was via an Excel data collection spreadsheet. No identifiable patient data were collected. The spreadsheet was paper-based and used for rounding purposes through both units. All printed materials were kept in a secured location within the medical facility.

After completion of the quality improvement project, the cessation of the IRB, and the completion of the final manuscript, all data were disposed of following the guidelines set forth by the institutions. Any hard copies of data did not leave the medical facility and were also disposed of following institutional guidelines. All findings are reported in aggregate to protect patient anonymity.

Results

This project examined the catalyst use of a multi-modal strategy to increase the overall usage of pronation as a non-invasive intervention for ARDS. In 2021, 457 patients were admitted to the medical facility. Before any intervention was implemented, 9.8% of patients met criteria for pronation, but it was not utilized. As a result of the COVID-19 pandemic, pronation was implemented within the facility for patients with a diagnosis of COVID-19 and ARDS. Since pronation protocol intervention, there have been 75 admissions with five patients meeting criteria for pronation; all five patients received pronation therapies leading to a 100% rate of intervention.

This project sought to address the lack of pronation of ARDS patients by nursing staff. The aim of this project was to increase utilization of the process associated with pronation for this patient population. The objective was met as a result of the training opportunities which

familiarized and reinforced the protocol changes to include all patients with ARDs within the previously existing SOP. The integration of classroom-based and experiential learning within the training allowed nursing staff to increase their ARDs recognition, recognize best practices for caring for patients within this population (i.e. earlier utilization of pronation), and strategies for patient advocacy. Following the pronation intervention, data showed that all patients who met criteria for pronation were proned 100% of the time. This finding further stresses the importance of providing simulation opportunities for the nursing staff to increase awareness of criteria and the process of pronation.

Of the 45-healthcare staff, who participated in the training, less than half participated in the voluntary focus group. Common themes identified supported the value of the experience. Feedback was positive and participants vocalized the need for preparation prior to implementation of the pronation process. Individual staff members identified the training was beneficial to their daily work involving ARDS patients. Positive feedback was noted regarding the checklist and streamlining the process of pronation. Participants identified that they would recommend this training to other nursing staff from other units.

Discussion

Protocols have been in place for years at other medical facilities to support translation of EBP that promotes consistency in clinical practice across healthcare. The evidence provided from this project aligns with the literature which should support the adoption of this process and procedure into ICUs within medical facilities. Activating a standardized protocol allows for increased usage with the healthcare staff (Benson & Albert, 2014) as they can identify patients with or at risk for developing ARDS. They then in turn can advocate for pronation with this subset of patients. Having a standardized process and protocol should increase ease of usage by

healthcare staff when providing a targeted intervention; this project supports the theory of targeting specific barriers through training initiatives to result in greater success regarding staff knowledge and staff implementation (Giovanni et al., 2021).

Pronation training sessions for this project played an important role for the success. Continued training sessions regarding ARDS and pronation can further increase the identification of patients who meet these criteria. These opportunities for training can be offered during the orientation process and within annual competencies to ensure longevity and sustainability of the use of pronation. Furthermore, improving baseline knowledge of ARDS and incorporating interdisciplinary engagement should help foster pronation activities (Giovanni et al., 2021).

Feedback from the medical staff was positive regarding the learning opportunities given. The integration of the debrief sessions aligns with Elpern et al., (2021) findings that identified the need for medical staff to ask questions regarding the training and to allow staff to vocalize ways training can improve for future learning opportunities. The debrief sessions was also incorporated to minimize stress related to the pronation intervention.

The Executive Leadership Team was supportive throughout the implementation of this project. With their support, the number of patients proned increased. As Giovanni et al. (2021) noted considering key stakeholders is essential “to guarantee successful buy in” (p.7) to implement practice change. The incorporation of various layers of review and feedback from the Staff Development Office to the Executive Leadership Team created a sense of ownership across the facility that encouraged protocol adoption upon implementation. Additional literature examining the role of facility buy-in, and the success of non-invasive interventions is needed to identify how facility commitment impacts patient outcomes.

The aim of the project was met as demonstrated by the increased number of patients proned. This study adds to the existing literature that supports the alignment of standardized protocol by focusing on healthcare providers and process improvement initiatives (Elpern et al., 2021; Giovanni et al., 2021). As there are limited studies available on these types of initiatives, the need for continued literature evidence regarding standardization of a process showing the importance of pronation among the ARDS population is essential.

Having a standardized protocol with Executive Leadership Team support can empower healthcare staff to institute pronation among ARDS patients (Giovanni et al., 2021). This is evident by having an increase in the pronation events in both MICU and CCU. Having a protocol gives the healthcare staff a documented process for real time use. With continued evaluation and refinement of this protocol and process, this standard can be shared with other federal facilities in the state and across the Southeast.

Barriers and Limitations

The main limitation for this project has been an abnormally low census within MICU and CCU. Both units have been at 50% capacity since the beginning of March 2022. Having a low census led to a sample size of five (n=5) that met criteria for pronation. Additional observations of the pronation process are recommended to ascertain the lasting effect of the pronation training and checklist. Another limitation included difficulties obtaining proper equipment. This challenge was due to supply chain issues and obtaining new equipment for the unit. Working with the logistics supervisor greatly streamlined the process in attaining required equipment including the foam head pillow.

Nursing staff, who participated in the learning opportunities, felt the experience was positive. The limited qualitative data available prevented a comprehensive evaluation of the

value. As participation was limited and due to the short duration of the debrief only a limited number of responses were available for evaluation. Recommendation for a robust debriefing and increased sample size.

Sustainability

Once the evaluation of the possible benefits of pronating ARDS patients is completed, dissemination of findings was shared to the Service Chief of the Intensive Care Units and the Associate Director of Patient Care Service within the facility. Collaboration with the Unit Educator occurred to develop an annual competency to ensure instruction regarding ARDS criteria and the process of pronation is maintained. It will also include an initial competency for new nursing staff hired for the units. SICU will be included to ensure all critical care nursing staff are competent in recognizing ARDS and advocate for pronation among ARDS patients since the SICU accepts MICU service patients periodically.

Plans for Future Scholarship

This DNP project adds to existing evidence-based practice, literature, and data supporting a multi-modal approach to pronation. Further research and observations are needed to substantiate the importance of this project's findings. There are expansion recommendations of the pronation protocol to other areas of the hospital and to create a more multi-disciplinary approach to the process by involving medical residents and respiratory therapists to continue to ensure a smooth transition for the process of pronation. Collaboration between other medical facilities in the region could lead to a standardized approach of pronation with ARDS patients.

Conclusion

ARDS remains a condition with high morbidity, mortality, and high cost to the individual. This project seeks to provide standardization through a multi-modal approach with

training focusing on the SOP for the pronation process, evidence-based checklist, and simulation exercises for the nursing staff of both MICU and CCU. Although the sample size is relatively small, there is evidence to support the use of a standardized multi-modal approach for pronation.

Since the post implementation sample size was small, continued study to conclude a definitive improvement in pronation interventions for patients meeting criteria is needed. Additional research is vital to continue to validate the utilization of pronation in ARDS patients as evidence supporting this intervention is still limited (Benson & Albert, 2014). Further evidence is essential to determine if the use of pronation for ARDS patients results in decreased overall mortality.

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Appendix A

Medical Facility Standard Operating Procedure

PRONING FOR INTUBATED AND MECHANICALLY VENTILATED PATIENTS

SOP: 118-129

Service Line(s):
Patient Care Services (PCS)

Signatory Authority:
Associate Director for Patient Care Services

Effective Date:
December 8, 2020

Recertification Date:
December 31, 2025

Responsible Owner:
PCS

1. PURPOSE AND AUTHORITY

a. The purpose of this standard operating procedure (SOP) is to establish the process of proning an intubated patient, including those suspected to have or confirmed to have COVID-19 or other highly infectious pathogens. Pronation Therapy is a short term supportive therapy used to improve gas exchange or oxygenation by recruiting alveoli and to decrease the risk of ventilator injury in patients who are critically ill and require mechanical ventilation.

b. There is no governing document.

2. PROCEDURES

a. **Inclusion Criteria:**

(1) **New onset** (within 36 hours of intubation) and severe Adult Respiratory Distress Syndrome (ARDS)

(2) ALL of the following present:

(a) Partial pressure of arterial oxygen/fraction of inspired oxygen (PaO2/FiO2) ratio < 150 mmHg (Guerin, et al, 2013)

(b) FiO2 of at least 0.6 (60%)

(c) Positive End Expiratory Pressure (PEEP) of at least 5 cm H20

(d) Inclusion is based on concurrence of Critical Care Attending Physician/Intensivist

b. **Exclusion Criteria: If there is one or more exclusion criteria present, the RN should communicate with Providers.**

(1) Suspected increased ICP > 30mm Hg or CPP < 60mm Hg

(2) Unstable spine, femur, pelvic, or rib fractures or other skeletal limitations

(3) Open chest or unstable chest wall

(4) Open abdomen

(5) Substantial facial trauma or facial surgery during previous 15 days

(6) Substantial acute bleeding (e.g., requiring immediate endoscopic, surgical or Interventional Radiology (IR) procedure)

(7) Wounds at risk of dehiscence: consult surgical service for appropriateness of proning

(8) The presence of an anterior chest tube with air leaks

(9) Pregnancy

(10) Tracheal surgery or sternotomy during previous 15 days: consult surgical service for appropriateness of proning

(11) Intra-aortic balloon pump (IABP) therapy, ventricular assist device: consult cardiology service for appropriateness of proning

(12) Cardiac pacemaker inserted in the last 2 days

(13) Patient with hemodynamically unstable condition (MAP < 65 mm Hg) despite fluid and vasoactive support in place

(14) Weight > 160 kg is a relative exclusion (consider risk/benefit ratio for Veteran and staff)

(15) Goals of care incompatible with aggressive treatment plans

c. **Precautions:**

(1) The patient will be in the prone position for at least 16 consecutive hours per day.

(2) Ensure all staff are informed of patient in prone position on the unit and a sign will be placed on the patient's door.

d. **Personnel:** Team members include the 5-6 individuals below:

(1) One (1) Respiratory Therapist (RT) to manage the ventilator

(2) One (1) provider with Out of Operating Room Airway Management (OORAM) privileges for emergency airway management

(3) One (1) Attending Physician (anesthesia or critical care) to lead/direct the procedure. (note: #1b and #1c can be the same person)

(4) 3-4 additional personnel comprised of nursing, physical therapy, occupational therapy, or other healthcare workers trained in the protocol.

e. **Equipment:**

(1) Approximately 6-10 pillows (depending on patient size)

(2) One (1) flat sheet (draw sheet)

(3) Face foam cushion (1)

(4) New electrocardiogram (ECG) electrodes packages (2 for each pronation event)

(5) Mepilex – to be cut to fit forehead and chin

(6) Lacrilube and tape for the eyes

(7) Ultrasorb pads

(8) Wedge pillow for torso

(9) Intubation kit (for emergency re-intubation) for pronation event

f. **Pre-Proning Actions:**

(1) Discuss potential candidates for proning during afternoon proning rounds. Anticipated times to perform the pronation procedure is approximately 16:00 and the supination procedure at 08:00 to provide ~16 hours of pronation.

(2) Obtain provider order to place patient in prone position.

(3) Obtain baseline vital signs and hemodynamic measurements.

(4) Perform and document physical assessment (make sure to include specific attention to skin condition)

(5) If there is a wound dressing to anterior portion of the body, which is due to be changed during time of pronation, perform the dressing change prior to turning the patient to prone position.

(6) Assess patient's mental status (including both RASS and CAM-ICU).

(7) Obtain any ordered outstanding (pre-proning) lab samples, including arterial blood gas.

(8) Provide analgesia, sedation and consider neuromuscular blockade.

(9) Hold tube feeding for one (1) hour prior to pronation event unless the feeding tube placement is post-pyloric.

(10) Consult with Respiratory Therapy to secure the airway.

(11) Position intubation kit in or near patient's room

(12) Perform skin and eye protection interventions

(a) Apply Mepilex to forehead and chin

(b) Apply lacrilube or moisture drops to eyes and tape eyelids shut (preferably with "kind removal" tape)

(c) Ensure the tongue is inside the patient's mouth and insert bite block or oropharyngeal airway if tongue is swollen or protruding.

(13) If patient has an ilieostomy/colostomy, empty the bag(s) before placing in prone position. Place the drainage bag to gravity drainage and a pad around the stoma to prevent direct pressure to the stoma.

(14) Secure tubes/line/drains. Note position of tubes for reference and document. If patient does not have a NG/OG tube, consider placing one prior to proning.

(15) During pronation event, disconnect and cap any non-vital tubes/lines/drains, including arterial lines. Reconnect all tubes/lines/drains after completion of turn.

(16) Remove ECG leads and stickers from the front of the patient and place on patient's side until pronation complete.

(17) Keep SpO2 and capnography monitor on patient to assess oxygen saturation and heart rate during the procedure.

(18) Preoxygenate patient with 100% oxygen and suction patient's artificial airway.

(19) Measure the depth of the ETT at the lip

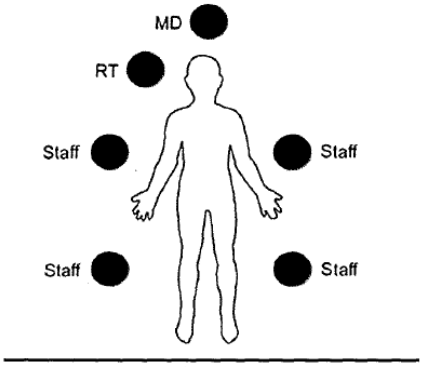
(20) Explain the procedure to the patient and/or family as applicable.

g. **Pronation Process:**

(1) Perform hand hygiene and don appropriate personal protective equipment (PPE) as necessary.

(2) Placement/positioning of medical staff is displayed in Figure 1. Position two staff member on each side of the patient's bed, 1 RT near the head of the bed (in close proximity to the ventilator), and the MD at the head of the bed to lead pronation procedure.

Figure 1. Personnel Placement During Pronation



(3) If the patient is in skeletal traction, one staff member will need to apply traction to the leg while the lines and weights are removed for the turn. If a skeletal pin comes in contact with the bed, place a pillow in the position to alleviate pressure points. (*reminder that unstable fractures are exclusionary – see exclusion #2).

(4) Arrange lines in the upper torso to align with either shoulder, or at head of bed. Arrange chest tubes and lines or tubes in the lower torso to align with either leg and extend off the end of the bed.

(5) If the patient is on a low air-loss surface, maximally inflate the surface.

(6) Ensure a clean flat sheet is under the patient.

(7) Measure distance from ETT to lip.

(8) On RT/MD indication, roll the patient to his/her side and tuck a flat/lift sheet under the patient to assist with turning.

(9) On RT/MD indication, use the flat/turn sheet under the patient to pull the patient to one side of the bed (opposite the direction of the turn) using 4 staff members. Remember to turn the patient in the direction of the mechanical ventilator.

(10) Prepare the patient for the turn:

(a) Turn the patient's head **away** from the direction of the turn.

(b) Loop the ventilator tubing above the patient's head.

(c) Cross the patient's leg closer to the edge of the bed over the opposite leg at the ankle.

(d) Place the flat sheet around the arm that will be pulled underneath the patient during the turn (side you are turning toward).

(11) On RT/MD indication, place a second flat sheet on the bed and tuck it under the patient. This sheet will be pulled underneath the patient as the patient is turned.

(12) Pillow placement- depending on the patient's size and need, the healthcare team may want to:

(a) Place face cushion on the patient's face

(b) Place 2-3 pillows on the patient's chest

(c) Place 2-3 pillows on hips

(d) Cover pillows with the draped end of the flat sheet

(13) Remove headboard and footboard, move bed away from wall and drop side rails, and tuck the patient's arms slightly under his/her buttocks.

(14) Place a sheet over the patient.

(15) Staff members of both sides of the bed take the top and bottom sheets and roll them together tightly toward the patient, forming a tight "burrito" holding the pillows in place.

(16) Perform "Time Out" and call the room to order. Conversations not related to the prone positioning will be held until after the procedure to ensure patient safety. Leader (MD) calls "Time Out" to confirm procedure, plan, and ensure that tubes/lines/drains still attached are secured.

(17) On MD indication, slide the patient to the edge of the mattress away from the ventilator.

(18) Using a three count, and on MD indication, roll the patient, using the sheets, into the prone position while RT supports the head during the turn, ensuring that ETT, lines, and tubes are secure. The arm and sheet will pull across the bed.

(19) Adjust patient for appropriate position and center in the bed.

(20) Discard the sheet that was used to place the patient in the prone position.

(21) Note the patient's body position, if the patient is hyper-flexed, add an additional pillow under the neck to maintain a neutral position.

(22) Use wedges and pillows to adjust patient position as needed.

(23) Attach new ECG electrodes on patient's back.

(24) Position arms in a neutral position, parallel to the body. Arms may be placed by the head, aligned with the body, or one up and one down.

(25) If using the face cushion, ensure that the eyes are clear of the cushion. Staff may also position the patient's head to the left or right with a regular pad.

(26) Ensure Mepilex dressings on chin and forehead are intact.

(27) Assess for hyperextension of the neck.

(28) Consider placing an Ultrasorb pad under the patient's head to absorb oral drainage.

(29) Reconnect tubes/lines/drains. Verify there are no kinks in tubing, and resume infusions that were halted for proning procedure.

(30) If the patient is on a low air-loss surface, adjust the inflation as appropriate.

(31) Perform physical assessment once patient is in prone position.

(32) Measure distance from ETT to lip.

(33) Place pillow or other support (i.e. wedge) under ankles.

(34) Place the bed in reverse Trendelenburg (head higher than feet) position at 10 degrees for the duration of prone positioning.

(35) Discard used supplies, follow protocols for hand hygiene and PPE doffing.

(36) Resume tube feedings, if ordered.

(37) Consider ordering chest x-ray to confirm ETT placement.

(38) Document procedure and patient's response in the electronic health record (EHR).

h. **Care of the Patient in the Prone Position:**

(1) Assess and document tolerance and response to prone position, including HR, BP, Respiratory rate, SpO2, and ABGs, 15 and 30 minutes after pronation and report to the critical care provider.

(2) ABGs every 2 hours if SpO2 < 92% or every 4 hours if SpO2 is ≥ 92% and there is no evidence of hemodynamic instability.

(3) Determine anticipated timeframe for patient remaining in prone position.

(a) If the patient is too unstable to return to the supine position, alleviate pressure points on the front of the body.

(b) One option is to turn the patient side to side in a ¾ prone position.

(4) Reposition arms and head to reduce pressure every 2 hours.

(5) Assess skin every 2 hours for pressure on pressure points with attention to: face, shoulders, chest, breasts, abdomen, genitalia, knees, pelvis, feet and toes, and skin areas overlying all tubes (e.g. indwelling urinary catheters, intravascular catheters).

(6) Provide frequent oral care (every 4 hours) and suction airway as needed.

(7) If patient is receiving a neuromuscular blocking agent, maintain sedation Richmond Agitation-Sedation Scale (RASS) goal -5 and paralysis Train of Four (TOF) 2/4.

(8) Ensure adequate nutritional intake while in supine position.

i. **Criteria for Discontinuing Pronation Therapy:**

(1) **Patient improvement:** Veteran has met pre-established criteria (defined as a PaO2: FiO2 ratio of >150 mm Hg, with a PEEP of ≤10 cm of H2O and an FiO2 of ≤0.6; these criteria must be met in the supine position at least 4 hours after the end of the last prone session.

(2) **Absence of response:** Consistent PaO2/FiO2 ratio deterioration by more than 20% relative to the PaO2/FiO2 ratio in the previous supine session. Stop pronation therapy if deterioration occurs in two consecutive prone sessions.

(3) **Life-threatening deteriorations:** Complications that occur during a prone session leading to immediate interruption of prone therapy:

(a) Oxygen saturation of <85% on pulse oximetry, or a PaO2 of <55mmHg for more than 5 minutes when FiO2 is 1.0 (100%)

(b) Unplanned extubation

(c) Main-stem bronchus intubation

(d) Endotracheal (ET) tube obstruction

(e) Substantial hemoptysis

(f) Cardiac arrest or heart rate <30 beats per minute for more than 1 minute

(g) Systolic blood pressure of <60mmHg for more than 5 minutes.

j. Procedure for Returning to Supine Position:

(1) Criteria for the return to the supine position include patient improvement, absence of response, life-threatening deteriorations, and are defined in the criteria for discontinuing pronation therapy section.

(2) Obtain provider order to place patient in supine position.

(3) Perform hand hygiene and apply proper PPE as appropriate.

(4) Place bed in neutral position from Reverse Trendelenburg.

(5) Secure tubes/lines/drains. Note position of tubes for reference and document.

(6) Disconnect and cap any non-vital tubes/lines/drains, including arterial lines. Reconnect all tubes/lines/drains after completion of turn.

(7) Measure the depth of the ETT at the lip.

(8) Staff members, RT, and MD should be positioned the same for supination as for proning as shown in Figure 1.

(9) Arrange lines in the upper torso to align with either shoulder, or at head of bed. Arrange chest tubes and lines or tubes in the lower torso to align with either leg and extend off the end of the bed.

(10) If patient is on a low air-loss surface, maximally inflate.

(11) On RT/MD indication, roll the patient on his/her side and tuck a flat/lift sheet under the patient to assist with turning.

(12) On RT/MD indication, use the flat/turn sheet under the patient to pull the patient to one side of the bed (opposite the direction of the turn) using 4 staff members.

(13) Remember to turn the patient in the direction of the ventilator.

(14) Prepare the patient for the turn:

(a) Turn the patient's head away from the direction of the turn

(b) Loop the ventilator tubing above the patient's head

(c) Bring patient's arms to rest on either side of the head

(d) Remove leg and ankle pillow supports

(e) Cross the patient's leg closer to the edge of the bed over the opposite leg at the ankle.

(f) Remove the ECG electrodes from the patient's back and place on patient's side until supination complete

(g) Keep SpO2 and capnography monitor on patient to assess oxygen saturation and heart rate during the procedure

(h) Place the flat sheet around the arm that will be pulled underneath the patient during the turn

(15) On RT/MD indication, place a second flat sheet on the bed and tuck it under the patient. This sheet will be pulled underneath the patient as the patient is turned.

(16) Place a sheet over the patient.

(17) Staff members on both sides of the bed take the top and bottom sheets and roll them together tightly toward the patient, forming a tight "burrito" holding the pillows in place.

(18) Perform "Time Out" and call the room to order. Conversations not related to the prone positioning will be held until after the procedure to ensure patient safety. Leader (MD) calls "Time Out" to confirm procedure, plan, and ensure that tubes/lines/drains still attached are secured.

(19) On RT/MD indication, slide the patient to the edge of the mattress away from the ventilator.

(20) Using a three count, and on RT/MD indication, roll the patient, using the sheets, into the supine position while RT supports the head during the turn, ensuring that ETT, lines, and tubes are secure. The arm and sheet will pull across the bed.

(21) Adjust patient for appropriate position and in the center of the bed. Discard the sheet that was used to place the patient in supine position.

(22) Use wedges and pillows to adjust patient position as needed.

(23) Replace ECG electrodes on patient's chest.

(24) Reconnect disconnected tubes/lines/drains. Verify that no tubes/lines/drains are kinked.

(25) If the patient is on a low air-loss surface, adjust the inflation as appropriate.

(26) Perform physical assessment once patient is in supine position.

(27) Measure distance from ETT to lip.

(28) Place the head of bed at 30 degrees.

(29) Discard used supplies, perform hand hygiene, and doff PPE using existing protocols, as appropriate.

(30) Resume tube feedings, if ordered.

(31) The ICU RN will obtain an ABG 4-6 hours after supination.

(32) Document procedure and patient's response in the electronic health record (EHR).

3. ASSIGNMENT OF RESPONSIBILITIES

None

4. DEFINITIONS

None

5. REFERENCES

a. Alsaghir, A. H., Martian, C. M., (2008). Effect of prone positioning in patients with acute respiratory distress syndrome: A Meta-analysis. *Critical Care Medicine*. 36, 603-609.

b. Sud, S., Friedrich, J.O., Adhikari, N.K., Taccone, P., Mancebo, J., Polli, F., Latini, R., Presenti, A., Curley, M. A., Fernandez, R., Chan, M.C., Beuret, P., Voggenreiter, G., Sud, M., Tognoni G., Gattinoni, L., & Guérin, C. *(2014)*. Effect of prone positioning during mechanical ventilation on mortality among patients with acute respiratory distress syndrome: a systematic review and meta-analysis. *CMAJ. 186*(10), E381–E390.

c. Benson, A. B., Albert, R. K. (2014). Prone positioning for acute respiratory distress syndrome. *Clinics in Chest Medicine*, *35*(4), 743-752.

d. Wiegand, D. L. (Ed). (2017). *AACN procedure manual for high acuity, progressive, and critical care* (7th edition). St. Louis: Elsevier, pp. 142-163.

6. REVIEW

This SOP must be reviewed at minimum at the recertification date.

7. RECERTIFICATION

This SOP is scheduled for recertification on or before the last working day of December 2025. In the event of contradiction with national policy, the national policy supersedes and controls.

8. SIGNATORY AUTHORITY

James Michael Wells, MD, MSPH
MICU Director; Critical Care Steering Committee Chair
Date Approved: 08/18/2020

for Cynthia Cleveland, DNP, RN, NE-BC
Associate Director for Patient Care Services
Date Approved:

NOTE: *The signature remains valid until rescinded by an appropriate administrative action.*

To: McCrorie, Meredith N.
Cc:

Tue 7/26/2022 7:44 AM

Good Morning Meredith,

The Clinical Practice Council (CPC) and Nurse Executive Council (NEC) have reviewed and approved the Manual Pronation SOP. I spoke with the Chair of NEC this morning, and there are no reservations regarding the use of the SOP in your manuscript as long as the SOP does not specifically name the Birmingham VA Health Care System.

If there are any questions or concerns, please feel free to reach out.

Thanks,

Jana Falkner, MSN, RN, NE-BC
Acting Chief, Critical Care/ED/Cath Lab/Heart Station
Chair, Clinical Practice Council
Staffing Nurse Manager
Birmingham VA Medical Center

From: McCrorie, Meredith N.
Sent: Tuesday, July 26, 2022 7:26 AM
To: Falkner, Jana
Cc: Meredith McCrorie
Subject: Manual Pronation SOP

Good Morning Ms. Falkner,

I am currently a DNP student at JSU and my project is implementation of a standardized manual pronation protocol. The facility has adopted a SOP for the process. I would like to place the SOP in the appendix of my manuscript. Could I have permission to publish the SOP within my manuscript in it entirety?

Thank you,
Meredith

Appendix B

Pronation Checklist

Health Care System

Manual Prone Position for Patients with ARDS

Date:_____ **Time:_____**

Criteria for Pronation

√	
	Partial pressure of arterial oxygen/fraction of inspired oxygen (PaO2/FiO2) ratio < 150 mmHg
	FiO2 of at least 0.6 (60%)
	Positive End Expiratory Pressure (PEEP) of at least 5 cm H20
	Chest film indicative of ARDS diagnosis (i.e. bilateral opacities)

Pre-Prone Checklist

√	
	Ensure physician order for pronation
	Contact Respiratory Therapy and Anesthesia
	Gather supplies (please see equipment checklist)
	Obtain baseline vital signs and hemodynamic measurements.
	Perform and document physical assessment (make sure to include specific attention to skin condition)
	If there is a wound dressing to anterior portion of the body, which is due to be changed during time of pronation, perform the dressing change prior to turning the patient to prone position.
	Assess patient's mental status (including both RASS and CAM-ICU).
	Obtain any ordered outstanding (pre-proning) lab samples, including arterial blood gas.
	Provide analgesia, sedation and consider neuromuscular blockade.
	Hold tube feeding for one (1) hour prior to pronation event unless the feeding tube placement is post-pyloric.
	Position intubation kit in or near patient's room
	Perform skin and eye protection interventions • Apply Mepilex to forehead and chin • Apply lacrilube or moisture drops to eyes and tape eyelids shut (preferably with "kind removal" tape) • Ensure the tongue is inside the patient's mouth and insert bite block or oropharyngeal airway if tongue is swollen or protruding.
	If patient has an ileostomy/colostomy, empty the bag(s) before placing in prone position. Place the drainage bag to gravity drainage and a pad around the stoma to prevent direct pressure to the stoma.
	Secure tubes/line/drains, note position of tubes for reference and document.

	If patient does not have a NG/OG tube, consider placing one prior to proning.
	During pronation event, disconnect and cap any non-vital tubes/lines/drains, including arterial lines. Reconnect all tubes/lines/drains after completion of turn.
	Remove ECG leads and stickers from the front of the patient and place on patient's side until pronation complete. (Keep SpO2 and capnography monitor on patient to assess oxygen saturation and heart rate during the procedure)
	Preoxygenate patient with 100% oxygen and suction patient's artificial airway.
	Measure the depth of the ETT at the lip.
	Explain the procedure to the patient and/or family as applicable.

Equipment Checklist

√	
	Approximately 6-10 pillows (depending on patient size)
	One (1) Flat sheet (draw sheet)
	Face foam cushion (1)
	New ECG electrodes packages (2 for each pronation event)
	Mepilex – to be cut to fit forehead and chin
	Lacrilube and tape for the eyes
	Ultrasorb pads
	Wedge pillow for torso
	Intubation kit (for emergency re-intubation) for pronation event

Proning Checklist

√	
	Perform hand hygiene and don appropriate PPE, as necessary.
	Placement/positioning of medical staff. Position two staff members on each side of the patient's bed, 1 RT near the head of the bed (in close proximity to the ventilator), and the MD at the head of the bed to lead pronation procedure.
	If the patient is in skeletal traction, one staff member will need to apply traction to the leg while the lines and weights are removed for the turn. If a skeletal pin comes in contact with the bed, place a pillow in the position to alleviate pressure points.
	Arrange lines in the upper torso to align with either shoulder, or at head of bed. Arrange chest tubes and lines or tubes in the lower torso to align with either leg and extend off the end of the bed.
	If the patient is on a low air-loss surface, maximally inflate the surface.
	Ensure that clean flat sheet is under the patient
	Measure distance from ETT to lip.

	On RT/MD indication, roll the patient on his/her side and tuck a flat/lift sheet under the patient to assist with turning
	On RT/MD indication, use the flat/turn sheet under the patient to pull the patient to one side of the bed (opposite the direction of the turn) using 4 staff members. Remember to turn the patient in the direction of the mechanical ventilator.
	Prepare the patient for the turn: Turn the patient's head away from the direction of the turn · Loop the ventilator tubing above the patient's head · Cross the patient's leg closer to the edge of the bed over the opposite leg at the ankle · Place the flat sheet around the arm that will be pulled underneath the patient during the turn (side you are turning toward).
	On RT/MD indication, place a second flat sheet on the bed and tuck it under the patient. This sheet will be pulled underneath the patient as the patient is turned.
	Pillow placement – depending on the patient's size and need for abdomen-unrestricted position, may want to: • Place face cushion on patient's face • Place 2-3 pillows on patient's chest • Place 2-3 pillows on hips • Cover pillows with the draped end of the flat sheet
	Remove headboard and footboard, move bed away from wall and drop side rails, and tuck the patient's arms slightly under his/her buttocks.
	Place a sheet over the patient.
	Staff members on both sides of the bed take the top and bottom sheets and roll them together tightly toward the patient, forming a tight "burrito" holding the pillows in place.
	Perform "TIME OUT" and call the room to order • Conversations not related to prone positioning will be held until after the procedure to ensure patient safety. • Leader (MD) calls "Time Out" to confirm procedure, plan, and ensure that tubes/lines/drains still attached are secured.
	On MD indication, slide the patient to the edge of the mattress away from the ventilator
	Using a three count, and on MD indication, roll the patient, using the sheets, into the prone position while RT supports the head during the turn, ensuring that ETT, lines and tubes are secure. The arm and sheet will pull across the bed.
	Adjust patient for appropriate position and center in the bed • Discard the sheet that was used to place the patient in the prone position • Note the patient's body position, if the patient is hyper-flexed, add an additional pillow under the chest to maintain a neutral position • Use wedges and pillows to adjust patient position as needed.
	Attach new ECG electrodes on patient's back.
	Position arms in a neutral position, parallel to the body. (May be placed by the head, aligned with the body, or one up and one down
	If using the face cushion, ensure that the eyes are clear of the cushion. You may also position the patient's head to the left or right with a regular pillow or pad. • Ensure Mepilex dressings on chin and forehead are intact • Assess for hyper extension of the neck.

	• Consider placing an Ultrabsorb pad under patient's head to absorb oral drainage
	Reconnect disconnected tubes/lines/drains. Verify there are no kinks in tubing, and resume infusions that were halted for the proning procedure.
	If the patient is on a low air-loss surface, adjust the inflation as appropriate.
	Perform physical assessments once patient is in prone position.
	Measure distance from ETT to lip.
	Place pillow or other support (i.e. wedge) under ankles.
	Place the bed in reverse Trendelenburg (head higher than feet) position
	Discard used supplies, follow protocols for hand hygiene and PPE doffing.
	Resume tube feedings, if ordered.
	Consider ordering chest x-ray to confirm ETT placement
	Document procedure and patient's response in electronic health record (EHR)

Care of a Prone Patient

√	
	Assess and document tolerance and response to prone position, including HR, BP, Respiratory rate, SpO2, ABGs and CPOT 15 and 30 minutes after pronation.
	ABGs every 2 hours if SpO2 < 90% or every 4 hours if SpO2 is > 92% and there is no evidence of hemodynamic instability.
	Determine anticipated timeframe for patient remaining in prone position. • If the patient is too unstable to return to the supine position, alleviate pressure points on the front of the body. • One option is to turn the patient side to side in a ¾ prone position.
	Reposition arms and head to reduce pressure every 2 hours.
	Assess skin every 2 hours for pressure-on-pressure points with attention to: face, shoulders, chest, breasts, abdomen, genitalia, knees, pelvis, feet and toes, and skin areas overlying all tubes (e.g., indwelling urinary catheter, intravascular catheters).
	Provide frequent oral care (every 4 hours) and suction airway as needed.
	If patient is receiving a Neuromuscular blocking agent, maintain sedation RASS goal –5 and paralysis TOF 2/4
	Ensure adequate nutritional intake while in supine position.

Supine Positioning Patient

Criteria for the return to the supine position include patient improvement, absence of response, life-threatening deteriorations and are defined in criteria for discontinuing pronation therapy section.

√	
	Obtain provider order to place patient in supine position.
	Perform hand hygiene and apply proper PPE, as appropriate.
	Place bed in neutral position from Reverse Trendelenburg.
	Secure tubes/line/drains note position of tubes for reference and document.
	Disconnect and cap any non-vital tubes/lines/drains, including arterial lines. Reconnect all tubes/lines/drains after completion of turn.
	Measure the depth of the ETT at the lip.
	Staff members, RT, and MD should be positioned the same for supination
	Arrange lines in the upper torso to align with either shoulder, or at head of bed. Arrange chest tubes and lines or tubes in the lower torso to align with either leg and extend off the end of the bed.
	If patient is on a low air-loss surface, maximally inflate.
	On RT/MD indication, roll the patient on his/her side and tuck a flat/lift sheet under the patient to assist with turning.
	On RT/MD indication, use the flat/turn sheet under the patient to pull the patient to one side of the bed (opposite the direction of the turn) using 4 staff members. **Remember to turn the patient in the direction of the ventilator**
	On RT/MD indication, place a second flat sheet on the bed and tuck it under the patient. This sheet will be pulled underneath the patient as the patient is turned.
	Place a sheet over the patient.
	Staff members on both sides of the bed take the top and bottom sheets and roll them together tightly toward the patient, forming a tight "burrito" holding the pillows in place.
	Perform "TIME OUT" and call the room to order • Conversations not related to prone positioning will be held until after the procedure to ensure patient safety. • Leader (MD) calls "Time Out" to confirm procedure, plan, and ensure that tubes/lines/drains still attached are secured.
	On RT/MD indication, slide the patient to the edge of the mattress away from the ventilator.
	Using a three count, and on RT/MD indication, roll the patient, using the sheets, into the supine position while RT supports the head during the turn, ensuring that ETT, lines and tubes are secure. The arm and sheet will pull across the bed.
	Adjust patient for appropriate position and in center of bed • Discard the sheet that was used to place the patient in the supine position. • Use wedges and pillows to adjust patient position as needed.
	Replace ECG electrodes on patient's chest
	Reconnect disconnected tubes/line/drains. Verify that no tubes/line/drains are kinked.
	If the patient is on a low air-loss surface, adjust the inflation as appropriate.
	Perform physical assessments once patient is in prone position.
	Measure distance from ETT to lip.

	Place the head of bed at 30 degrees.
	Discard used supplies, perform hand hygiene, and doff PPE using existing protocols, as appropriate.
	Resume tube feedings, if ordered.
	Document procedure and patient's response in electronic health record (EHR).

Criteria for Discontinuing Pronation

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	Patient improvement: Veteran has met pre-established criteria (defined as a PaO2: FiO2 ratio of >150 mm Hg, with a PEEP of ≤10 cm of water and an FiO2 of ≤0.6; these criteria must be met in the supine position at least 4 hours after the end of the last prone session
	Absence of response: Consistent PaO2/FiO2 ratio deterioration by more than 20% relative to the PaO2/FiO2 ratio in the previous supine session. Stop pronation therapy if deterioration occurs in two consecutive prone sessions.
	Life-threatening deteriorations: Complications that occur during a prone session leading to immediate interruption of prone therapy: a) Oxygen saturation of < 85% on pulse oximetry, or a PaO2 of < 55 mm Hg for more than 5 minutes when the FiO2 was 1.0 (100%) b) Unplanned extubation c) Main-stem bronchus intubation d) Endotracheal (ET) tube obstruction e) Substantial hemoptysis f) Cardiac arrest or heart rate < 30 beats per minute for more than 1 minute. g) Systolic blood pressure of < 60 mm Hg for more than 5 minutes

Appendix C

Nursing Consent

Participant Consent Form

TITLE OF STUDY: A Multi-modal Strategy to Activate Pronation for Acute Respiratory Distress Syndrome Patients.

Principal Investigator: Meredith McCrorie MSN, RN

This consent form is part of the informed consent process for this DNP project. The purpose of this consent is to provide information to assist with your decision process regarding participation. This consent will provide information regarding the change process and the implementation guideline.
If you have any questions during this process, you should feel free to ask them with the expectation of an answer in an entirety.

After answering the questions, you may complete the attached consent and participate in the educational sessions if you continue to desire to participate in this project. You are not giving up any of your legal rights by volunteering for this research project.

Why is this project being done?
The focus of this project is to provide a consistent protocol and process when implementing pronation for mechanically ventilated patient with ARDS. Currently the medical facility lacks a process for manual pronation of ARDS patients. This project hopes to improve the overall outcome by decreasing the amount of time mechanically ventilated. The study will run for ninety days.

What will you be asked to do if you take part in this research project?
Initially, the PI will conduct a survey of current practices and compose a standard evidence-based practice for the providers and nurses to follow. Simulation education will be conducted with the simulation department with a time length of approximately forty-five minutes.

What are the risks or discomforts you might experience if you take part in this project?
The PI has identified no risks for involvement of the participants. Participation is completely voluntary and there is no participation from executive leadership.

How will information about you be kept private or confidential?
All efforts will be made to keep personal identification confidential, although total confidentially cannot be guarantee. A randomized ID codes will be assigned to each person. Spreadsheets will remain on the medical unit in a locked cabinet behind a locked door.

What will happen if you do not wish to participate in the project or if you later decide not to stay in the project?

Participation is voluntary. If you choose to not participate or withdrawal, you may do so without penalty.

Who can you call if you have any questions?
If you have any questions about taking part in this project you can call the principal investigator:

Meredith McCrorie, MSN, RN
mmccrorie@stu.jsu.edu

AGREEMENT TO PARTICIPATE

1. Subject consent:

I have read this entire form, or it has been read to me, and I believe I understand what has been discussed. All of my questions about this form or this study have been answered. I agree to take participate in this research project.

Subject Name (printed):_____

Subject Signature:_____ Date:_____

2. Signature of Investigator/Individual Obtaining Consent:

To the best of my ability, I have explained and discussed the study's complete contents, including all of the information contained in this consent form.

Investigator/Person Obtaining Consent (printed):_____

Signature:_____ Date: _____

Appendix D

Citi Training Certificate

CITI PROGRAM

Completion Date 19-Sep-2021
Expiration Date 18-Sep-2024
Record ID 45108817

This is to certify that:

Meredith McCrorie

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social and Behavioral Responsible Conduct of Research
(Curriculum Group)
Social and Behavioral Responsible Conduct of Research
(Course Learner Group)
1 - RCR
(Stage)

Under requirements set by:

Jacksonville State University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w33a7345e-550d-408e-9346-70729673dff8-45108817

Appendix E

JSU IRB Approval Letter

JSU | INSTITUTIONAL REVIEW BOARD
JACKSONVILLE STATE UNIVERSITY

Institutional Review Board for the Protection of Human Subjects in Research
203 Angle Hall
700 Pelham Road North
Jacksonville, AL 36265-1602

December 8, 2021

Meredith McCrorie
Jacksonville State University
Jacksonville, AL 36265

Dear Meredith:

Your protocol for the project titled "Implementation of a Pronation Process Checklist to Increaser Usage among Patients with Acute Respiratory Distress Syndrome (ARDS) in an Intensive Care Setting" 12082021-06 has been granted exemption by the JSU Institutional Review Board for the Protection of Human Subjects in Research (IRB). If your research deviates from that listed in the protocol, please notify me immediately. One year from the date of this approval letter, please send me a progress report of your research project.

Best wishes for a successful research project.

Sincerely,

Lynn Garner
Associate Human Protections Administrator, Institutional Review Board