Our experts’ responses to your questions:

Q: Do you recommend post-pyloric feeding tube (ie, NJ tubes) instead of gastric tubes? You say that we should continue feeding patients while they’re proned. Is that after neuromuscular blockade treatment has ended? What degree of reverse Trendelenburg do you achieve before you begin feeding patient?

A: To summarize recommendations/consideration in feeding in the prone position:
- ASPEN/SCCM guidelines 2016, Recommendations B4a: “We recommend that the level of infusion be diverted lower in the GI tract in those critically ill patients at high risk for aspiration (see section D4) or those who have shown intolerance to gastric EN.”
- D4 in ASPEN SCCM states, “We suggest that patients receiving EN should be assessed for risk of aspiration and that steps to reduce risk of aspiration and aspiration pneumonia should be proactively employed.” Factors associated with increased risk are mechanical ventilation and supine position (not describing prone). Recommendation D4a goes on to state that those deemed high risk should have feeding diverted post-pyloric.
- The only published article about enteral feeding in the prone position that I have come across was published in 2014; it reported no increased/significant differences in gastric residual events, vomiting, or regurgitation vs those who were fed not proned. The population was fed via NG tube and actually utilized a high-fiber formula.

Overall, we would state that feeding in the prone position would be safe to consider with gastric access/feeding; however, we should evaluate patient-by-patient; those deemed high risk or have shown prior intolerances should have timely post-pyloric access for feedings. Reverse Trendelenburg can reduce the micro aspiration risk. Most critical care beds reach around 20°. There is no literature to support degree of angle. Our best opinion would be any angle that is not completely flat.
Additionally, neuromuscular blockade is not a contraindication to enteral feeding, as it does not improve or worsen gastric emptying ability. Individual monitoring of the patient is warranted to ensure changes in feeding regimen and appropriate method of feeding.

Q: Is rotational therapy with a kinetic bed (eg, RotoProne) more beneficial in terms of alveolar recruitment and lung compliance?
A: Continuous lateral rotation (rotational therapy) may have an impact on the prevention and treatment of nosocomial infections by improving the gravitational effects on blood flow and ventilation, reducing lung water and aiding in the removal of secretion through enhancement of the mucociliary escalator (supine position). There still remains insufficient evidence to support its inclusion as a fully validated treatment in the prone position. Physiologically speaking, rotating while in the prone position could impact the pressure relationships in the chest, which may create a more positive pleural pressure resulting in less recruitment. However, this has not been studied.

Q: Has there been any research on ARDS patients and the development of pulmonary fibrosis after recovery?
A: Pulmonary fibrosis was noted as a potential complication in about 10% of the patients who were treated for H1N1 in a study by Mineo G, et al (Mineo G, et al. Radiol Med. 2012;117(2):185-200). Additional studies have substantiated these results.

Q: The last evidence I had seen from Guerin was that proning >16-18 hours/day showed benefits. Was the 12-hour mark a new change?
A: The current recommendations are to consider 16 hours of uninterrupted prone positioning. More frequent turn back (supine positioning) may cause derecruitment. The >12-hour mark was from a meta-analysis of all the research. However, the three most recent studies all used >16 hours, and the ATS/SCCM guidelines for mechanical ventilation of ARDS patients recommends >16 hours.

Q: How do you determine whether prone position is best, vs ECMO?
A: ECMO is considered only after routine treatment strategies have been tried and have failed. These treatment strategies include:
- Lung protective ventilation with a VT of 4-6 mL/kg
- Short course of neuromuscular blockade, 48 hours
- Recruitment maneuvers
- Prone positioning
- Advanced ventilator strategies such as airway pressure release ventilation (APRV)
- Consider inhaled nitric oxide
- Consider ECMO

Q: Would altitude effect the range of the PF ratio to prone someone and ARDS criteria? We live at 5500-foot elevation, so we have lower PaO2 ranges that are normal.
A: That is a great question. From all our reading, we have not seen reference changes in the ARDS definition of mild, moderate, or severe hypoxemia based on altitude. We do understand your
question. Contact me directly at kvollman@comcast.net. I will reach out to one of my colleagues who is heavily involved in national ARDS research and get his response.

Q: How do you deal with that hemodynamic instability during that 10–15-minute wait period after proning? What do you tolerate?
A: If it is cardiovascular instability (ie, blood pressure), many adjust the vasopressor temporally and then titrate back down as appropriate. If it is oxygen, repeat the hyperoxygenation until patient has had the opportunity to adjust. The body’s oxygen demand increases during a turn, so providing more may be enough to overcome the increase in demand. If it is life-threatening arrhythmias, patients should be immediately returned to the supine position.

Q: Do you turn a patient who is hemodynamically unstable more slowly, to reduce the inner-ear issue?
A: The research that has looked at inner ear equilibrium and the impact on the cardiovascular system would suggest that turning more slowly into a lateral position from supine has an impact. We would suspect that this may be similar when turning to the prone position but there are no studies.

Q: What are your thoughts on preemptively giving the patient a bolus of IV fluids that are hemodynamically unstable (given that when we prone we are essentially increasing the size of our circulatory system with the improved recruitment)?
A: When we prone, the circulatory system (pulmonary bed) does not really change; the change occurs in the fact that the pulmonary bed is now next to recruited alveoli that improves the oxygenation. We do not recommend preemptive fluid. If the patient has been adequately resuscitated, there should be no need for additional fluid. Dynamic measures of fluid status should be used to determine whether a patient needs more fluid or not.

Q: Any contraindication to placing patients who are on multiple vasopressors in the prone position?
A: There is no contraindication to placing patients who are on multiple vasopressors in the prone position. If the patients oxygenate better when prone, cardiovascular stability could improve. If the concern is that they may arrest during the turn or immediately following, then you have to weigh risk vs benefit to the position change.

Q: Do you have recommendations for neurological assessment when prone? Someone at my facility suggested BIS monitoring.
A: There are no specific guidelines regarding the frequency of neurological assessment for patients with ARDS who are placed in the prone position. Assessment should be based on clinical diagnosis and other conditions, just as is the case for supine ARDS patients.

Q: Are standards to place them in prone ASAP, or within so many hours of diagnosis of ARDS?
A: The time interval from injury to position change, prone positioning, should be <48 hours. Our practice is the sooner, the better.

Q: Given a goal of 12 hours per day of proning, would it be an option to meet the goal if the patient were proned 6 hours X2 episodes a day, rather than 12 straight hours? The last evidence I had seen
from Guerin was that proning >16-18 hours/day showed benefits. Was the 12-hour mark a new change?

A: The current recommendations are to consider 16 hours of uninterrupted prone positioning. A total of 16 hours using different time sequencing has not been studied. It would make a great study. The >12-hour mark was from a meta-analysis of all the research. However, the three most recent studies all used >16 hours, and the ATS/SCCM guidelines for mechanical ventilation of ARDS patients recommends >16 hours.

Q: What degree of reverse Trendelenburg would you suggest? Does using the reverse Trendelenburg position effect the flow of secretions when the patient is prone? My worry is that secretions flowing back down the trachea, instead of up and being able to be suctioned out turn back (supine positioning), may cause derecruitment.

A: In general, a 20° reverse Trendelenburg position combined with prone positioning helps remove abdominal pressure on the diaphragm, which may enhance ventilation, limit lung derecruitment, and helps to reduce facial edema. Usually on the turn to prone, the secretions movement is the greatest and would allow for effective pulmonary clearance; then they could be placed in the reverse Trendelenburg. Use of a closed suction system helps prevent decruitment with the suctioning process.

Q: Do you have an order to not reposition except arms, face? Nurses on my night shift have had a difficult time with not moving the patient. A patient’s ETT was dislodged while they tried changing a sheet.

A: Some patients may require a “no turn” order if their respiratory status is so compromised that any activity may potentially cause them to arrest. No turn, basically, means do not touch or move. However, if you do not move the head slightly every hour we can guarantee a pressure injury. A no-turn order should be generally self-limiting after the initiation of standard treatment guidelines for ARDS. In our unit, if there is a no-turn order, there is a mandatory reassessment every 4 hours.

Q: Besides moving the head and arms, are there other ways to turn or slightly reposition patients to decrease the risk of pressure injury? (In addition to your ideas of silicone barriers)? Do you know of any products, or have another tip to assist with repositioning of the head?

A: Our practice is to rotate the head from side to side every 2 hours to reduce pressure on the face. To accomplish this, we lift the shoulders slightly while rotating the head. We use liter bags of IV fluid wrapped in a pillowcase to help support the head. In larger patients, you can use dialysis bags, 5-liter wrapped in a sheet to help position the head (a so-called waterbed for the head). Sometimes we take 100 cc out of the liter bags to make them more malleable.

Q: Do you allow physical therapy to continue while the patient is in the prone position?

A: Physical therapy is not started until the patient’s respiratory status is stabilized (ie, nitric oxide easily desaturates to the point of sustained dangerous levels). However, if that condition does not exist, we do ROM/turning/shifting q 2 and arm/leg movement even while prone.

Q: Does this apply to pediatrics, as well? Do you have any pediatric-specific information or data on this practice? We care for infants to teens.

A: We do not have any expertise in the pediatric population. The only large randomized trial on peds was conducted for >16 hours in the prone position per day, but before low tidal volume ventilation
was part of our therapy; it showed no impact on mortality. Because of the confounding variable of the lack of low tidal volume, we do not know whether it was the way they were ventilated or the prone position that had no impact on mortality. Newer studies would need to be conducted.

**Q:** Are there BMI recommendations for placing patients in the prone position? How can you prone a 350-pound patient with three, four, or even five staff? This seems unsafe for nurses.

**A:** Prone positioning may be an even more important recruitment strategy in patients who are obese with lung injury. Proning allows the weight of mediastinal tissue to be supported by the sternum, resulting in less lung tissue being susceptible to collapsing forces. Unfortunately, we cannot make a recommendation regarding an appropriate BMI that is safe to prone. Prone positioning, using the manual method, requires some level of expertise in the process. At the University of Michigan, we have proned 600-pound patients successfully, without the use of a lift. This does require coordination, including planning an adequate number of staff to prevent injuries. The larger the patient, the greater number of staff required to move and turn the patient. We use a slide sheet to help reduce friction when we are pulling and turning. It should be remembered that proning does not require that staff lift the patient, but rather just roll them. The sheet acts as a fulcrum to help with the turn, reducing the stress on staff.

**Q:** What is the average time to manually turn a patient with a high BMI into the supine position for CPR, including gathering staff and resources to turn the patient over rapidly and safely?

**A:** We have perfected this technique, even in the obese patient through years of practice. Even in the obese patient we can return to supine from the prone positioning in less than a minute. Practice makes perfect.

**Q:** Is there evidence-based practice for specific skin care techniques while placing patients in the prone position? We use a bridge where the patient’s face sits, and we are having trouble with breakdown. Do you use a device or just turn head side to side?

**A:** There are no specific, published guidelines for protecting the skin in prone patients. We use the same guidelines you would use for patients in the supine position, which include:

- Consider placement of five-layer silicone dressings in high-pressure/shear risk areas (i.e., forehead, chest, knees)
- Ensure the tongue is inside patient’s mouth
- Elevate the toes/knees off the bed with pillows
- Elevate the head by using reverse Trendelenburg
- Position every 2 hours
- Keep skin clean and dry
- Reposition tubes and lines

**Q:** The other problem with placing the patient in the prone position is, the bed is heavy. How do you prevent staff injury?

**A:** We prone patients manually, as outlined in the AACN Procedure Manual, Chapter 19. We use a standard ICU bed or a bed with lateral rotation. These beds are not heavy. The procedure manual also covers proning with the kinetic bed (e.g., RotoProne).
Q: Is there literature out there to support RotoProne bed vs manually proning? Our RotoProne office does not service us anymore so we have been doing manual proning? What are you using to prone? RotoProne bed or Vollman pronator or manual?

A: The decision to use a RotoProne vs manual prone must be based on patient population, comfort level of the staff, and bed availability. There are no studies comparing manual, frame, or automatic. The advantage of manual prone positioning is its cost effectiveness, as it can be achieved with a sheet and a regular ICU bed and you can accomplish prone positioning immediately. Automated prone positioning can be achieved with one nurse, but the bed may not fit all patients and there is a cost associated with its use. There is also a time lag due to the ordering and delivery of the bed. At our facility, we use the manual prone method. The Vollman Prone Positioner has been retired, but if you do have one, we included the procedure in the AACN manual.

Q: How receptive have the medical staff been in implementing these practices? Did you involve the medical team in developing the protocol?

A: Prone positioning has been in practice since the early 80s at our institution, so this practice for the treatment of ARDS patients has been engrained in our care. Those institutions that are considering prone positioning for the first time should present the results of the clinical trials (eg, PROSEVA trial) to their medical leadership to elicit buy-in.

Q: How do you feel about the use of paralytics in place of a neuromuscular blockade while proning?

A: Paralytics are used for transient paralysis, such as during endotracheal intubation. Conversely, the non-depolarizing NMBAs are reserved for prolonged muscle paralysis, as in patients with ARDS. Cisatracurium is the NMB used in the prone and the ARDS studies.

Q: What is the evidence for inhaled epoprostenol? If we're using inhaled epoprostenol (Flolan) or nitric before proning, is there anything saying we should stop that prior to proning? If nitric oxide isn't available, can epoprostenol be used as a substitute? I also understand epoprostenol is cheaper.

A: Inhaled nitric oxide (iNO) continues to be used for the minority of patients with ARDS. We could find only one observational study that demonstrated the use of inhaled epoprostenol in 22% of patients with severe ARDS treated with extracorporeal support. Based on the research, inhaled nitric oxide is the preferred treatment. Patients can be proned when nitric oxide or epoprostenol is being used to treat ARDS. There have been single-center studies showing synergistic benefit of NO and the prone position. However, in the overall ARDS literature, the phase III trial of NO showed no benefit on morality.

Q: I am curious as to the rationale for the contraindication for proning the patient with a ventral surface burn. I have been a burn nurse for 16 years, and we absolutely consider this when necessary. We can fix the skin if needed, but optimizing their lung outcomes takes priority in our view.

A: We believe it is a relative contraindication and should be addressed on a case-by-case basis, examining risk vs benefit.

Q: Is it OK to initiate proning if the patient was already on high PEEP with high respiratory rate? For example, right now we have a patient on PEEP 25 with RR 40.
A: Yes, the prone positioning will help to recruit collapsed and consolidated areas of the lung.

Q: When a patient is on CRRT, how do you ensure that the access site is still visible? The access site could dislodge, obviously causing a very dangerous environment for the patient. How do you assess the site during prone positioning, other than watching arterial and venous pressures on the CRRT machine?

A: In our institution, all dialysis catheters are placed in the internal jugular or groin. As we noted in the presentation, we place lines inserted above the waste at the top on the bed and those below the waste at the bottom of the bed. This allows us to easily and quickly visualize these lines when positioning the patient prone.

Q: Have you had experience with proning trach patients and, if so, how does it differ from proning with an ET tube?

A: Sometimes we add an accordion to the trach to give us more length, but in general we just position the head and neck so that we can visualize. More often, you are supporting the forehead, chest, or chin based on the distance to the bed and the size of the head and neck.

Q: Have any nurses become injured, or resigned because they cannot or do not want to lift so much weight?

A: We have had no nurses hurt with our manual technique, and we do no advocate lifting the patient. The manual process is about sliding and rolling, not lifting. Please refer to the AACN Procedure Manual, chapter 19 for specific instructions on the process.

Q: What is best method to deal with pain, sedation, or paralysis during proning? What are the best parameters to use to monitor for adequate sedation and paralysis? For how long?

A: We follow the PAD guidelines for pain and sedation management. Monitoring for sedation during neuromuscular blockade is done with a TOF. Although TOF evaluation has a “no recommendation” from the guidelines. Once the patient is off sedation, we use RASS for sedation, FLACC, or CPOT for pain.

Q: Do you obtain consent for proning?

A: No, it is part of the normal treatment for ARDS.

Q: With safe patient handling on the forefront of ICU care, why are we manually proning patients, putting ourselves and our patients at risk of injury? Ten years ago, we never used lifts to reposition patients; now we know better. Why is manually proning patients any different?

A: Manual proning is safe and effective and utilizes the concepts of Safe Patient Handling because you are pulling, not lifting, and you should be doing it with some type of slide sheet to reduce skin shear injury for the patient and create a safe handling environment for the staff.

Q: Are these patients 1:1, and do you staff up when proning?

A: Due to severity of illness (ie, acuity), these patients are always singled and sometimes we place two nurses in these rooms.

Q: For trauma patients, c-spine CT negative, but unable to do MRI, should proning be done?
A: We would recommend that you wait until there is complete confirmation that the c-spine is ok before you institute prone positioning.

Q: Since a physician order is required and prone positioning is basically a procedure, is there a reimbursement code?

A: We are unaware of a billing code for this. It is generally just part of the treatment bundle that is billed under the diagnosis of ARDS.

Q: What would be the best way to help bring a proning protocol to a hospital that does not have one, and that has reluctant staff? Being a progressive care nurse, how can I institute some procedures into my unit to help patient with ARDS without having a lot of continuous hemodynamic monitoring?

A: Our suggestion would be to present the studies on prone positioning for ARDS at a journal club, staff meeting, or other gathering. Get staff talking about what the evidence is. We have learned that knowledge is the best way to illicit change. Start the movement with nursing staff and then move it to multidisciplinary group for buy-in. For progressive care, considering ARDS' severity of disease and associated mortality, these patients should be in the ICU.

Q: I am in a smaller community hospital ICU of 10 beds. We sent most of our patients with ARDS to tertiary care. Is it helpful to prone while we are preparing for the transfer? What can I do to promote the use of early proning?

A: Yes, it is helpful to prone while preparing for transfer. The evidence suggests that early prone positioning decreases mortality.

Q: I am a nurse from the Philippines. How can this be applied in a resources-limited setting in terms of the capacity of the nurses to do this? Are there data to support efficacy related to cost effectiveness with proning and ventilator days?

A: Our suggestion is to utilize other staff, such as a nurse aid, physician, and respiratory therapist to help with the turn. As long as you have a few people that can plan and direct other staff in the procedure, the manual turn method can work. If there is any concern about safety for the patient or staff, your best course of action is to use a kinetic bed (eg, RotoProne). In terms of cost effectiveness, those studies have not been done. However, 60- and 90-day mortality is improved—so that would be the argument.

Q: Great strategy for the NG. We place the gastric tubes orally. Any suggestions for securing tube to reduce risk for pressure ulcer development?

A: With nasal gastric tubes that are placed orally, we recommend securing them to the ETT with cloth tape.