Lakeridge Health ☑ Harmonized	**Mechanically Ventilated Patient Prone Positioning – Guideline**	
	Manual: Guidelines	Original Date: 11AUG2020
	Section: N/A	Revision Date(s): DDMONYYYY
	Document Sponsor/Owner Group: Critical Care Program	Review Date: DDMONYYYY
	Approved by: Critical Care Program	
	Cross Reference to: Pressure Injury Prevention Patient Care Standard	
	Document Applies to: Lakeridge Health – All Critical Care Units Staff	
A printed copy of this document may not reflect the current, electronic version on Lakeridge Health's Intranet, 'The Wave.' Any copies of this document appearing in paper form should ALWAYS be checked against the electronic version prior to use.		

Introduction

Prone positioning improves oxygenation through a variety of mechanisms, primarily optimization of ventilation and perfusion. It produces changes in the distribution of extravascular lung water as well as secretions and results in a decrease in both alveolar over inflation and alveolar collapse.

A physicians order is required and a plan should be discussed by the Regulated Health Care Provider (RHCP) interprofessional team in advance to ensure a safe environment for pronation of the mechanically ventilated patient (Appendix A).

Duration and frequency of prone positioning is dependent on the physicians order and is established on a case-by-case basis. Recent evidence support the prone position being maintained for a period of 16 hours (or as directed by intensivist), based on the patient tolerance for the mechanically ventilated patient. Prone positioning for the non-mechanically ventilated patient can be maintained for 30 minutes to 2 hours. Several repeat sessions may be required and are dependent upon the patient's response and tolerance.

Inclusion criteria

- Endotracheal intubation and mechanical ventilation
- PaO_2/FiO_2 ratio less than 150 mmHg with an FiO_2 greater than or equal to 0.6, PEEP greater than 8 cmH_2O and Vt of 4-8 mL/kg predicted body weight (PBW).
- Diffuse bilateral infiltrates as evidenced on a radiological exam.

Absolute contraindication

- Massive hemoptysis requiring immediate surgical or interventional radiology procedure
- Serious facial trauma or facial surgery in the previous 15 days
- Cardiac pacemaker inserted in the previous 2 days
- Unstable spine, femur or pelvic fractures
- MAP less than 65 mmHg despite vasopressors
- Pregnant patients
- Abdominal compartment syndrome

Relative contraindications

The following list does not exclude a patient from prone positioning, but extra caution and consideration must be exercised when proning a patient with any of the following. Discussion with consulting services is recommended to optimize patient safety.

- Dialysis
- Morbid obesity
- Difficult intubation
- Anterior chest tube with airleak
- Deep venous thrombosis treated for less than 2 days

Equipment

- Proning checklist
- Pillows or gel bolsters
- Flat sheet
- Dry flow sheets (3)
- Gel head cushion/Headrest pillow
- Paper tape
- 2x2 gauze for eye patch (2)
- Eye lubricating ointment (i.e., Lacrilube)
- Barrier cream
- Personal protective equipment
- Electrodes for posterior placement
- Protective dressings (i.e., Mepilex)
- Medication anticipated to be required i.e., hypotension/pain/agitation

Pre-Proning Assessment/Activities

- **Personnel**
  - Physician
  - RRT, 2 if possible
  - RN, minimum of 4

- **Safety Huddle**
  - The purpose of the huddle is to ensure the procedure is done safely and effectively through a review of the following:
  - Inclusion criteria and cautions
  - Access the Clinical Practice Leaders
  - Review the maneuver
  - Review emergency procedures and ensure emergency equipment is easily accessible and in good working condition
  - Review proning checklist
  - Consider time of proning
    - Suggest positioning patient prone between 1600-1700 hours and returning to supine between 0800-0900 to ensure maximal interprofessional staff availability.

- **Patient assessment/Pre-proning activities**
  - Reposition ETT and ensure it is secure and will not apply pressure to patients face.
  - Tube feeding to be discontinued and gastric contents emptied as per physician order prior to turn

        - Decision to resume enteral feeds is at the discretion of the physician after turn. Consider discontinuing volume based feeding. Initiate trophic feeding protocol and notify Registered Dietician (RD).
    - Change any dressings
    - Clean face and apply barrier cream
        - Increased oral/nasal drainage while prone can contribute to skin breakdown
    - Apply eye lubricant and tape eyes shut with 2x2 gauze and paper tape
        - Patients in prone position are at increased risk of corneal abrasion and orbital edema
    - When patient is turned on their side, apply posterior ECG leads and remove anterior leads
    - Disconnect any non-essential lines/tubing (i.e.tubing for feeds, maintenance IVs, and, CVP line)
    - Secure lines and add extension tubing
    - Secure chest tubes and place drainage device at the foot of the head
    - Secure urinary catheter and place drainage device at the foot of the bed
    - Protective dressing applied to bony prominences – iliac crests and knees

The Turn to Prone

- ICU physician or delegate is outside the room or available, if needed.
- RRT is positioned at the head of the bed. If second RRT or additional RN available, at the side of the bed with the ventilator to manage hoses.
- If SpO_2 less than 90%, hyper oxygenate patient, if possible.
- RN - minimum 2 staff at each side of the patient
- Tuck arm closest to ventilator under buttock, turn palm downward.
- Place SpO_2 on limb farthest away from the ventilator
    - This will ensure that SpO_2 measurement continues through the duration of the turn.
- Place dry flow pads over the patient
    - These will end up under the patient when the turn is complete
- Place 2 pillows or gel bolsters on top of dry flow pads
    - Chest
    - Iliac crest
- Place flat sheet on top of pillows, roll the top sheet together with the bottom sheet (cocoon). Ensure there is enough sheet on either side to cover the mattress when patient is prone.
    1. Slide the patient away from the ventilator
    2. Turn the patient to the side, facing the ventilator. Reassessment ETT, lines and tubes. Attach ECG electrodes.
    3. Slowly complete proning, taking extra caution with ETT/lines/tubes. RRT to support head and ETT with turn. Head to face ventilator ensuring ETT accessible and not kinked.
    4. Assess lines for dislodgement or kinking. Assess for bilateral air entry
    5. Reattach disconnected lines/cables/tubing
    6. Position arms in swimmers crawl
        - Arm up on the side the face is turned. Shoulder dropped and elbow below axilla. Opposite arm at the side of the patient with the palm up.
    7. Unfold and flatten flat sheet so it's flat under the patients head.
    8. Ensure pillow is under shin; ankles and toes are off the bed. Use additional pillows to keep feet at 90 degree angle.
    9. Place bed in reverse Trendelenburg, minimum 10 degrees

10. Ensure ETT cuff is at MOV
11. Check tidal volumes and air entry
12. Consider debriefing after the turn for feedback from the team members

Repositioning

In addition to standard ICU care, patient that are in prone position should also have the following assessment/care completed Q2H:

- Ensure ears are not kinked
- Eyes are well lubricated
- ETT secure
  - Assess patient for pressure injury that may occur from ETT securement device
- Pressure points assessed
- Nasal/Oral ETT secretions are suctioned

Facial repositioning

- Method 1 (The Dangle)
  This method is preferred when using a standard ICU mattress and/or with patients who have good range of motion in their neck.
  1. Ensure the ETT is secure prior to repositioning
  2. Gather personnel, 4-5 staff (RRT at HOB)
  3. Place both arms at the side of the patient with palms facing up
  4. Slide the patient up in the bed so head is fully off the bed and supported by the RT (second RRT may be necessary to assist with ventilator tubing)
  5. RT & RN support the patient's head and reposition the head and tubing to the alternate side
  6. Team slides the patient back down the bed so that head is on bed
  7. RN and RT assess the face to ensure ETT is accessible and no pressure on eyes
  8. Reassess repositioning key points noted above

- Method 2 (The Cobra lift)
  This method is preferred when using a specialty bed with the, head deflate" option and/or patients with limited neck mobility
  1. Ensure ETT is secure
  2. Gather 4-5 personnel, 4-5 staff (RRT at HOB)
  3. Place both arms at the side of the patient with palms facing up
  4. One person on each side of the patient raises their chest off the bed (Cobra lift)
  5. RT & RN support the patient's head and reposition the head and tubing to the alternate side
  6. RN and RT to assess the face to ensure ETT is accessible and no pressure on eyes
  7. Reassess repositioning key points noted above

- **Arms**
  - Modified swimmers crawl (arm up on the side where the face is turned)
  - Shoulders dropped
  - Elbow below axilla.

- **Legs**
  - Examine knees and toes for skin breakdown

- **Genitals**
  - Examine genitals for position and skin breakdown

Return to supine

- Safety huddle
- ICU physician or delegate is outside the room or available, if needed.
- Hold gastric feeds prior to turn
- RRTs at HOB and ventilator to assist with airway management
- RN each side of patient (minimum 2 staff on each side)
- Start by ensuring the head is facing the ventilator
- Place SpO_2 on limb closest to the ventilator
- Tuck the arm furthest away from the ventilator under the patient's thigh, palm position upward.
- Place 2 dry flow pads across patient covering posterior
- Place flat sheet from head to toe, roll top sheet together with bottom sheet (cocoon)
  1. ICU physician or delegate to review the plan for the turn with the team, if needed.
  2. Slide patient toward ventilator check ETT/lines/tubes
  3. Turn patient to side, facing ventilator ETT/lines/tubes
  4. Slowly complete turn to supine using extra caution with ETT/lines/tubes
  5. Unfold the flat sheet so it is flat under the patient
  6. Elevate the HOB to 30 degrees and initiate rotation and advanced therapy with bed if applicable
  7. Consider a debriefing after the turn for feedback from the team members

Complications

The following is a list of common potential complications of proning. Routine care (listed below) with repositioning and ongoing monitoring will assist in minimizing risk of complications.

- Corneal abrasions
  - Apply eye lubricant, eye patches and tape eyelids with paper tape.
  - Avoid any pressure on eyes

- Skin breakdown/pressure ulcers
  - Place pillows or pressure relieving devices at potential pressure areas (forehead, knees, hips and chest)
  - Reposition arms and head Q2H
  - Apply barrier cream (include the face due to excessive nasal and oral secretions)
  - Apply protective dressings to bony prominences such as knees/iliac crest as needed (i.e., Mepilex)
  - Do not secure oral gastric tube to the area of the face that rests on the mattress.
  - Secure nasograstric tubes with waterproof tape due to excessive nasal secretions.

- Facial edema
  - Use reverse Trendelenburg position, minimum 10 degrees
  - Head repositioning Q2H

- Cardiac Arrest
  - See "What to do in Event of Cardiac Arrest" below

- ETT kinking or blockage
  - For Q2H head reposition, RRT and second RRT (if possible) should be at the head of the bed. Suction before each head manipulation.
  - Use facial gel pads or pressure relieving devices to facilitate a position that avoids kinking/blockages
  - Assess air entry post turning and facial repositioning.

- Line dislodgement
  - Secure lines in a position that will prevent dislodgement prior to turning patient
  - Utilize extension tubing as necessary
  - Minimize unnecessary IV tubing

- Gastric intolerance
  - May continue enteral feeding via NG tube at the discretion of the physician. Consider obtaining order for trophic feeding protocol and notify RD.
  - Secure gastric tube with placement documented in centimeters at the site of insertion.
  - Use reverse Trendelengburg position.
  - Consider obtaining order for prokinetic agents if there are signs of enteral feeding intolerance.
  - Consider post pyloric enteral nutrition delivery if prokinetic agents fail.
  - If not feasible to feed post pyloric consider early parenteral nutrition initiation.

When to discontinue

Discontinuing the prone position is done at the discretion of the critical care attending physician. The following criteria can be used for guidance.

- Improvement in oxygenation defined at PaO_2/FiO_2 greater than 150 mmHg with PEEP less than 8 cmH_2O and FiO_2 less than 0.60 sustained for 4 hours with supine
- ETT migration
- ETT obstruction not immediately relieved with usual troubleshooting (i.e., suctioning)
- Hemoptysis
- SpO_2 less than 85% or PaO_2 less than 55mmHg on FiO_2 1.0 for greater than 5 minutes
- Bradycardia less than 30 bpm for greater than 1 minute
- SBP less than 60 mmHg for greater than 5 minutes

Cardiac Arrest Management

It is important to be aware that priority should be given to high quality CPR and minimizing time to defibrillation. While it may 'appear' that CPR is less effective when done on the patients back, the decision to return the patient supine should be based on quantitative indicators ($EtCO_2$) and having the resources to safely turn the patient with minimal interruption in CPR (less than 10 secs).

- Immediately initiate CPR on the patient's back
  To landmark:
  - Place one hand under the patient to landmark sternum
  - Place both hands on posterior thorax with fingers interlaced at T7 and start chest compressions. Alternatively, place hands on either side of the patients' spine at T7 and initiate chest compressions.
- Place pads in an anterior and posterior placement
- Defibrillate as per ACLS guidelines

References

Balas, M.C. (2000). Prone positioning of patients with acute respiratory distress syndrome: Applying research to practice. Critical Care Nurse 20(1), 24-36.

Ding L et al. Critical Care 2020;24(1):28

Emergency Department Critical Care (EMCrit). 2016. PulmCrit Wee- Proning the non-intubated patient. Retrieved from https://emcrit.org/pulmcrit/proning-nonintubated/ [Accessed 17th April, 2020]

Guerin, C., Reignier, J., Richard, J.C., Beuret, P., Gacouin, A., Boulain, T.,Ayzac, L. (2013).

Prone positioning in severe acute respiratory distress syndrome. New England Journal of Medicine, 386(23), 2159-2168.

Hales, B., Terblanche, M., Fowler, R., & Sibbald, W. (2008). Development of medical checklists for improved quality of patient care. International Journal for Quality in Health Care, 20 (1), 22-30.

Kopterides, P., Siempos, I.I., & Armaganidis, A. (2009). Prone positioning in hypoxemic respiratory failure: Meta-analysis of randomized controlled trials. Journal of Critical Care, 24, 89-100.

Messerole, E., Peine, P., Wittkopp, S., Marini, J.J., & Albert, R.K. (2002). The pragmatics of prone positioning. American Journal of Respiratory and Critical Care Medicine, 165(10), 1359-1363.

Sud, S. et al.Prone ventilation reduces mortality in patients with acute respiratory failure and severe hypoxemia: systematic review and meta-analysis Intensive Care Med (2010) 36:585–599

Mancebo, J. et al A Multicenter Trial of Prolonged Prone Ventilation in Severe Acute Respiratory Distress Syndrome American Journal of Respiratory and Critical Care Medicine; Jun 1, 2006; 173, 11;

De Souza Gomes, D., Alves Bersot, C.D. Cardiopulmonary Resuscitation in the Prone Position Open Journal of Anesthesiology, 2012, 2, 199-201

Appendix A – Critical Care Prone Positioning – Mechanically Ventilated Patient Checklist

Pre Prone	Actions
☐ Identify Intensivist or delegate ☐ Inclusion & Contraindications reviewed ☐ Review Guidelines ☐ Emergency procedures reviewed ☐ Explain procedure/risks/benefits to SDM ☐ Gather staff	☐ Pre-oxygenate ☐ ETT & oral suction ☐ ETT secure with waterproof tape ☐ Cap off unnecessary lines and tubes (consider ext. tubing) ☐ Dressings changed ☐ Apply posterior electrodes/remove chest & limb leads ☐ Eyes lubricated, eye patches applied and taped ☐ Wash face & apply barrier cream ☐ Apply protective dressing to iliac crests, knees ☐ Gastric tube secure (not taped to face) ☐ Hold feeds ☐ Chest tube secure & midline (if applicable) ☐ Foley secure & midline ☐ Ensure adequate analgesia/sedation/NMB ☐ Reposition equipment to allow access to HOB ☐ Prepare anticipated medications
Gather Equipment	
☐ Pillows or gel bolsters ☐ Dry flow pads (3) ☐ Flat sheet ☐ ECG leads (5) ☐ Paper tape ☐ Eye lubrication ☐ Eye pads (2) ☐ Gel facial pillow ☐ Barrier cream ☐ Protective dressings	

The Turn

☐ RRT at HOB
☐ RN - minimum 2 staff at each side of patient
☐ Safety Huddle: Intensivist or delegate to communicate plan and review emergency procedures, if needed

N.B: Each move must be done solely on the direction of the RHCP at the head of the bed to ensure synchronous movement

☐ Discontinue tube feeds
☐ Hyperoxygenate, if SpO_2 less than 90%
☐ Remove or reposition ECG leads
☐ Place dry flow pads over patient
☐ Place SpO_2 on limb furthest away from the ventilator

N.B: Reduce pressure points and abdominal pressure.

☐ Tuck arm closet to ventilator under buttock, palm down
☐ Place 2 pillows/gel bolsters on patient, chest and iliac crest
☐ Place flat sheet on top of pillows, fold to not cover face, leave enough sheet to cover mattress when patient prone
☐ Roll top sheet together with bottom sheet (cocoon)
☐ Slide patient away from ventilator – pause to check ETT/lines/tubes
☐ Turn patient to face ventilator – pause to check ETT/lines/tubes
☐ Slowly complete proning – extra caution with ETT/lines/tubes
☐ RRT to support head with turn, head facing vent ensuring ETT accessible and not kinked
☐ Unfold and pull flat sheet so its flat under the patient's head
☐ Assess lines and tubes for dislodgement, air entry or kinking
☐ Reattach disconnected lines/cables
☐ Position arms in modified 'swimmers crawl', face in the direction of the raised arm
☐ Shoulder dropped and elbow below axilla – other arm at side – palm facing up
☐ Ensure pillow is under shin and toes are off the bed
☐ Place bed in reverse Trendelenburg, minimum 10 degrees
☐ Re-assess ETT cuff pressures and tidal volumes

Appendix A – Critical Care Prone Positioning – Mechanically Ventilated Patient Checklist (cont'd)

Monitoring

☐ Reposition face
- ✓ Ears not kinked
- ✓ Eyes lubricated well
- ✓ ETT secured
- ✓ Pressure points assessed

Technique for Face

1. Ensure ETT secure prior to reposition
2. Gather staff 4-5 (RT & RN at HOB)
3. Place arms at side of body
4. Use **METHOD 1 or 2** to reposition face (see guidelines)
5. RT to move face to other side

☐ Reposition arms
- ✓ Swimmers Crawl
- ✓ Shoulders dropped
- ✓ Elbow below axilla

Technique for Arms

1. Once facial repositioning done, arms should be repositioned
2. Raise opposite arm. Face is in the direction of the raised arm, other arm at side of body, palm up

☐ Clear oral/nasal/ETT secretions
☐ Examine knees and toes for skin breakdown
☐ Examine genitals for position/skin breakdown

Return to Supine

☐ Safety Huddle
☐ RRT at HOB
☐ RN at each side of patient
☐ Discontinue tube feeds
☐ Hyperoxygenate, if SpO_2 less than 90%
☐ Reposition first so head facing ventilator and place SpO_2 on limb closest to the ventilator
☐ Tuck the arm furthest away from the vent under the patient's thigh, palm up.
☐ Place 2 dry flow pads across patient covering posterior
☐ Place flat sheet from head to toe (do not cover head)
☐ Roll top sheet together with bottom sheet (cocoon)
☐ Slide patient toward ventilator – pause to check ETT/lines/tubes
☐ Turn patient to face ventilator – pause to check ETT/lines/tubes
☐ Slowly complete turn supine – extra caution with ETT/lines/tubes
☐ RRT to support head with turn, head facing vent ensuring ETT accessible and not kinked
☐ Unfold and pull flat sheet so its flat under the patient
☐ Assess lines and tubes for dislodgement, air entry or kinking
☐ Reattach disconnected lines/cables
☐ Remove posterior ECG leads and apply chest leads (DO NOT leave leads on back)
☐ Elevate HOB

N.B: Each move must be done solely on the direction of the RHCP at the head of the bed to ensure synchronous movement

N.B: Upon return to supine, inspect patella, anterior superior iliac spine, toes, genitals, breasts, chin, cheeks/ear, forehead for pressure ulcers

Appendix A – Critical Care Prone Positioning – Mechanically Ventilated Patient Checklist (cont'd)

What to do in Event of Cardiac Arrest
CPR 1. Immediately initiate CPR on posterior of patient • Place one hand under patient to landmark sternum • Place other hand on the spine and start CPR (hard & fast) 2. Call for help and as soon as possible place hard board or deflate bed 3. Continuous $EtCO_2$ to monitor CPR quality and ETT placement (should be greater than 10 mmHg) 4. Return patient to supine • If CPR is not effective (as per $EtCO_2$) • When the team is prepared to safely reposition upon ROSC. **Defibrillation** • Place pads in an anterior and posterior placement (anterior can be applied with hard board placement) • Defibrillate as per ACLS guidelines