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APPROVAL LEVEL: Acting Executive Director, Critical Care – Jennifer Coulthard Physician Representative, Critical Care – Dr. L. Berthiaume	Date Established: 98.06	Date Revised: 08.01 09-05 14-01 16-04

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PURPOSE

To provide guidance on safely placing a patient in prone positioning.

APPLICABILITY

Compliance with this protocol is required by all Alberta Health Services employees, members of the medical and midwifery staffs, students, volunteers, and other persons acting on behalf of Alberta Health Services (including contracted services providers as necessary) working in a Calgary Critical Care site. Personnel permitted to perform procedure: Staff who are qualified in the care of gastric and esophagogastric tubes, have received education in this skill and have reviewed this document.

OVERVIEW OF PRONING

Prone positioning is most commonly used to optimize oxygenation in patients with acute lung injury or ARDS. In ARDS, consolidation in lung tissue is patchy and gravity dependent. In the supine position gravity dependent perfusion can match gravity dependent consolidation which may lead to severe VQ mismatch.

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Prone positioning increases ventilation to dependent lung zones by matching gravity dependent perfusion to ventilated alveoli, thus decreasing the shunt.

Prone positioning may also have a greater negative pleural pressure which may increase pressure to open and maintain airway patency. This results in better ventilation in dependent areas of the lung with better perfusion match. There may be some general improvements in hemodynamics once in prone position.

Other indications for prone positioning also exist (interventional radiology procedures, nephrostomies, ERCP). These guidelines are appropriate for use in these patient populations.

Indications for Prone Positioning under Extracorporeal Life Support (ECLS)

1. Noted improvement in lung oxygenation and/or compliance prior to initiation of ECLS and therefore continuation post ECLS initiation to facilitate expeditious lung recovery and weaning of VV-ECMO.
2. Refractory hypoxemia while on VV-ECMO, despite optimization of VV-ECMO and use of other adjunctive agents such as inhaled prostaglandins.

POLICY STATEMENTS

1. An order from the Most Responsible Health Provider (MRHP) or assigned delegate is required for prone positioning (entered in the electronic patient record).
2. A Critical Care Physician or assigned delegate must be present for the initial prone positioning procedure. The Critical Care Physician must always be aware of prone positioning procedure.
3. Prone positioning should be done when there are adequate personnel to support complications. These resources are most commonly available during the day.
4. Inclusion criteria for prone positioning will be any ventilated patient with a diagnosis of severe adult respiratory distress syndrome (ARDS) as evidenced by one of the following:
 - a. An Oxygen Index (OI) greater than or equal to 20

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- b. A PaO₂/FiO₂ (P/F) ratio less than or equal to 100 when receiving and FiO₂ of 0.60 or greater.
5. The following potential exclusion criteria for prone positioning will be considered in collaboration with the multi-disciplinary team:

Potential Exclusion Criteria	
• Acute bleeding	• Multiple trauma
• Spinal instability	• Large abdomen/gross ascites
• Pregnancy in the third trimester	• Anterior chest tubes
• Unstable ICP	• Open abdominal wound
• Unstable sternum	• Open chest
• Ventricular assist device	
• Intra-aortic balloon pump	

**There are no absolute contraindications to proning. The risk-benefit to the patient must be considered and if proning is deemed to be beneficial to the patient potential risks should be managed effectively and efficiently.

6. Clinical criteria for discontinuing therapy will be:
- FiO₂ less than 0.6 and/or IO less than 20
 - Deterioration of patient status related to prone position
 - Positioning demonstrates no improvement in patient status
 - Request of MRHP

POINTS OF EMPHASIS

- If decision has been made not to prone the patient, or the first attempt was unsuccessful, reconsider within 24 hours if no progress has been made in decreasing ventilator settings.
- Proning effects may not be immediate and it may take several hours to see the positive effects of proning.
- Carefully monitor the patient's tolerance to turning and to being in the prone position as the patient's cardiopulmonary status may deteriorate. If the cardiopulmonary parameters do not stabilize following the turn, the physician may consider intervening. If, after the initiation of the intervention, the patient's

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cardiopulmonary parameters are not stabilized, the patient may have to be returned to the supine position.

4. Prone positioning has many benefits for maximizing oxygenation, but can also be associated with complications, particularly skin breakdown and eye injury (orbital compression). Careful assessment and attention to nursing care is imperative for the patient positioned prone. Therefore, careful eye care, skin care and pressure relief is required on a regular basis.

Points of Emphasis for Prone Positioning with ECLS

1. Health care professionals involved in the initial attempt to prone position a patient on ECLS should include cardiac ICU attending physician or Cardiac Surgeon, as well as cardiac perfusion.
2. A TEE may be considered if there is concern about ECMO cannula infiltration.

Points of Emphasis for Prone Positioning with CRRT

It is reasonable to place a patient on CRRT while in prone position.

1. The patient should have an IJ line as it is easily visible while in the prone position. Femoral and subclavian lines pose a risk because of the inability to visualize the line at all times and disconnection may lead to exsanguination.
2. If the patient is already on CRRT prior to prone positioning, the circuit must be recirculated (if less than 24 hours old) or taken down to eliminate the risk of complications during repositioning.

PERSONNEL PERMITTED TO PERFORM PROCEDURE

At minimum, 5 personnel are required

- At least one RN and RRT must be present
- Physiotherapist and Nursing Attendants may assist
- Critical Care Physician or assigned delegate must be present for the first proning instance.

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EQUIPMENT

Pillows (3)
2-sheets
Duoderm
Head positioning devices (gel pads, foam head rest)
Sage product sheet
Sage turning and positioning system (optional)

PROTOCOL / PROCEDURE: PRONING

Patient and Environment Preparation

1. Explain the purpose for using prone positioning to the patient and family.
2. Ensure the following preparations are made:
 - ETT is secure with twill ties or tape to the far side of the mouth opposite the ventilator
 - Patient's face is turned towards the ventilator.
 - Mouth and ETT are suctioned.
 - CASS (EVAC) suction tubing has been disconnected.
 - Oxygen saturation monitor is on.
 - Continuous end tidal CO2 monitoring is in place and on.
 - Lines are positioned to avoid traction with turn. Place lines at head (IJ or subclavian lines) or foot (femoral) of bed.
 - ECG electrodes are repositioned (or removed with MRHP order) to avoid excessive pressure points.
 - Foley and / or rectal drainage bag is positioned at the end of the bed.
 - Chest tube drainage unit is positioned at the end of the bed.
 - For proning procedure hold enteral feeds and confirm position of feeding tube with insertion length marked.

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- If planning on enteral feeds while proned, ensure patient is on motility agents and is tolerating feeds.
 - Ensure suction is disconnected and naso/orogastric tube is placed up and around patient's face
 - Maximum inflate the bed if able.
 - Brakes are applied on the bed.
3. If indicated, ensure the patient is adequately sedated and/or paralyzed.
 4. Perform baseline comprehensive assessment and note cardiopulmonary parameters to assess patient's tolerance to prone positioning.

MANUAL PRONE POSITIONING

1. It is recommended that those personnel participating in the prone watch the below linked instructional video if time allows.
 - WWH Prone Tutorial 2012 located at:
<https://www.youtube.com/watch?v=Hd5o4ldp3c0>

****NOTE:** must be opened in Google Chrome or Firefox
2. Gather necessary personnel to assist with prone procedure.
 - Minimum of 1 RRT (at head of bed)
 - 2 RNs
 - other personnel as required (no less than 5)
3. Designate one person in charge of the turn at the foot of the bed (MD, RN, RRT).



PROCEDURE

Prior to proning, perform the following actions:




- Relocate or remove ECG leads as appropriate
- Consider duoderm on bony prominences as applicable
- Maximum inflate bed mattress if able
- Immediately prior to proning, ensure all personnel are ready for the prone

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The RRT at the head of the bed will lead the count and any position change is done at the direction of the RRT.

Intervention	Picture Depiction	Rationale
Place a single bedsheet flat under the patient. Place three pillows on the patient: one at the torso, below the clavicle; one at the hips; one over the legs (this pillow may be placed after proning) If patient has excessive drainage, you may place a sage product sheet under the pillows.		Will provide pressure relief to bony prominences while in prone position
Place one sheet on top of the patient and fold. Head, arm, hand, ankle positioning: -Tuck the patients arm closest to the ventilator under their hip, palm up -Turn the patient's head towards the ventilator -Cross the patient's ankles		



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<p>Tightly cocoon the patient with two sheets rolled tightly.</p>		
<p>Slide the patient to the edge of the bed away from the ventilator.</p> <p>*Note: patient's face will be turned toward the ventilator</p>		<p>Ensures the patients head is always turning toward the ventilator to prevent ventilator tubing tightness or kinking.</p>



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<p>Holding the cocooned sheet edges, rotate the patient up onto his/her lateral side ensuring the patient is facing the ventilator.</p> <p>To continue to prone: Individuals holding the top part of the sheets (by patient shoulders/hips furthest from the bed) work with individuals holding the bottom part of the sheets (closest to the bed) to rotate the patient onto their stomach.</p>		
<p>Flip the patient into prone position. Ensure hemodynamic stability throughout the procedure.</p>		
<p>Once the patient is in prone position:</p> <ul style="list-style-type: none"> • ensure there are no pressure points under the patient (tighten sheets, ensure knees and ankles are raised) • position the arms in 'swimmers position' (head may be turned in 		

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<p>either direction; ensure that body mechanics look appropriate and the patient appears comfortable).</p> <ul style="list-style-type: none"> place patient in reverse Trendelenburg at 30 degrees if able 		
<p>Place gel donut under patient's head with the open portion facing outwards.</p> <ul style="list-style-type: none"> The gel pad should rest on the forehead and cheek/mandible. The 'down' eye should not be resting on the pad. The mouth should always be accessible for oral care. The ETT should be on the 'up' corner of the mouth. Take care to avoid hyperflexion and hyper extension of the head and neck. 		

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<p>Place 5 lead ECG on patient's back for continuous cardiac monitoring. Ensure good adherence to skin.</p>		
<p>Place patient in reverse Trendelenburg position and provide care as outlined below.</p>		

Care Immediately Following Prone Positioning

1. Assess the patient's tolerance of turning procedure and for airway patency.
2. Place patient in reverse Trendelenburg position up to 30 degrees if possible to reduce the incidence of aspiration.
3. Reposition patient as necessary to minimize pressure points.
4. Zero hemodynamic monitoring lines.

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5. Reconnect NG/OG tube to suction or enteral feeds. Notify MRHP or delegate if patient is not tolerating feeds. Motility agents may be added if necessary.
6. Assess tolerance to prone positioning.
7. With initial turn obtain blood gases and hemodynamic profile.
8. Measure arterial/mixed venous blood gases within 30 min of proning or as per physician order.
9. To determine the frequency of arterial blood gas monitoring, refer to the Arterial Blood Gas Protocol, or use frequency ordered by physician.
10. Document on patient care record:
 - patient's response to proning
 - any complications that occurred
 - blood gases and hemodynamic profile with initial turn

PATIENT MONITORING AND CARE

1. Patients may be in prone position for up to 20 hours per day (of which at least 16 hours is continuous, as per physician's order).
2. Continue with regular assessments:
 - Follow oxygenation and hemodynamic status closely to monitor for deterioration.
 - Chest and heart sounds can be assessed by slipping stethoscope under patient's chest (if using a special care bed this will be easier if air pressure is decreased in the area to be assessed).
3. Minimize sedation and paralytics whenever possible. If sedation and paralysis are required follow Critical Care policy N:200: Neuromuscular blockade: Patient care and use of the peripheral nerve stimulator

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4. Anticipate potential complications of prone positioning and provide appropriate interventions:

PROBLEM	CAUSE	INTERVENTION
Skin Breakdown	Prolonged time between position changes	<ul style="list-style-type: none"> • provide regular skin care • continue to mobilize the patient while maintaining good body alignment by making small incremental changes in the patient's position q2h while in prone position. Accomplish this by turning slightly to the right or left side lying position, using pillows, as tolerated by the patient. Reposition patient as necessary to minimize pressure points. • for male patients ensure genitalia are not being compressed between the patient's legs or by the pelvic pad/pillow • ensure wet or soiled linen (i.e. due to the accumulation of oral secretions or wound drainage) is changed in a timely to manner to avoid excoriation of the skin. • Consider using a absorbent pad (Sage products) under the patient to absorb excess moisture • Assess ETT ties q2h to ensure no cuts or breakdown to back of the neck and corners of the mouth.
Eye Damage Including: <ul style="list-style-type: none"> • conjunctival edema • corneal scratch • sclera abrasion ulceration • retinal ischemia • blindness 	Orbital compression due to pressure directly on the eye when prone	<ul style="list-style-type: none"> • place a C-foam/gel ring under the head when placed in the lateral position to ensure that the eye is supported free of the bed surface • lubricate and close the patient's eyes minimum q2h to prevent corneal drying, abrasion, or infection.
Venous congestion of the head and neck	Face positioning below the level of the heart	<ul style="list-style-type: none"> • keep the bed in reverse Trendelenburg whenever possible • avoid over extension of the neck with positioning • turn the head q2h (place patient's head to face the arm that is abducted upward in the swimmer's position) to promote arterial perfusion and venous drainage of the intracranial and extracranial vessels

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Nerve compression to the brachial plexus and ulnar nerve	Arms are posterior to the level of the head	<ul style="list-style-type: none"> patients must have a functioning arterial line. Avoid continuous use of a NIBP as this may cause neuromuscular compression in the antecubital fossa. the arms when positioning keep elbow anterior to the head ensure that if the arm is placed superior to the head so that the head of the humerus is not stretching and compressing the axillary neurovascular bed. The musculature should not be under any tension. Support the elbows to prevent ulnar nerve compression. consult occupational therapy and/or physiotherapy as needed for assistance
Contractures	Improper positioning and lack of support to feet and arms	<ul style="list-style-type: none"> change position of the arms q2h to avoid arm contractures (using alternating swimmer's position) physiotherapy to complete passive ROM to the arms and legs q4h consult occupational therapy as needed for assistance

DOCUMENTATION


- prone event (start time)
- patient tolerance
- position changes (head, arms, repositioning)
- ETT check

PLACING PATIENT IN SUPINE POSITION (UN-PRONING)




1. Ensure the following preparations are made:
 - ETT is secure with twill ties or tape
 - Patient's face is turned towards the ventilator.
 - Mouth and ETT are suctioned.
 - Oxygen saturation monitor is on.

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- Continuous end tidal CO2 monitoring is in place and on.
 - Lines are positioned to avoid traction with turn. Place lines at head (IJ or subclavian lines) or foot (femoral) of bed.
 - ECG electrodes are repositioned (or removed with MRHP order)
 - Foley and / or rectal drainage bag is positioned at the end of the bed.
 - Chest tube drainage unit is positioned at the end of the bed.
 - Hold enteral feeds.
 - Ensure suction is disconnected and naso/orogastric tube is placed up and around patient's face
 - Brakes are applied on the bed.
2. If indicated, ensure the patient is adequately sedated and/or paralyzed.
 3. Perform baseline comprehensive assessment and note cardiopulmonary parameters to assess patient's tolerance to prone positioning

Intervention	Picture Depiction	Rationale
Tightly 'cocoon' the patient with a sheet.		

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<p>Slide the patient to the edge of the bed closest to the ventilator.</p>		<p>This will ensure that there will be no stretching or kinking of the ventilator tube during un-proning procedure.</p>
<p>Roll the patient up onto his/her side. The sheet will be pulled out from under the patient to place them in the supine position.</p>		
<p>Flip the patient into supine position. Ensure hemodynamic stability throughout repositioning. Attach ECG electrodes and perform a comprehensive assessment including:</p> <ul style="list-style-type: none"> • Assess ETT placement • Skin/tissue pressure points • Cardiovascular and hemodynamic status • Comprehensive respiratory assessment • CXR as ordered by MRHP 		
<p>Document procedure and response to repositioning in the electronic health record</p>		

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DOCUMENTATION

- un-prone event (start time)
- patient tolerance
- ETT check
- Skin assessment

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