Respiratory Therapy Society of Ontario
Société de la Thérapie Respiratoire de l'Ontario

RTSO PRONING RESOURCE

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A. INTRODUCTION

The purpose of this resource package is to provide Registered Respiratory Therapists (RRTs) and their interprofessional teams a resource for using proning as a strategy for enhancing oxygenation and perfusion matching in patients with respiratory compromise. This document was compiled by the RTSO Leadership Committee based on practice and experience in several Ontario centers as well as current resources and literature.

Purpose of Using Prone Position for Advanced Respiratory Management

1. To improve oxygenation and perfusion matching (improved V/Q ratio) in order to prevent the need for intubation due to increasing FiO_2 and ventilatory support requirements via:
    i. Increased V/Q matching
    ii. Improved secretion clearance
    iii. Increased FRC
    iv. Redirection of compressive forces in the heart and lungs
    v. Repositioning will reduce the incidence of serial collapse in the same lung fields due to stagnant patient positioning
2. To consider proning in instances of acute respiratory distress syndrome (ARDS) secondary to COVID-19
3. To consider proning in awake and spontaneously breathing patients in hypoxemic respiratory failure prior to intubation:
    i. FiO_2 greater than or equal to 28% to maintain SpO_2 greater than 92% AND suspected COVID-19 diagnosis

B. INDICATIONS, CONTRAINDICATIONS AND POTENTIAL COMPLICATIONS

The decision to prone should be made on a case-by-case basis. ICU staff should be aware of situations where prone positioning may be contraindicated and ensure these are taken into consideration.

Inclusion Criteria to be considered for prone position therapy:

1. Patient in severe oxygenation failure as indicated by a PaO_2/FiO_2 ratio <150, $FiO_2 \geq 0.60$, PEEP ≥ 5 cmH_2O and V_t 6 mL/kg IBW within a range of 4 – 8 mL/kg IBW
    i. Lung stress as measured by transpulmonary pressure > 20 cmH_2O
    ii. PIPs to achieve such volumes in Volume Control modes exceed at least 25 cmH_2O requiring PEEP of > 5 cmH_2O
2. Patient disease process results in worsening respiratory symptoms not fully explained by their pathology and PaO_2/FIO_2 ratio is <200
    i. Noting idiopathic opacities on CXR unrelated to effusions or nodules
    ii. Lung Field opacities unrelated to cardio-pathogenic disease processes including, but not limited to, congestive heart failure and/or right ventricular hypertrophy

3. Patient with suspected or confirmed COVID-19 experiencing hypoxemia and additional oxygen supplementation where the FiO_2 is greater than 0.40

Absolute Contraindications:

a. Suspected raised intracranial pressure > 30 mmHg or cerebral perfusion pressure < 60 mmHg (if able to monitor)
b. Massive hemoptysis requiring intervention
c. Tracheal surgery (including tracheostomy) or sternotomy surgery in the past 15 days
d. New pacemaker insertion within the past 48 hours
e. Severe facial trauma or facial surgery in the past 15 days
f. Eye trauma or surgery
g. Deep vein thrombosis treated for less than 48 hours
h. Unstable C-spine, femur and/or pelvic fractures
i. Open abdomen or thorax due to trauma or surgery
j. Mean Arterial Pressure less than 65 mmHg

Relative Contraindications:

a. Morbid obesity (BMI > 40 kg/m^2)
b. Pregnancy
c. Difficult intubation
d. Recent life-threatening arrhythmia
e. Anterior chest tube with active air leak
f. Ongoing dialysis
g. Spinal drain
h. ICP monitoring
i. Skeletal traction for extremity fractures
j. Tracheostomy in situ
k. Burns on > 20% of body surface area (dependent on location)
l. Abdominal compartment syndrome
m. Previous poor tolerance of prone position

Complications associated with Prone Position and Prevention Techniques

1. Corneal abrasions
    i. Ensure adequate application of eye lubricant
    ii. Tape eyelids shut
    iii. Avoid pressure on eyes through careful head positioning
2. Skin breakdown and pressure ulcers (see *Figure 1*)
    i. Apply pillows/pressure relieving devices to potential pressure points (face, knees, chest, hips)
    ii. Secure nasogastric tubes with waterproof tapes (due to oral secretions)
    iii. Apply zinc-based barrier creams on areas of pressure:
    iv. Apply protective dressings to bony prominences (ie. Iliac crest, knees)

   v. Consider securing ETT with cloth or tape only to avoid development of pressure sores under ETT holder. If using a securing device, ensure hard plastics/surfaces are floating and not in direct contact with pillow
3. Facial Edema
   i. Reverse Trendelenburg position to prevent fluid pooling in facial regions
4. ETT blockage/kink
   i. Use pressure relieving devices and/or facial gel pads to facilitate a position that avoids kinking or blockages
5. Line displacement
   i. Secure lines in positions of minimal risk for dislodgement
   ii. Extension tubing should be utilized where necessary, though tubing needs to be limited
   iii. Minimize any unnecessary tubing
6. Gastric Intolerance
   i. Continue enteral nutrition at discretion of physician
   ii. Use reverse Trendelenburg

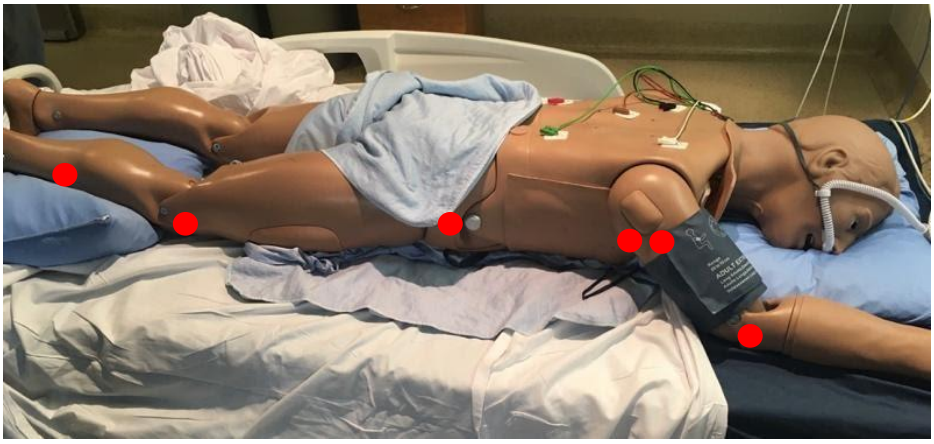

Figure 1: Pressure points in prone patient

C. CRITERIA FOR DURATION OF PRONING AND DISCONTINUATION OF PRONING

Duration of Proning:

1. The suggested range to target is 12 to 20 hours in controlled conditions
   i. For spontaneously breathing patients this will be limited by their tolerance, the target is 8 hours although 30 minutes to 1 hour may be the threshold
   ii. Often proning sessions last for 16 hours at a time to coincide with care team schedules and care being provided to the patient
      a. Consider an ABG 30 to 60 minutes post completion of prone position
2. The suggested range to target for patient to remain supine post proning is 4 – 8 hours as tolerated
3. Note that improvement may be seen immediately in some cases. However, it is not uncommon for it to take several hours for noticeable clinical improvement to occur

Criteria for the Discontinuation of Prone Positioning

1. Sustained oxygenation improvement post returning to supine position ≥ 4 hours defined as:
    a. PaO_2/FiO_2 ratio of ≥ 150 with a PEEP ≤ 10 cmH_2O and a FiO_2 ≤ 0.60
2. Deterioration in the patient's clinical status including:
    a. SpO_2 <85% or PaO_2/FiO_2 ratio drop by ≥ 20% for ≥ 5 minutes
    b. Hemodynamic instability:
        i. SBP ≤ 60 mmHg for ≥ 5 minutes and/or:
        ii. HR ≤ 30 BPM for ≥ 1 minute
3. Complications during prone session requiring a turn to the supine position including, but not limited to:
    a. Inadvertent extubation
    b. Mainstem bronchus intubation
    c. New onset of hemoptysis
    d. Suspected ETT occlusion
    e. Other life-threatening complication for which the clinician requires the patient to return to the supine position
4. No clinical improvements following several hours of proning

D. STAFFING, EQUIPMENT AND PREPARATION

Staffing Requirements

1. A minimum of 5 staff members are required to safely execute the pronation/supination procedure
2. One critical care RN and one RRT must be part of the proning team
3. The RRT will lead the counts during the pronation/supination procedure

Equipment Requirements

1. Minimum of three pillows
2. 3 dry flow pads
3. Flat sheet
4. ECG leads
5. Paper tape
6. Eye lubrication and eye pads
7. Gel pillow
8. Barrier cream and protective dressings
9. Airway cart/re-intubation equipment

Preparation

Preparation is the key to a successful pronation/supination procedure. The following points must be taken into account in preparation for performing the procedure:

1. Multidisciplinary discussion regarding the potential risks and benefits of prone positioning
2. Ensure no contraindications (see **section C**)

3. Explain procedure, risks and benefits to patient and family members. Obtain informed consent (physician)
4. Confirm patient ID x2
5. Ensure adequate room and that all required equipment is present
6. Review emergency procedures (ie. Cardiac arrest, prolonged desaturation, inadvertent extubation)
7. Review plan to prone patient
8. Ensure adequate staffing available for procedure. Establish roles
9. Don appropriate PPE

	Awake/Spontaneously Breathing	Intubated and Ventilated Patient
Respiratory Therapist	• Ensure airway equipment readily available • Pre-oxygenate patient with 100% FiO_2 • Assess baseline ABGs (if ordered by MD) and vitals	• Ensure airway equipment readily available • Provide oral and in-line ETT suction • Verify ETT distance at the teeth • Consider switch to cloth/tapes to secure ETT • Pre-oxygenate to 100% FiO_2 • Establish continuous $EtCO_2$ monitoring if available • Ensure ventilator tubing has enough slack for the turn • Assess baseline ABGs and vitals
Registered Nurse	• Assess for risk of skin breakdown using the Braden Scale • Apply barrier cream to the face as necessary • Remove ECG leads and stickers from the chest and place on back • Remove any unnecessary intravenous infusions • Secure lines and tubing, ensure they do not lie under the patient. Some IV lines may require extension tubing • Ensure patient is comfortable with appropriate analgesic and anxiolytic medications	• Assess for risk of skin breakdown using the Braden Scale • Lubricate the patient's eyes and apply moist eye patches. Tape eyes shut with proper tape. Apply barrier cream to face as necessary • Remove ECG leads and stickers from the chest and place them on back • Stop and cap feeds • Remove any unnecessary intravenous infusions • Secure lines and tubing, ensure they do not lie under the patient. Some IV lines may require extension tubing • Ensure the patient is adequately sedated (analgesics and paralytics) depending on how awake the patient is. Consider utilizing the RASS score

E. AWAKE SPONTANEOUSLY BREATHING PRONING PROCEDURE

1. Determine if the patient can prone themselves or if assistance is required
2. Ensure patient is stabilized on oxygen therapy being provided
3. Ensure all lines are secure on one side
4. Cardiac leads to be placed on left and right shoulders and on left pelvis
5. Lower the head of the bed to place the patient in supine position

6. Three pillows to be obtained to support patient at the head, below the chest, and at the knees
7. Assist the patient in repositioning themselves in the prone position
8. Have the patient turn themselves over if able and support as needed
9. Assist the patient in positioning arms and head for comfort

<u>If the patient cannot self-prone:</u>

1. You may perform an assisted roll for the awake patient as outlined in the video link below:
    i. https://www.youtube.com/watch?v=EuWshgeW8JY
2. On the RT's count: "1, 2, 3, MOVE" – shift the patient as far over in the bed as possible
3. On RT's count, roll patient onto their side while stabilizing the head
4. Ensure patient is tolerating the turn well and that all lines are secure and in good position
5. Staff switch hand positions on roll
6. On the RT's count, team will complete the turn, proning the patient. Position the patient on the bed appropriately. Adjust pillows, sheets, pads to ensure comfort and prevent pressure sores
7. Place the arms in the "modified swimmer's crawl" position. One arm above the head and the opposite arm at the side, palm facing up. Alternate Q2H – Q4H as acuity allows

<u>Post Proning Care of the Awake and Spontaneously Breathing Patient:</u>

1. Monitor O2 saturation for 15 minutes. Aim for SpO_2 of 92% - 96% (88% - 92% if patient at risk of hypercapnic respiratory failure).
    a. If deteriorating O_2 saturations:
        i. Ensure oxygen delivery equipment is still in place and connected to source.
        ii. Increase FiO_2 as needed
        iii. Adjust patient position
        iv. Consider return to supine position. Consult critical care if appropriate
2. If patient tolerating prone position, plan to implement timed position changes as follows:
    a. 30 minutes to 2 hours in prone position (bed flat)
    b. 30 minutes to 2 hours lying on right side (bed flat)
    c. 30 minutes to 2 hours sitting up (30 – 60 degrees HOB)
    d. 30 minutes to 2 hours lying on left side (bed flat)
    e. Repeat cycle by returning to prone position for 30 minutes to 2 hours (bed flat)
    f. Monitor SpO_2 for 15 minutes after each position change.
3. Titrate oxygen as per SpO_2 range and/or MD orders

4. Discontinue proning if:
    a. No improvement with change of position
    b. Patient unable to tolerate change in position
    c. RR ≥ 35, patient looks tired, accessory muscle use

F. PRONING THE INTUBATED AND MECHANICALLY VENTILATED PATIENT

Please see checklist in Appendix for step-by-step format.

Turn from Supine to Prone Position:

1. The RT will be at the head of the bed controlling and monitoring the airway
2. The RT will be the lead throughout the turning process, indicating when to start, pause, and continue
3. There will be two staff on each side of the patient with at least 1 RN per side
4. RNs will monitor lines, drains, catheters and tubing while helping with the maneuver
5. Decide upon direction of turn. Aim for central lines to move up and over as opposed to under the patient.

Patient Positioning:

- Ensure preparatory tasks completed (**see section D**)
- Position the patient's arms along the side of the body with fingers pointing towards the toes
- Tuck the arm in the direction of turn under the patient (ex. if turning towards the ventilator, the arm nearest the ventilator is tucked under the body)
- Place a pillow across the chest and one across the iliac crest. Be mindful of nerve compression (ie. Femoral, bronchial)
- Cross the patient's feet at the ankles, placing the foot in the direction of turn on top
- **Optional:** Place two lifters over the chest and midsection of the patient
- Cover the patient (and lifters if used) with the sheet, leaving the head exposed
- Grab the top and bottom sheets together on both sides of the patient. Roll the sheets together tightly to "cocoon" the patient between the two sheets

Performing the Rota on: ● On RT's count: "1, 2, 3, MOVE," shi the pa ent as far over in the bed as possible ● The lead will ensure the team is ready to move forward with the turn. On the RT's count: "1, 2, 3, ROLL," roll the pa ent on their side while stabilizing the head (using log roll technique) ● As per RT's instruc on, "PAUSE," to ensure the pa ent is tolera ng the turn and that all lines and tubes are s ll secure and in good posi on	
● Staff will switch hand posi ons (those holding the sheets at the bo om will now hold the sheets from the top and vice versa). ● On the RT's count:, "1, 2, 3, TURN," the team will complete the turn, proning the pa ent. Posi on the pa ent on the bed appropriately. Adjust the bo om sheet, pillows and pads to ensure comfort and prevent pressure sores ● Place the arms in the "modified swimmer's crawl" posi on with one arm above the head (elbow below the shoulder) and the opposite arm at the side, palm facing up. Arm posi ons should be alternated Q2H – Q4H as acuity allows ● Resume all monitoring including 5 lead ECG monitoring, feeds and any paused/disconnected intravenous infusions	

Post Proning Care

Respiratory Therapy	● Immediately post proning or supina on assess pa ent's oxygena on and ven la on status. Titrate FiO_2 to maintain SpO_2 range/orders. ● Ensure tongue is not protruding out of the mouth or being bi en. Insert bite block if required ● Evaluate need for recruitment maneuver as per MD orders if pa ent is hemodynamically stable and is PEEP dependent ● Draw ABG 30 minutes post proning – adjust ven lator parameters as per your hospital policy ● RT and RN will perform head turn Q2H – Q4H as acuity allows, to prevent pressure injuries

Nursing	● Ensure patient is not lying on any tubes and does not have remaining electrodes on their chest ● Place ECG leads and electrodes on patient's back ● Place patient in reverse Trendelenburg position ● Ensure there are no EEGs on dependent side of head ● Ensure eyes are moist and lids are closed ● Ensure ears are not kinked ● Relieve pressure points (should be reassessed Q2H) ○ Ensure there is appropriate support for the head ○ Ensure there is appropriate pressure relief for the knees ○ Ensure feet are maintained in dorsiflexed position ○ Place breasts laterally to reduce pressure around nipple/breast tissue ○ Male genitalia should hang freely (use iliac crest roll/pillow to raise pelvis) ○ Ensure the shoulders are relaxed, sitting below the chest ○ Use gel pads to protect against ulnar nerve injury, reposition frequently ● Ensure foley is positioned between patient's legs

<u>Turn to Prone to Supine Position:</u>

1. Follow the steps listed in the "Preparation" section (Section D).
2. Remove all pillows from under the patient
3. Follow the "Turn to Prone Procedure" and "Post Proning Care" sections:
    a. Remove ECG leads from back and place them on chest
4. Assess the patient

G. ACLS AND COMPRESSIONS IN PRONE POSITION

Prone patients are at increased risk for cardiac arrest due to increased hemodynamic instability, loss of airway, and severity of illness. There is little good evidence to guide the optimum position for chest compressions in the prone patient. The following guidelines are based on recommendations from the Intensive Care Society document, *Guidance for: Prone Positioning in Adult Critical Care*:

1. If the personnel required to reposition the patient from prone, to supine, are not available, it may be appropriate to perform CPR with the patient in the prone position.
2. Compressions should be initiated using a two-handed technique over the mid-thoracic spine located between the two scapulae at a rate of 100 – 120 compressions/minute as per ACLS guidelines (see Figure 2)
3. Compressions should be initiated on an appropriate surface; either by deflating the patient mattress or insertion of a CPR board.

   i. As a short-term solution, if a second provider is immediately present, have them place their hands under the patient's sternum to provide counter pressure
4. Defibrillate as per ACLS guidelines. Defibrillation pads can be placed (see Figure 3):
   i. Postero-lateral (one in the left mid-axillary line, the other over the right scapula)
   ii. Bi-axillary positions
5. Move patient to supine position when appropriate resources have been allocated. Do this with minimal interruptions in CPR

Figure 2: Compressions in prone position

Figure 3: Defibrillation pads placed postero-lateral

H. REFERENCES

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APPENDIX – PRONE PROCEDURE SAFETY CHECKLIST FOR THE INTUBATED AND MECHANICALLY VENTILATED PATIENT

BEFORE THE PROCEDURE		
Have all members of the team introduced themselves	Y	N
Any contraindications?	Y	N
Re-intubation equipment available	Y	N
Eyes taped and lubricated	Y	N
ETT taped/tied, position verified by RRT at the teeth	Y	N
Stop NG feed and aspirate	Y	N
Stop non-essential monitoring and IV infusions	Y	N
Adequate length on remaining lines, positioned either up or down the bed	Y	N
Chest drains below patient. Clamped if safe to do so	Y	N
Assess and document skin integrity	Y	N
Anti-pressure dressings to bony prominences/nipples	Y	N
Daily hygiene completed (mouthcare, washing, dressings)	Y	N
Emergency equipment readily available	Y	N
Are there any concerns about this procedure?	Y	N
Concerns		

PRONING PROCEDURE	✓
Adjust bed height, max inflate	
Position linen and patient: ● Soaker pad over genitalia ● Tuck the arm in the direction of turn under patient ● Cross feet at ankles ● Place clean sheet over the patient, allowing enough sheet to cover head, then fold beneath head	
Place pillows as follows: ● Below level of axilla above breast ● Above iliac crest, below pannus ● Mid-thigh (male genitals hang) ● Below shin	
Place clean sheet over pillows and pt.	
Roll top and bottom sheets together as tightly to patient as possible	
RRT pre-oxygenate and suction	

SAFETY PAUSE Verbal confirmation between team members before start of procedure		
Minimum of 5 appropriate staff present, plus 1 for chest drains	Y	N
All team members aware of role	Y	N
Review emergency procedures	Y	N
Pre-oxygenation performed	Y	N
Cardiovascular stability	Y	N
Adequate sedation (RASS -5)	Y	N
Adequate muscle relaxation – consider need for bolus	Y	N
Pillows positioned correctly	Y	N

RESUME PRONING PROCEDURE	
On RT count "1, 2, 3, MOVE," slide to side of bed as far as possible	
On RT count "1, 2, 3, ROLL," roll onto side, stabilize head	
Ensure patient tolerating procedure	
On RT count "1, 2, 3, TURN," place into prone position	
Position patient into modified swimmers position. Arms change Q2H – Q4H with head turns.	

SIGN OUT CHECKS		
Verify ETT length at teeth, $EtCO_2$	Y	N
Re-establish monitors	Y	N
Review ventilator settings	Y	N
Lines secured	Y	N
Chest drains below patient and unclamped	Y	N
Pressure areas checked: ● ETT not pressing on lips ● No pressure on eyes ● Ears not kinked/bent ● NG not pressed against nose ● Penis between legs, urinary catheter secure ● Lines/tubing not resting against skin ● Pillows positioned correctly	Y	N
Reverse Trendelenburg 30°	Y	N
Verify/confirm NG tube, resume enteral feeds as per orders	Y	N