

# PR45: Prone Ventilation

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## Applicable To

■ CCP only

## Introduction

Prone ventilation is an oxygenation strategy for patients whose hypoxemia is refractory to treatment. Movement from a supine to a prone position attempts to optimize ventral-dorsal transpulmonary pressure, reduce dorsal compression, and improve lung perfusion.

## Indications

- Refractory hypoxemia in the ARDS patient unresponsive to multiple attempts at optimization of ventilator settings including recruitment maneuvers
- PF ratio of  $< 150$ , prone ventilation should be considered after normal oxygenation strategies have failed
- PF ratio of  $< 100$ , prone ventilation should be attempted based on clinical presentation, time, and resource availability

## Contraindications

- Spinal instability or risk of spinal instability
- Unstable pelvic or facial fractures
- Anterior burns
- Open wounds
- Shock unresponsive to vasopressors
- Pregnancy
- Recent tracheal surgery
- Raised intracranial pressure

### Cautions:

- Chest tube
- Hemodynamic instability
- Cardiac abnormalities
- Thoracic and abdominal surgeries
- Difficult airway and/or massive hemoptysis

## Procedure

### Preparation:

1. Check for contraindications.
2. Consider possible adverse effects of prone positioning on chest tube drainage.
3. Explain the maneuver to the patient, associated health care personnel, and/or their family.
4. Confirm the endotracheal tube is located 2-4 cm above the carina.
5. Inspect and confirm that the endotracheal tube, and all central and large bore peripheral catheters, are firmly secured.

6. Consider how the patient's head, neck, and shoulder girdle will be supported after they are turned prone.
7. Stop tube feeding, check for residual, fully evacuate the stomach, and cap or clamp feeding and gastric tubes.
8. Prepare endotracheal suctioning equipment and review the process for managing copious airway secretions that may abruptly interfere with ventilation.
9. Decide whether the roll will be rightward or leftward, considering line placement, positioning within the aircraft, and ambulance stretcher orientation.
10. Support and/or pad IO site.
11. Prepare all intravenous catheters and other tubing for when the patient is prone:
  - Ensure sufficient tubing length.
  - Ensure all tubing connections are tight and secure.
  - Relocate all drainage bags to the foot of the bed.
  - Roll away from chest tubes if possible.
  - Reposition intravenous and arterial line tubing toward the patient's head.

**Rolling procedure:**

1. Place one (or more) people on both sides of the bed (to be responsible for the rolling processes) and another at the head of the bed (to ensure the central lines and the endotracheal tube do not become dislodged or kinked).
2. Increase the FiO<sub>2</sub> to 1 and note the mode of ventilation, the tidal volume, the minute ventilation, and airway pressures.
3. Pull the patient to the edge of the bed furthest from whichever lateral decubitus position will be used while rolling.
4. Move ET, OG, CVC, arterial line, and IV lines towards the head of the bed.
5. Move foley, or subdiaphragmatic lines, to the foot end.
6. Remove ECG leads and patches. Suction the airway, mouth, and nasal passages if necessary.
7. Ensure no other lines, tubes, securing devices, clips, clamps, or patches are on the patient's anterior side as these will become pressure points when the patient is lying on their anterior aspect.
8. Place the patient's arms down along their sides. Ensure that when rolling, their hands will not become pinched or contorted.
9. Place a new draw sheet over the patient.
10. Place a pillow on the ankles, waist, and chest (total 3 or more if obese).
11. Place another sturdy draw sheet over the pillows.
12. Roll the new sheets with the sheets under the patient together. One side rolls up and the other side rolls down so that the upper sheets and the lower sheets become taught.
13. Slide the patient up the bed so that the patient's head is beyond the top of the bed. In such a manner as to allow the ET tube to freely rotate when rolling the patient.
14. Turn the patient to the prone position when all parties are aware of their role.
15. Reposition the patient to the centre of the bed using the draw sheet and slide the patient down the bed to a comfortable position.
16. Ensure that the airway is not kinked and has not migrated during the rolling process. Suction the airway if necessary.
17. Support the face and shoulders appropriately, avoiding any contact of the supporting pads with the orbits or the eyes.
18. Position the arms for patient comfort. If the patient cannot communicate, avoid any type of arm extension that might result in a brachial plexus injury.
19. Auscultate the chest to check for right mainstem intubation. Reassess the endotracheal tube depth, the tidal volume, and minute ventilation.
20. Adjust all tubing and reassess connections and function.
21. Reattach ECG patches and leads to the back.
22. Slight, intermittent lateral repositioning (20 to 30°) should also be used, changing sides at least every 2 hours.
23. Document a thorough skin assessment every shift, specifically inspecting weight bearing, ventral surfaces.
24. Turn the patient's head every 2 hours to avoid pressure sores, ideally once every hour where possible.

## Notes

### Assessing for a response:

1. Sustained improvement in gas exchange  $> \text{PaO}_2$  10mmHg.
2. Evidence of alveolar recruitment not increasing the risk of VILI.
3. Be prepared for significant endotracheal drainage following proning.
4. Improvement may take time.

If gas exchange, lung mechanics, or cardiovascular status deteriorates, consider moving the patient back to supine ventilation.

### Complications:

1. Increased need for sedation and/or paralytics.
2. Hemodynamic instability.
3. Inadvertent endotracheal tube extubation or main stem migration.
4. Obstructed or kinked endotracheal tube.
5. Obstructed chest tube.
6. Dislodged central venous catheter.
7. Dislodged femoral hemodialysis catheter.
8. Compressed tubing infusing vasoactive medications.
9. Transient episodes of supraventricular tachycardia.

## References

1. Malhotra A, Kacmarek RM. Prone ventilation for adult patients with acute respiratory distress syndrome. (2020). [\[Link\]](#)
2. Morgan B. Procedure for turning a ventilated patient prone. (2021). [\[Link\]](#)

