Supplemental Oxygenation

**GOAL** = SpO2 92 – 96% (88 – 94% if COPD)

**Recommended path**
- Start humidified NC 1 – 6 L/min
- Escalate to oxymizer 6 – 12 L/min or Venturi mask 40 – 60%
  - if oxymizer 10 L/min or Venturi at 50%, transfer to ICU (p39999)
  - if oxymizer 12 L/min or Venturi at 60% and within GOC, intubate (p39265)

**Noninvasive ventilation**
- CPAP/BIPAP (NIPPV): use as normal (OSA, TBM, COPD, flash pulmonary edema, etc.)
  - use hospital’s machines with HEPA filters and AGP precautions
- HFNC: Use as normal with AGP precautions

**Awake Proning (Self-Prone)**

*Any willing patients with the ability to unprone themselves if needed*
- Recommend swimmer position; alternatives okay if more comfortable for patient
- Okay with NC, NIPPV, or HFNC
- Maximum time tolerated per day

Ventilator Adjustments

**VENTILATION**

**GOAL** = pH of roughly 7.25 – 7.45 while maintaining low tidal volumes

1. Start with tidal volumes
   - 4 – 6 cc/kg ideal body weight

2. Then adjust respiratory rate
   - adjust to achieve pH goal (typical range 20 – 35 breaths/min)

**OXYGENATION**

**GOAL** = SpO2 92 – 96% (88 – 94% if COPD)

1. Start with PEEP
   - **Initial settings** on intubation
     - BMI < 40: PEEP 5
     - BMI ≥ 40: PEEP 10
   - **Adjust PEEP**
     *Use optimal PEEP study or PV tool if available and trained; otherwise use ARDSnet tables at right:*
     - BMI < 40: Low PEEP table
     - BMI ≥ 40: High PEEP table

2. Adjust FiO2
   - Minimum tolerated for SpO2 92 – 96% (88 – 94% if COPD) after adjusting PEEP
     - if FiO2 > 60%, see Refractory Hypoxemia on page 2 of this guide

**MECHANICS**

- Measure static compliance (CStat) and plateau pressure (PPlat)
- If PPlat > 30: decrease TV (min 4 cc/kg ideal body weight)

ARDSNET TABLES

Use a minimum PEEP of 5 cm H2O. Consider use of incremental FiO2/PEEP combinations as follows:

**LOW PEEP** (BMI < 40)

<table>
<thead>
<tr>
<th>FiO2</th>
<th>PEEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>5</td>
</tr>
<tr>
<td>0.4</td>
<td>5</td>
</tr>
<tr>
<td>0.5</td>
<td>8</td>
</tr>
<tr>
<td>0.6</td>
<td>10</td>
</tr>
<tr>
<td>0.7</td>
<td>10</td>
</tr>
<tr>
<td>0.7</td>
<td>12</td>
</tr>
<tr>
<td>0.7</td>
<td>14</td>
</tr>
<tr>
<td>0.8</td>
<td>14</td>
</tr>
<tr>
<td>0.9</td>
<td>14</td>
</tr>
<tr>
<td>0.9</td>
<td>16</td>
</tr>
<tr>
<td>1.0</td>
<td>18 – 24</td>
</tr>
</tbody>
</table>

**HIGH PEEP** (BMI ≥ 40)

<table>
<thead>
<tr>
<th>FiO2</th>
<th>PEEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>5</td>
</tr>
<tr>
<td>0.3</td>
<td>8</td>
</tr>
<tr>
<td>0.3</td>
<td>10</td>
</tr>
<tr>
<td>0.3</td>
<td>12</td>
</tr>
<tr>
<td>0.3</td>
<td>14</td>
</tr>
<tr>
<td>0.4</td>
<td>14</td>
</tr>
<tr>
<td>0.4</td>
<td>16</td>
</tr>
<tr>
<td>0.5</td>
<td>16</td>
</tr>
<tr>
<td>0.5</td>
<td>18</td>
</tr>
<tr>
<td>0.5</td>
<td>to 0.8 20</td>
</tr>
<tr>
<td>0.8</td>
<td>22</td>
</tr>
<tr>
<td>0.9</td>
<td>22</td>
</tr>
<tr>
<td>1.0</td>
<td>22</td>
</tr>
<tr>
<td>1.0</td>
<td>24</td>
</tr>
</tbody>
</table>

FOR URGENT QUESTIONS: Pulmonary consult p11957 or ICU Triage p39999. See https://covidprotocols.org/ for current full manual.
## Sedation / NMB

**Start with sedation**

*Use minimum doses to achieve ventilator synchrony*

**Assess and treat in sequence:**

1. **Pain**
   - Assess for goals: NRS < 4, CPOT < 3
   - Treat: Dilaudid or Fentanyl, prefer bolus, switch to drip PRN, try PO options if IV shortages

2. **Agitation**
   - Assess for goals: RASS 0 to −1, or BIS 60 if on neuromuscular blockade
   - Treat: Propofol drip preferred, benzodiazepine second line (delirium risk), dexmedetomidine only if weaning (tachyphylaxis after 3 days)

3. **Delirium**
   - Assess: CAM-ICU
   - Treat: quetiapine, olanzapine, haloperidol

**Consider neuromuscular blockade if:**

- Not synchronous with RASS −4 to −5 or −
- Need to improve gas exchange:
  - decreased skeletal muscle metabolism (lowers O2 demand and CO2 production)
  - increased abdomen and chest compliance

**METHOD**

- Sedate to RASS −3 to −4 prior to initiating
  - then goal BIS − 60 after (BIS inaccurate prior to paralysis)
- Bolus dose rocuronium or cisatracurium (start drip only if needed)
- Discontinue as soon as possible and minimize steroids to reduce risk of myopathy

## Ventilated Proning

- Ideally: < 36 hours from ARDS onset
- Contraindicated in spinal cord injury, open chest or abdomen, unstable airway (BMI, RRT are not contraindications)

**METHOD**

- Hold tube feeds 1 hour prior to turns, otherwise they can be continued
- Place in swimmer position
  - Proning Team (p34433) if needed
  - bolus paralytic PRN for turns; *not required* to prone
- Obtain ABG and mechanics 1 hour after proning or re-supinating
- Keep proned for 16–20 hrs per 24 h

**DISCONTINUE IF**

- Minimal improvement to P/F with proning
- P/F > 200 on FiO2 < 60% when supine
- Unsafe hemodynamic changes on turns, or if concern that patient may require ECMO

## Refractory Hypoxemia

**If PaO2 < 75 with FiO2 ≥ 0.6 there is concern for oxygen toxicity; try:**

1. Optimize PEEP and vent synchrony (flow, triggers, volumes; page RT or pulmonary consult PRN)
2. Optimize volume (RRT or diuretic)
3. Trial proning
4. Deeply sedate (to RASS −3 to −5)
5. Trial neuromuscular blockade
6. Consider ECMO (p35010)
7. Trial inhaled epoprostenol or iNO (contraindicated in pulmonary hemorrhage, LV failure)

## Extubation Readiness

**In patients who meet all four of:**

- SpO2 > 92% or PaO2 > 75
- FiO2 ≤ 50%
- PEEP ≤ 10
- PPlat < 30

1. **Daily SAT (RASS 0)**
   - Do not attempt if paralyzed, prone, or HD unstable

2. **If passing SAT, daily SBT**
   - Trial PSV 5/5 × 30 minutes
   - Discontinue if: RR > 30, SpO2 < 92%, HD unstable, Rapid Shallow Breathing Index (RSBI) = RR/TV > 105

3. **If passing SAT and SBT, consider extubation if also:**
   - Following commands, ideally RASS 0 to +1
   - Able to cough
   - Requiring suctioning less frequently than q2h
   - TIP: Place NG tube or Dobhoff prior to extubation

## Extubation Readiness

**If failing SAT and SBT consider:**

- Volume status/diuresis
- Bronchoconstriction and airway edema
- Sputum production/VAP
- Neuromuscular weakness including malnutrition and electrolytes (phos)
- Delirium, sedation

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**FOR URGENT QUESTIONS:** Pulmonary consult p11957 or ICU Triage p39999. See https://covidprotocols.org/ for current full manual.