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
  - if oxymizer 12 L/min or Venturi at 60% and within GOC, intubate

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 unpron 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>0.5</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>0.9</td>
<td>18</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  to 0.8</td>
<td>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 more information on respiratory failure, visit https://covidprotocols.org/protocols/respiratory.
See also: Inpatient, Outpatient, and ICU Patient guides at https://covidprotocols.org/quick-guides.
**Extubation Readiness**

In patients who meet all four of:
- $SpO_2 > 92\% \text{ or } PaO_2 > 75$
- $FiO_2 \leq 50\%$
- $PEEP \leq 10$
- $PPlat < 30$

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

2. **If passing SAT, daily SBT**
   - Trial PSV 5/5 × 30 minutes
   - Discontinue if: $RR > 30$, $SpO_2 < 92\%$, HD unstable, $Rapid\ Shallow\ Breathing\ Index (RSBI) = RR/TV > 105$

3. **If passing SAT and SBT, consider extubation**
   - 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

**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
- 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 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 $FiO_2 < 60\%$ when supine
- Unsafe hemodynamic changes on turns, or if concern that patient may require ECMO

**Refactory Hypoxemia**

If $PaO_2 < 75$ with $FiO_2 \geq 0.6$ 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 inhaled epoprostenol or iNO (contraindicated in pulmonary hemorrhage, LV failure)
6. Trial neuromuscular blockade
7. Consider ECMO

**Extubation Readiness**

In patients who meet all four of:
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   - **Discontinue if:**
     - $RR > 30$, $SpO_2 < 92\%$, 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

**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 or ICU Triage. See https://covidprotocols.org/ for current full manual.