**PICU INVASIVE VENTILATOR WEANING PROTOCOL**

**Criteria for Initiation Ventilator Weaning Algorithm:**
- Vital signs within ordered parameters and acceptable work of breathing
- Tolerating SBS goal of (-)1 to 0
- Off Neuromuscular blockade for >6 hours
- Spontaneously breathing: triggering breaths on the ventilator or above set rate
- Ventilator settings: maintained for at least 6 hours in SIMV mode
  - Tidal volume 6-8ml/kg, Mean airway pressure < 18, peak inspiratory pressure (PIP) < 30, FIO2 ≤ 40%, Oxygenation Index (OI) ≤ 6 or Oxygenation Saturation Index (OSI) ≤ 5
- Blood gases: maintained within acceptable range & discussed with Intensivist
- End tidal CO2 monitor (EtCO2) or Transcutaneous monitor (TCM) within set goals

**Ventilation**
- Respiratory rate (RR) at age specific extubation parameter?
  - Yes
  - Pressure support at extubation parameter?
    - Yes
    - Ventilation and Oxygenation can be weaned at the same time.
    - MD/APP to place protocol orders and RT to initiate ventilator weaning
    - Oxygenation
      - Positive End Expiratory Pressure (PEEP) at extubation parameter?
        - Yes
        - Wean ventilator setting as stated in weaning parameter section until at setting specific goal as tolerated.
          - *Intensivist/APP can wean vent faster if clinically indicated*
        - No
        - Increase settings to last stable settings, discuss with Intensivist/APP, treat possible causes & reassess in 4 hours
      - No
        - Wean tolerated?
          - Yes
          - Ventilator settings at extubation parameter?
            - Yes
            - Notify Intensivist and discuss Extubation Readiness Trial (ERT)
            - No
            - Wean tolerated?
              - Yes
              - Ensure NPO status and continue to ERT protocol section
              - No
              - Increase settings to last stable settings, discuss with Intensivist/APP, treat possible causes & reassess in 4 hours
  - No
    - Reassess patient every 4 hours. Address concerns causing patient to not meet criteria

**Significant Event:** If at any point during the protocol, the patient has a significant change in status (eg, code, ECMO, OR, sepsis): discontinue the protocol. Discuss with provider once criteria subsequently met.

Last Edited: 8 April 2019
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**PICU INVASIVE VENTILATOR WEANING PARAMETERS**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Weaning Parameter</th>
<th>Frequency</th>
<th>Extubation Parameters</th>
<th>RT Clinical Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate (RR)</td>
<td>2 breaths per minute (bpm)</td>
<td>every 2 hours</td>
<td>&lt;5 yo = 10 bpm</td>
<td>Monitor vital signs, work of breathing, tidal volume &amp; RR</td>
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<td></td>
<td>≥5 yo = 5 bpm</td>
<td>Maintain ordered CO₂ range by blood gas, ETCO₂ or TCM</td>
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<tr>
<td>Pressure Support (PS)</td>
<td>2 cmH₂O</td>
<td>every 2 hours</td>
<td>&lt;5 yo = 8 cmH₂O</td>
<td>Maintain tidal volume (TV) ≥ 4 ml/kg on spontaneous breaths</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>≥5 yo = 5 cmH₂O</td>
<td>Monitor vital signs &amp; work of breathing</td>
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<td></td>
<td></td>
<td>Maintain ordered CO₂ range by blood gas, ETCO₂ or TCM</td>
</tr>
<tr>
<td>PEEP (positive end expiratory pressure)</td>
<td>1 cmH₂O</td>
<td>every 8 hours</td>
<td>5 cmH₂O</td>
<td>Maintain FIO₂ ≤ 40%</td>
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<td>Maintain O₂ sats &gt;90%</td>
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**DEXAMETHASONE CRITERIA**

Discuss initiation of dexamethasone for extubation if following criteria are present:
- Intubated patient < 1 year of age
- No leak present at > 20 cmH₂O within 24 hours prior to planned extubation

**Initiation of dexamethasone:**
- 12 hours prior to planned extubation
  - Goal: at least 2 doses given to patient prior to extubation
  - Dose: 0.5mg/kg IV q6h x 4 doses (max dose: 4mg/dose)
  - Adjunct medications:
    - Racemic Epi to be at bedside for extubation
      - Dose: 0.25-0.5ml of 2.25% racemic epinephrine diluted in 3ml
Criteria for Initiation for Extubation Readiness Trial:
- Vital signs within ordered parameters
- Patient at SBS goal of (-)1 or 0 with appropriate respiratory rate
- Patient NPO status and timing verified
- Ventilator settings at extubation parameters for age and tolerated for ≥ 2 hours
- Acceptable work of breathing
- Blood gases, End tidal CO2 monitor (EtCO2) and/or Transcutaneous monitor (TCM) within set goals & discussed with Intensivist
- Cough and gag present

Initiate ERT per Intensivist orders for 60 minutes

Patient tolerating ERT as evident by:
- Vital signs within ordered parameters and acceptable WOB
- EtCO2 and/or TCM within ordered range
- RR, tidal volume, FiO2, and OI/OSI within goal parameters

Patient appropriate to extubate per Intensivist?

Notify Intensivist of result of ERT. Obtain & result blood gas if ordered by Intensivist

Complete pre-extubation time out checklist (see next page). Utilize laminated checklist card at bedside

Verify sedation plan for extubation:
- Initiate extubation sedation plan per MD order
- Patient awake and alert without stimulation or at baseline neurologic status

Patient awake and alert without stimulation:
- Suction ETT, mouth, nose
- Extubate patient to discussed non-invasive respiratory support

Complete immediate post-extubation assessment (10 min):
- Patient tolerating post-extubation plan without respiratory support escalation?

Notify Intensivist immediately to come to bedside due to escalation of respiratory support and potential extubation failure

Yes

No

Identify reasons patient not appropriate for extubation
- Place patient on most recent stable ventilator settings
- Schedule time to re-evaluate

Notify Intensivist of successful extubation
Continue to monitor patient for signs of extubation failure and document a 1 hour reassessment
Obtain post-extubation blood gas if ordered by Intensivist/APP

ERT Vent Settings:
<5yo: PEEP 5, PS 8
≥5yo: PEEP 5, PS 5
**PRE-EXTUBATION CHECKLIST**

**Intensivist to define the following:**
- Intensivist present at bedside for extubation?
  - If no, does Intensivist want APP or resident present?
- Verify peri-extubation sedation plan
- Determine post-extubation respiratory support plan

**Nursing:**
- Emergency equipment ready at bedside prior to extubation attempt:
  - Emergency med sheet present
  - Med-line identified, function verified and readily available
  - Suction set-up, functioning and ready
  - Self-inflating bag attached to oxygen with proper mask size attached

**Respiratory Therapy:**
- Airway cart outside of room
- Re-intubation supplies verified available in cart:
  - ETT/LMA
  - Stylet
  - Waveform ETCO₂
  - Tube tape/duoderm available
  - Laryngoscope/C-Mac with appropriate blade available
  - Oral airway available
  - Flow-inflating (anesthesia) bag in cart

**PROTOCOL PATIENT EXEMPTIONS**

**Following patient populations are exempt from this protocol:**
- Congenital heart disease: *Single ventricle or cyanotic mixing lesion with baseline saturation < 90%*
- Current ECMO patient
- Trisomy 13 or 18 patient

**Following patient populations ARE exempt from the extubation only section of this protocol:**
- Critical or difficult airway

**Following patient populations MAY be exempt from the extubation only section of this protocol:**
- Neuromuscular weakness (eg. SMA1, Mysthenia gravis)
- Post-op oropharyngeal surgical patients (eg. LeFort, mandibular distraction)
- Post-op ENT airway surgical patients (eg. laryngotracheal reconstruction (LTR), tracheal slide)
- Patient being extubated to RAM or Bipap, not on non-invasive positive pressure support at baseline
- Patients intubated for non-respiratory causes (eg. ingestions, post-epileptic respiratory depression)