Spontaneous Breathing Trial (SBT) and Mechanical Ventilation Weaning Process

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

**PRESENTATION**

- Patient receiving mechanical ventilation

**ASSESSMENT**

- Does patient meet criteria\(^1\) for SBT
- Does patient tolerate SBT\(^2\) for 30 minutes?

**INTERVENTION**

- RT and RN to assess criteria\(^1\) for SBT
- RT to initiate SBT
- Perform and document pulmonary mechanics
- Pulmonary mechanics acceptable?\(^3\)

- Contact provider to obtain order for extubation\(^4\)
- Extubate and begin lung expansion therapy per RT protocol\(^6\)

- Return to appropriate ventilator mode/settings as tolerated
- Adjust ventilator alarms as appropriate
- Document and re-assess as indicated

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CPAP = continuous positive airway pressure
PSV = pressure support ventilation
RN = registered nurse
RT = respiratory therapist
SBT = spontaneous breathing trial

1 See Appendix A: SBT Criteria
2 Signs of intolerance which would require termination of SBT include:
   - Signs of dyspnea or fatigue
   - SpO\(_2\) < 90%
   - SpO\(_2\) drop > 15%
   - Asynchronous or discordant respiratory pattern
   - Use of accessory muscles
   - New onset of dysrhythmias
   - Sustained HR > 20 bpm above baseline for 10 minutes
3 See Appendix B: Weaning Process
4 Acceptable pulmonary mechanics include: vital capacity ≥ 10 mL/kg, negative inspiratory force > -20 cm H\(_2\)O and rapid shallow breathing index (RSBI) < 105. RSBI = ratio of respiratory frequency (f) to tidal volume (TV) (f/TV)
5 If extubation orders are received from a non-critical care provider (i.e., primary physician), the RT should notify the patient’s critical care physician prior to the tube removal
6 See Respiratory Therapy Departmental Protocol (#ATT3291)
APPENDIX A: SBT Criteria

Spontaneous Breathing Readiness Assessment shall be completed by RT and RN by 8:30 am (unless otherwise ordered)

(All must be met in order to proceed with protocol)

- Stable hemodynamics (MAP > 60 mmHg, HR < 120 bpm)
- No significant dysrhythmias (unless chronic). If patient has a dysrhythmia, contact ICU provider prior to proceeding with SBT.
- If patient is receiving vasopressor therapy, contact ICU provider prior to proceeding
- The most recent ABG values are as follows: pH > 7.28, PCO₂ < 60 mmHg (unless chronic), and PO₂ > 60 mmHg. If ABG not available, SpO₂ ≥ 92%.
- Temperature < 38.9°C
- Ventilator rate is set ≤ 20 bpm and spontaneous respiratory rate < 35 bpm
- Capability to breathe spontaneously
- FiO₂ ≤ 0.50
- PEEP ≤ 10 cm H₂O
- Capable of lifting head off pillow
- RASS score +1 to -2 (see Appendix C). If RASS score < -2, discuss with ICU provider. RT to discuss with the RN, if sedation holiday is appropriate and if it has been performed.

MAP = mean arterial pressure
ABG = arterial blood gas
PCO₂ = partial pressure of carbon dioxide
PO₂ = partial pressure of oxygen
SpO₂ = arterial oxygen saturation
FiO₂ = fraction of inspired oxygen
PEEP = positive end-expiratory pressure
RASS = Richmond Agitation-Sedation Scale
APPENDIX B: Weaning Process

- Change ventilator settings to PS mode or ventilation of 6 cm H$_2$O and titrate PS to deliver tidal volume of 6-7 mL/kg of ideal body weight
- Monitor patient’s respiratory status as appropriate

**Note:** If there are signs of intolerance, terminate weaning process and return to appropriate ventilator mode/settings, adjust alarms as appropriate and document

- Once the weaning process has reached acceptable level (i.e., PSV of 6 and acceptable spontaneous pulmonary mechanics) consult the physician for extubation orders

**Note:** If extubation orders are received from a non-critical care provider (i.e., primary physician), the RT should notify the patient’s critical care physician prior to the tube removal

PS = pressure support  PSV = pressure support ventilation

1 Signs of intolerance include:
- Signs of dyspnea or fatigue
- SpO$_2$ < 90%
- Noted diaphoresis
- New onset of dysrhythmias
- Asynchronous or discordant respiratory pattern
- Sustained HR > 20 bpm above baseline for 10 minutes
- Use of accessory muscles

2 Acceptable pulmonary mechanics include: vital capacity $\geq$ 10 mL/kg, negative inspiratory force $>-20$ cm H$_2$O and rapid shallow breathing index (RSBI) < 105. RSBI = ratio of respiratory frequency (f) to tidal volume (TV) (f/VT)
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### APPENDIX C: Richmond Agitation Sedation Scale (RASS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>Combative</td>
</tr>
<tr>
<td>+3</td>
<td>Very agitated</td>
</tr>
<tr>
<td>+2</td>
<td>Agitated</td>
</tr>
<tr>
<td>+1</td>
<td>Restless</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
</tr>
<tr>
<td>-4</td>
<td>Deep sedation</td>
</tr>
<tr>
<td>-5</td>
<td>Unarousable</td>
</tr>
</tbody>
</table>

+4: Overly combative, violent, immediate danger to staff
+3: Pulls or removes tube(s) or catheter(s); aggressive
+2: Frequent, non-purposeful movement, fights ventilator
+1: Anxious, but movements not aggressive or vigorous
0: Briefly awakens with eye contact to voice (less than 10 seconds)
-1: Not fully alert, but has sustained awakening (eye-opening/eye contact) to voice (greater than or equal to 10 seconds)
-2: Briefly awakens with eye contact to voice (less than 10 seconds)
-3: Movement or eye openings to voice (but no eye contact)
-4: No response to voice, but movement or eye opening to physical stimulation
-5: Unarousable
SUGGESTED READINGS

Departmental Protocol for Assessing Liberation from Mechanical Ventilation (#ATT3296)


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DEVELOPMENT CREDITS

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