RESPIRATORY CARE SERVICES
VENTILATOR LIBERATION PROTOCOL

**Purpose:** Provide a protocol for the daily evaluation of all mechanically ventilated patients for readiness to be liberated (i.e. extubated) from mechanical ventilation.

**Equipment Required:**
1) Intensive care bed
2) Continuous cardiac and blood pressure monitoring
3) Continuous pulse oximeter

**Procedure:** See figure 1. All patients who meet the defined inclusion criteria will be placed on a spontaneous breathing trial (SBT) for 30 to 120 minutes. If patient tolerates the SBT (based on predefined criteria) a extubation safety screen will be done, then the responsible physician will be notified for extubation orders.

Figure 1.
SBT Initiation Criteria

Prior to beginning the SBT, the therapist will assess the patient using Attachment I. Inclusion criteria to be met are:

1) Evidence for some reversal of the underlying cause for respiratory failure (i.e. decreasing ventilator support)
2) Adequate Oxygenation:
   a. FiO2 \leq 0.5 (50\%) with SpO2 >90\% or PaO2/FiO2 ratio > 150 (attachment II)
   b. PEEP \leq 8
   c. pH \geq 7.30 (if available)
3) Hemodynamic stability - no clinically significant hypotension (\leq 5 mcg of dopamine, dobutamine, or levophed with a MAP\geq 65 or SBP \geq 90)
4) The capability to initiate an inspiratory effort (i.e. no current use of neuromuscular blockers)

Should questions arise concerning these assessment criteria, the respiratory therapist will contact the physician for instructions before beginning spontaneous breathing trials. The extubation plan will be documented in Sunrise by the respiratory therapist. *

The physician and the respiratory therapist will discuss the extubation plan daily.

*Note: If the above criteria are not met, the spontaneous trials may be initiated with the approval of the treating physician.

Patient Preparation for the SBT

The patient must be prepared for the SBT as follows:

1) **Patient sedation should be on hold** during the SBT. Analgesic (opiate) infusions may be continued if the patient requires it.
2) Inform the patient of the process involved in the SBT to provide reassurance and reduce psychological stresses.
3) Place the patient in the semi-fowler position or other preferred body position.
4) Bronchial hygiene:
   a. Suction and chest physical therapy as needed for secretion clearance
   b. If a patient is on bronchodilators, please give prior to SBT
5) All patients on spontaneous breathing trials will be monitored by heart and blood pressure monitors and continuous pulse oximetry.
6) Arterial blood gases will be drawn as clinically indicated to verify oxygenation or ventilation status.
SBT procedure

SBT can be performed on pressure support ventilation (PSV) or with a T-Tube setting. Variations to the technique (automatic tube compensation, ATC or Continuous Positive Airway Pressure with no PS) may be attempted by order of the attending physician.

1) All SBT will be done with PSV of 5 cmH2O (8 cmH2O if ETT < 7.5). Some physicians may request that a T-tube trial to replace the PS trial which is also acceptable.
2) FiO2 and PEEP will be maintained at level present in original ventilator settings.
3) The first five (5) minutes of the trial the patient is to be observed closely for signs of fatigue and/or decompensation and observed thereafter at fifteen (15) minutes intervals.
4) An SBT will last a minimum of 30 minutes and a maximum of 120 minutes. At the end of this period the MD should be informed of patient condition, and if no order for extubation then the patient should be placed back on original ventilator settings.
5) If the patient completes the SBT successfully, he/she will be evaluated for extubation (see extubation safety Criteria). If the patient does not tolerate the SBT ( see criteria below), the patient will be placed on their original settings and the MD informed.
6) It is acceptable, if the patient successfully completes the SBT, to extend the SBT if the physician requests it. Remember: the SBT should routinely be between 30 and 120 minutes long. Extension in SBT time has shown to increase risk of extubation failure.

Note: The decision to extubate should be made between the hours of 6 am and 6 pm routinely, but exceptions may be made by the treating physician.

Failure of SBT Criteria

Discontinue the SBT and return patient to the original settings when the patient exhibits any of the following signs of clinical deterioration and decompensation (see Attachment I). Immediately notify the patients nurse and MD as appropriate. The patient should “rest” overnight before another spontaneous trial is attempted the following morning. (Another SBT during the same day should be discouraged, but is acceptable if the physician requests).

1) A respiratory rate greater than 35 bpm or apnea. (A respiratory rate >35 for less than 5 minutes may be acceptable).
2) If the patient HR and/or BP is >120% or < 80% of baseline, the trials will be discontinued and hemodynamic signs recorded.
3) If the patient develops arrhythmias.
4) If the patient exhibits use of accessory muscles, paradoxical breathing, or diaphoresis or complains of dyspnea, ventilatory support will be reinstituted.

5) Should there be deterioration in oxygen saturation (defined as a SaO2 <90%), the FiO2 may be increased by 10% to maintain a saturation of ≥ 90%, before the SBT is discontinued.

### Extubation Safety Criteria

Patients that pass the SBT will be evaluated for extubation. The intention of the extubation safety criteria is to identify patients at higher risk for airway complications. There are no tests that identify 100% patients that will have airway problems; hence these criteria may be overridden by the attending physician but are intended to increase awareness of patients at risk.

1) Patient should have passed a SBT.
2) Cuff-leak test. Once the ET tube cuff is deflated there should be > 110 mL difference between tidal volume in vs. out. (average 6 breaths before and 6 breaths after deflating the cuff, in the same mode of mechanical ventilation - Volume or pressure control with Auto-Flow off). A POSITIVE TEST means there is no leak or <110 mL escaped, while a NEGATIVE TEST means there is a leak (>110mL). A POSITIVE test should prompt an alert to MD in charge of extubation orders.
3) Secretions: Excessive secretions (an arbitrary term, which we defined as the need to suction a patient every hour) is a known cause of extubation failure, however, this is not universal and varies from patient to patient. When detected the RT should notify the MD so that specific strategies can be implemented to help with extubation.

### Extubation/Ventilator Discontinuance

1) Extubation requires a written or verbal physician order. Nursing must be informed prior to patient extubation.
2) A respiratory therapist may extubate a patient per protocol upon receipt of a physician’s order.
3) The ventilator will be placed on standby for the first thirty minutes after extubation.
Documentation of Progress

1) Each shift, the respiratory therapist will also record in the progress notes the details of the spontaneous breathing trials.

2) The patient's medical record must accurately reflect all current settings and weaning progress by the end of each shift. Documentation must include a summary of the spontaneous trials and how they were tolerated.

3) If the patient fails the SBT, the RT note in the electronic chart should reflect why you think the trial failed.

4) The physician will be notified and his/her name placed in the appropriate spot in the document.
## Attachment I

### Spontaneous Breathing Trial Initiation Criteria (If any NO, alert MD)

1. Improvement in or resolution of the underlying disease process which required mechanical ventilation.  
   - YES [ ] NO [ ]

2. Can the patient breath spontaneously  
   - YES [ ] NO [ ]

3. MAP ≥ 65 or SBP ≥ 90 (≤ 5 mcg/kg/min dopamine, dobutamine or levophed)  
   - YES [ ] NO [ ]

4. PH ≥ 7.30  
   - YES [ ] NO [ ]

5. SaO₂ > 90% with FIO₂ < .50 (50%) or PaO₂/FIO₂ Ratio > 150  
   - YES [ ] NO [ ]

6. PEEP < 8  
   - YES [ ] NO [ ]

### Spontaneous Breathing Trial Failure Criteria (if any YES, alert MD)

1. Respiratory rate >35 bpm >5 min  
   - YES [ ] NO [ ]

2. HR and/or BP is >120% or < 80% of baseline  
   - YES [ ] NO [ ]

3. New Arrhythmias  
   - YES [ ] NO [ ]

4. Clinical signs and symptoms of respiratory failure  
   - YES [ ] NO [ ]

5. SaO₂ ≤ 90% with FIO₂ >10% baseline  
   - YES [ ] NO [ ]

### Extubation Safety Checks (if any NO, alert MD)

1. Patient awake and obeys commands  
   - YES [ ] NO [ ]

2. Negative Cuff-leak test (i.e. leak present)  
   - YES [ ] NO [ ]

3. NO excessive secretions  
   - YES [ ] NO [ ]
## Attachment II

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Patients with FiO2 above 50% are **usually** not subject to a SBT.
REFERENCES


MacIntyre NR, Branson RD. Mechanical Ventilation. W.B. Saunders 2001; 348-357.


