Adult Ventilator Protocols

GUIDELINES

TITLE: Adult Ventilator Protocols (AVP)  NUMBER: 

EFFECTIVE DATE:  APPROVED:_______

Ventilator Setup, Ventilator Management and Ventilator Weaning

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POLICY

The MD and/or RCP shall determine ventilator settings based upon each patient’s ideal body weight, physical condition and immediate clinical demands. Due to their intimate role with the patient, RNs shall be relied upon to provide clinical and observational data upon which such changes might be determined.

PURPOSE

The objective is to provide a safe and efficient standardized approach to ventilator setup, management and weaning. To achieve this objective the policies and procedures are based upon current technology, recent studies, and the clinical guidelines for mechanical ventilation as set forth by the American Association for Respiratory Care (AARC).

SCOPE

These mechanical ventilation policies and procedures transcend the solely physician driven approach to include the entire critical care team; incorporating, to some degree, all members: physicians (MD), respiratory care practitioners (RCP), and registered nurses (RN). It has been well established that using such protocols reduces the time of mechanical ventilation, thereby having a positive affect on ventilator complications and ultimately reducing the length of stay.

Guidelines for Using ADULT Ventilator Protocols

I. Process for Ordering Adult Ventilator Protocols (AVP) for Intubated Patients

A. The use of AVP shall be initiated by physician order, written in the physician’s order sheet.
   1. Initial and subsequent ventilator parameters shall be documented on the bedside ventilator flow sheet.
   2. Ventilator parameters shall be documented on the bedside ventilator flow sheet at a minimum of every four hours.
   3. Any physician order not covered by the protocols should be written in the physician’s order sheet.
4. The attending physician may write, “discontinue AVP” at any time.

5. A patient that meets the AVP exclusion criteria shall not be managed using the protocol.

A. Exclusion from AVP includes the following criteria; these patients’s shall require direct physician management of the ventilatory parameters:

   1. Patient less than 16 years old.

   2. A written ventilator order from the primary or consulting physician that varies from AVP and does not permit adjustment of ventilator parameters based on AVP. In such a scenario, the physician will be contacted for clarification as to whether further ventilator adjustments shall be made based on AVP. The physician then has the choice to approve further use of AVP or to discontinue AVP.

II. Definition of Modes and Suggestions for Use of Modes

A. Definition - Mandatory Breath Modes

   1. Volume Ventilation (VV): a preset volume is delivered. VV is used in either assist/control AC or CMV), where every breath receives minimally the set volume; or Synchronized Intermittent Mandatory Ventilation (SIMV), where the minimum set volume is delivered at a rate based on the breath rate set for mandatory breaths.

   2. Pressure Ventilation (PV) or pressure control ventilation (PCV): a preset pressure is delivered. Used in either assist/control, where every breath receives a minimal the set pressure; or SIMV, where the minimum set pressure is delivered at a rate based on the breath rate set for mandatory breaths.

   3. Pressure Regulated Volume Control (PRVC) [Note, this acronym and nomenclature may change from one ventilator manufacturer to another.]: pressure ventilation is delivered such that the pressure is automatically adjusted by the ventilator to provide a set tidal volume. This mode is used in either assist/control, where every breath receives minimally the set volume; or SIMV, where the minimum set volume is delivered at a rate based on the breath rate set for mandatory breaths.

   4. Airway Pressure Release Ventilation (APRV) [Note, this acronym and nomenclature may change from one ventilator manufacturer to another]: pressure ventilation in which the following parameters are set: high pressure (P-high), low pressure (P-low) or low PEEP/CPAP), time during which high pressure is delivered (T-high), and time during which low pressure (T-low).

B. Definition - Support Breath Modes

   1. Pressure Support (PS): a patient-triggered, pressure targeted, flow-cycled mode. This can be a stand-alone breath in patients who have an intact respiratory drive, or it can be used in combination with mandatory breath.

   2. Volume Support (VS): a patient-triggered, pressure targeted, flow-cycled mode that guarantees a set volume delivery. This can be a stand-alone breath type in patients who have an intact respiratory drive, or it can be used in combination with mandatory breath types.
3. Spontaneous Mode/CPAP: Spontaneous breathing through the ventilator, which allows for monitoring patient data, alarms, and baseline adjustment to a CPAP and FiO2. This breath type provides only pressure or flow assist to the patient. It can be used alone in patients with adequate respiratory drive and ventilation capabilities or in combination with mandatory breath types.

III. Suggestions for Use of Modes

A. Establish the specific goal for using ventilation for each patient.

1. In the initial phase of acute respiratory failure, nearly total or even total ventilator support is recommended.

2. As the patient’s condition improves, other methods of ventilation such as support breath modes that allow some amount of spontaneous ventilatory activity can be used in lieu of total support.

B. Example Uses

1. VV using AC provides basic ventilatory needs and can ease the work of breathing in patients requiring large minute volumes such as a septic patient.

2. VV using SIMV allow the patient to control the volume of their non-mandatory breaths. In some cases this may ease the work of breathing, in others it may increase it. Increasing the work of breathing may be a desired or non-desired affect, depending upon the specific objective with a particular patient.

3. PC using AC (pressure-limited, time-cycled assist/control) may help to reduce the work of breathing in patients with a high work of breathing, compared to other modes. Since volume delivery varies, monitoring of tidal volume is important.

4. PS by itself may be effective in patients with an adequate respiratory drive who might tolerate ventilation support better with a patient controlled, variable I:E ratio.

5. Initial ventilator setting will generally be volume modes (AC, SIMV). For example, patient’s moving no minute volume or, conversely, patients demanding excessive minute volumes, AC might be more appropriate. For patients with an inadequate respiratory drive, needing from minimal to total support, SIMV might be more efficient. Generally, other modes such as Spontaneous, PRVC, APRV, PCV, PV, etc., modes should be reserved for management and weaning scenarios.
SECTION ONE - VENTILATOR SETUP

SCOPE
This policy incorporates, some degree, all members of the critical care team: physicians (MD), respiratory care practitioners (RCP, and registered nurses (RN).

POLICY
For this AVP – Setup Section the MD and/or RCP shall determine ventilator settings based upon each patient’s ideal body weight, physical condition and immediate clinical demands. Due to their intimate role with the patient, RNs shall be relied upon to provide clinical and observational data upon which such changes might be determined. The MD and/or RCP shall determine initial ventilator setting based upon the following criteria.

I. Initial Parameters and Goals

A. Volume Ventilation modes are generally used for the majority of patients, but Pressure Ventilation modes should be considered if peak pressures rise over 40 cm H2O, or if plateau pressures (Pplateau) rise > 30 cm H2O. The initial VV settings (SIMV or A/C) should be determined based upon the patient’s Ideal Body Weight (IBW), Body Surface Area (BSA) and immediate clinical needs.

B. Tidal Volume (VT) initial setting of 8 mL/Kg IBW while maintaining Pplateau < 30 cm H2O and delta P < 20 cm H2O. Necessary adjustments may range from 4 to 12 mL/Kg IBW to maintain the parameters of Pplateau < 30 cm H2O and delta P < 20 cm H2O. Consult physician if unable to maintain these parameters. Calculate IBW.

1. Males IBW (kg) = 50 + 2.3 [height (inches) - 60].
2. Females IBW (kg) = 45.5 + 2.3 [height (inches) -60].

C. Minute Ventilation (MV) based upon Body Surface Area (BSA) = VE (L/min), to be achieved while maintaining Pplateau < 30 cm H2O and delta P < 20 cm H2O.

1. Males = 4.0 x BSA = VE (L/min).
2. Female = 3.5 x BSA = VE (L/min).

3. Calculate BSA as follows: [(Height{in} x Weight{lbs}) / (3131)] x 0.5.

D. Rate (f): 8 to 26 breaths/minute adjusted to achieve I:E Ratio and maintain desired MV, while maintaining Pplateau < 30 cm H2O and delta P < 20 cm H2O.

E. FgO2: Initial setting of 0.6 to 1.0 (may be less 0.4 to 1.0 for post anesthesia recovery) until ABG results are obtained.

1. Initial ABG should be obtained 15 - 45 minutes from start of ventilation
2. Pulse Oximetry (SpO2), and End-Tidal CO2 (ETC02 optional), should be correlated with initial ABG.
a. Once ABGs are stabilized continue subsequent patient monitoring with continuous pulse oximetry to maintain SpO₂ desired Saturation for patient’s category as listed in table below.

b. Once ABGs are stabilized continue subsequent patient monitoring with ETCO₂ to maintain patient’s normal or within the normal ETCO₂ range.

5. PEEP: Set initial PEEP at 5 cm H₂O, unless otherwise indicated. Higher PEEP levels may be required with acute lung injury (ALI) or acute respiratory distress syndrome (ARDS). [Note: See ALI/ARDS Protocol].

F. Pressure Support (PS): Set initial PS at 8 to 20 cm H₂O, adjusted to reduce work of breathing, patient fatigue and still support effective ventilation.

G. I:E Ratio: Adjust to achieve an I:E ratio greater than 1:1 (example 1:3). The I:E ratio should be optimized to provide optimum mean airway pressure, lung filling, lung emptying (minimizing air-trapping/Auto-PEEP), and patient/ventilator synchrony.

II. Initial Ventilator and Patient Assessment

A. Initial ventilator and patient assessment will be performed within 15 - 45 minutes from setup.

B. Assessment will include evaluation of the patient’s general appearance, breath sounds, ventilating pressures and volumes, ETCO₂ SpO₂ (optional), SpO₂, ABGs, HR, BP, and other hemodynamic data (if available).

C. Adjust the ventilator settings to achieve and maintain acceptable ABG results for the following patient categories.

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>pH</th>
<th>PaCO₂</th>
<th>PaO₂</th>
<th>SpO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>7.35 - 7.45</td>
<td>35 - 45 mmHg</td>
<td>&gt; 80 mmHg</td>
<td>92-97%</td>
</tr>
<tr>
<td>Chronic CO₂ Retention</td>
<td>7.30 - 7.45</td>
<td>45 - 55 mmHg</td>
<td>55 - 75 mmHg</td>
<td>&gt; 89%</td>
</tr>
<tr>
<td>ALI/ARDS</td>
<td>7.25 - 7.45</td>
<td>Adjust to pH range</td>
<td>&gt; 60 mmHg</td>
<td>90-95%</td>
</tr>
</tbody>
</table>
SECTION TWO - VENTILATOR MANAGEMENT

SCOPE
This policy incorporates, some degree, all members of the critical care team: physicians (MD), respiratory care practitioners (RCP, and registered nurses (RN).

POLICY
The MD and/or RCP shall make subsequent ventilator adjustments attempting to achieve and maintain the following parameters. (Note: Regular assessments of general appearance, vital signs, BS and hemodynamic stability should be evaluated a minimum of every four hours as well as prior to and during any ventilator adjustments.)

A. Select the ventilation mode that best meets the ventilatory needs and goals set for the patient, as well as the patient’s general comfort.

B. For a pH < 7.30, evaluate to determine if the cause is respiratory.
   4. If appropriate, increase rate to a maximum of 26 breaths/min until pH is > 7.30.
   5. If further adjustment is needed, incrementally increase Vₜ until PIP = 40 cm H₂O or Pplateau = 30 cm H₂O.
   6. If adjustments are unable to achieve and maintain desired pH within the maximum parameters (PIP = 40 cm H₂O or Pplateau = 30 cm H₂O), consult physician and consider allowing permissive hypercapnia.

C. For a pH > 7.45, evaluate to determine if the cause is respiratory.
   1. If appropriate, reduce rate to a minimum of 8 breaths/minute or until pH is < 7.45.
   2. After rate is decreased to 8 breaths/minute, if pH is still > 7.45, reduce volume to a minimum of 4 mL/Kg IBW.

D. PaO₂ or SpO₂ should be maintained based on patient’s targeted values (see table).
   1. Hemoglobin should be checked to ensure the absence of anemia.
   2. Hemodynamic data should be checked to ensure adequate perfusion.
   3. Consult pulmonologist and consider the ARDS/ALI protocol if:
      a. If PaO₂/FiO₂ ratio is < 300 or
      b. Settings of F₁O₂ = 0.5 and PEEP = 12 cm H₂O are insufficient to maintain appropriate oxygenation.

E. Insert A-Line if patient requires, or is anticipated to require, more than one ABG per day.
F. Change from Heat Moisture Exchange (HME) unit to heated circuit within 48 to 72 hours on ventilator.
SECTION THREE - ARDS/ALI ventilator protocol

SCOPE
This ventilator protocol for Acute Respiratory Distress Syndrome (ARDS) and Acute Ling Injury (ALI) centers around tidal volumes based on the patient’s IBW, derived from the patient’s height.

EXCLUSION
This ventilator protocol is not appropriate for patients with raised intracranial pressure, spinal cord injury, tricyclic antidepressant overdose, Sickle cell disease, or other conditions where hypercapnoea would not be tolerated.

ARDS/ALI INCLUSION CRITERIA
I. Choosing to Initiate ARDS/ALI Protocol
   A. In the presence of the following criteria, the ARDS/ALI protocol is recommended.
      1. PaO2/FiO2 \( \leq 300 \).
      2. Bilateral (patchy, diffuse, or homogeneous) infiltrates consistent with pulmonary edema.
      3. No clinical evidence of left atrial hypertension.
   B. An arterial A-Line is strongly recommended due to the anticipation of multiple ABGs.

II. Moving from Standard AVP to ARDS/ALI Ventilator Management
   A. Select desired ventilator mode.
      1. Unless current \( V_T \) is lower the 8 ml/kg IBW, set \( V_T \) to = 8 ml/kg IBW.
      3. Reduce \( V_T \) by 1 ml/kg at intervals \( \leq 2 \) hours until \( V_T = 6 \)ml/kg IBW.
      4. With a maximum respiratory rate (f) 35, set rate to achieve the required baseline MV before initiating ARDS/ALI protocol.
         a. If f > 35 is required to achieve the desired MV, consult physician and consider permissive hypercarbia.
         b. To maintain a \( V_T > \) than 6 ml/kg the physician must write a medical order in the chart.
      5. Adjust \( V_T \) and f to achieve desired pH and plateau pressures.
      6. Set the airway pressure alarm at 35 cm H2O to limit the maximal airway pressure to 30 cm H2O.
      7. Ensure that Autoflow is turned on and turn Flow Trigger “On” set to 2 L/min.
8. Set Flow Rate (Inspiratory Time if applicable) to achieve an I:E ratio of 1:3 without setting off the pressure limit alarm.

   a. If pressure limit alarms, adjust Flow Rate (Inspiratory Time if applicable) to allow time for delivery of the set $V_T$ without exceeding the pressure limit (e.g. 1:2, 1:1.5, 1:1).

   c. If the I:E adjustment does not resolve the alarm reduce $V_T$ in increments of one ml/kg IBW. This may be repeated every few minutes to a minimal $V_T$ of 4 ml/kg IBW. Do not reduce $V_T$ below 4 ml/kg. If a $V_T$ of 4 ml/kg is necessary, notify the physician.

   d. If the patient’s requisite $V_T$ is less than 6 ml/kg IBW, regular attempts should be made to increase it in increments of 1 ml/kg IBW to achieve 6 ml/kg.

   e. If the patient is receiving 6 ml/kg IBW, attempts should be made to reduce the inspiratory time to give an I:E ratio of 1:3.

III. Oxygenation Goal: to keep $PaO_2$ 55 - 80 mmHg or $SpO_2$ 88 - 95%.

   A. Use a minimum PEEP of 5 cm H$_2$O.

   B. Consider the following incremental $F_iO_2$/PEEP combinations (not required) to achieve goal. Adjustment to oxygenation can be made on $SpO_2$ alone. It is not necessary to obtain ABGs to change $F_iO_2$. However, if a $PaO_2$ is available it shall supercede the $SpO_2$.

<table>
<thead>
<tr>
<th>Lower PEEP/higher $F_iO_2$</th>
</tr>
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<tbody>
<tr>
<td>$FiO_2$</td>
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<td>PEEP 5</td>
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IV. Plateau Pressure Goal: to keep Pplateau < 30 cm H$_2$O

   A. Check Pplateau (0.5 second inspiratory pause) at least q 4h and after each change in PEEP or $V_T$.

   B. Adjustments to achieve desired Pplateau.

      1. If Pplateau > 30 cm H$_2$O, decrease $V_T$ in 1 ml/kg increments to a minimum of 4 ml/kg.

      2. If Pplateau < 25 cm H$_2$O and $V_T$ < 6 ml/kg, increase $V_T$ by 1 ml/kg increments until Pplateau > 25 cm H$_2$O or $V_T$ = 6 ml/kg.

      3. If Pplateau < 30 and breath stacking or dys-synchrony occurs, consider increasing $V_T$ in 1 ml/kg increments to 7 or 8 ml/kg if Pplateau remains < 30 cm H$_2$O.

V. pH Goal: to keep pH 7.30 - 7.45

   A. Acidosis Management: (pH < 7.30).
1. If pH 7.15 - 7.30: increase f to achieve pH > 7.30 or PaCO2 < 25 (Maximum set f = 35).

2. If pH < 7.15: increase f to 35.

3. If pH remains < 7.15, VT may be increased in 1 ml/kg increments until pH > 7.15 (Pplateau target of 30 may be exceeded). Consider NaHCO3.

B. Alkalosis Management: (pH > 7.45).

1. Decrease vent rate if possible.

VI. I: E Ratio Goal: to achieve a duration of inspiration < duration of expiration.
SECTION FOUR - WEANING FROM THE MECHANICAL VENTILATION

SCOPE
All changes are designed to move the patient safely toward liberation from ventilatory support. Each patient is different and thus will respond differently. Some will be able to wean from the ventilator swiftly, while others may take days or weeks.

POLICY
Once the underlining medical condition that resulted in the need for ventilatory support is resolved, the patient should be considered for a reduction in ventilatory support with the goal of weaning from the ventilator. When the patient assessment indicates the possibility for partial support or even discontinued ventilatory support may be appropriate, initiate the following weaning protocol.

The MD and/or RCP shall make subsequent ventilator adjustments to achieve and maintain the following guidelines.

I. Weaning Assessment

A. Verify that underlying diseases process has been sufficiently resolved.

B. ABGs should show adequate ventilation and oxygenation for the patient’s category (see table).

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C. Bedside Pulmonary Function Studies should show:

1. \(V_T\) 5 mL/kg.
2. \(VC\) 10 ml/kg \((V_t \times 2)\).
3. \(f\) 8 - 30 breaths per minute.
4. \(VE\) 10 L/min.
5. \(NIF\) -20 cm H₂O.
6. \(RSBI\) < 100 \((f/ V_T \text{ in L})\).

D. Clinical Considerations:

1. HR & BP normal.
2. Adequate oxygenation \((\text{e.g. } \text{PaO}_2/\text{FiO}_2 > 150-200 \text{ with PEEP } 5-8 \text{ cm H}_2\text{O or } \text{SaO}_2 92\% \text{ on } 50\% \text{ F}_1\text{O}_2)\).
3. Evidence that the underlying cause of respiratory failure is resolving.

4. Temperature < 102.

5. Hemodynamic stability as defined by:
   a. The absence of hypertension beyond patient’s normal or Systolic BP > 180.
   b. The absence of hypotension Systolic < 90.
   c. The absence of active myocardial ischemia and the absence of clinically important hypotension (i.e. a condition requiring no vasopressor therapy; or minimally, a therapy of only low-dose vasopressors such as dopamine or dobutamine < 5 micro g/kg/min).

3. A-a DO₂ < 300 mmHg (utilization optional).

4. Qs/QT < 20% (utilization optional).

5. V₀/VT < 60% (utilization optional).

II. Spontaneous Breathing Trials (SBT)

A. SBT is accomplished utilizing unassisted breathing. Unassisted breathing (and therefore SBT) differs from the simple spontaneous breathing in that neither therapeutic levels of CPAP > 5 cm H₂O, nor PS levels > 5 cm H₂O are allowed.

   a. CPAP ≤ 5 cm H₂O merely emulates the natural physiologic PEEP provided by the epiglottis.
   b. PS ≤ 5 cm H₂O merely serves to overcome the restricted lumen of the endotracheal tube, thereby better emulating ambient pressure.

A. Criteria for SBT.

1. Ability to maintain SaO₂ 92% on F₁O₂ ≤ 0.4 and PEEP ≤ 8 cm H₂O.

2. Ability to maintain SaO₂ 92% with PEEP and F₁O₂ ≤ values of previous day.

3. Adequate spontaneous breathing efforts. If necessary, decrease set rate by 50% for 5 minutes to detect respiratory efforts.


B. Maintain the following Weaning Cycle Parameters during SBT and throughout all stages of the weaning cycle regardless of weaning mode. Failure to stay with in these parameters is considered failure and patient should be returned to support mode used prior to weaning attempt.

1. Vₜ 5 mL/kg.

2. f 8 - 35 breaths per minute.
3. $V_E$ 10 L/min.

4. RSBI $< 100$ (f/ $V_T$ in L).

6. BP Normal for patient.

8. Signs of respiratory distress (distress = 2 or more). Pay special attention to these outward physical sign that indicate inward changes.
   1. HR $> 120\%$ of resting AM baseline lasting $> 5$ minutes.
   2. Marked use of accessory muscles.
   3. Abdominal paradox.
   4. Diaphoresis and signs of anxiety.
   5. Marked complaints of dyspnea.
   6. F $> 35$.
   7. $\text{SpO}_2 < 88\%$.

B. Initializing SBT

1. Initial SBT from 1 to 5 minutes.
   a. Assess patient based upon the Weaning Cycle Parameters criteria (above).
   b. If SBT fails return patient to stable, non-fatiguing, comfortable ventilatory support as used prior to SBT. Let patient rest 24 hours before attempting SBT again. Repeated 1 to 5 minute SBT daily until patient is able to tolerate 5 minutes.
   c. Once patient tolerates 5 minute SBT, proceed to formal SBT lasting 30 to 120 minutes.

2. Initial SBT Settings:
   a. $F_{IO2}$ to 0.5.
   b. $PS \leq 5$ cm H$_2$O (if using Spontaneous Mode/CPAP).
   c. $\text{PEEP} \leq 5$ cm H$_2$O (if using Spontaneous Mode/CPAP).

3. Abortion of SBT:
   a. Abort SBT if Weaning Cycle Parameters (above) are not maintained.
   b. Return to previous ventilator settings and reassess the next morning.
c. Occasionally it may be appropriate to repeat the trial after an appropriate intervention such as suctioning, analgesia, or some other factor contributing to weaning failure.

4. Formal SBT last from 30 to 120 minutes.

   a. Abort SBT at any point during the following scenarios and return patient to a stable, non-fatiguing, comfortable ventilatory support as used prior to SBT. Let patient rest 24 hours before attempting SBT again.

      1. Abort SBT if Weaning Cycle Parameters (above) are not maintained.

      2. Abort SBT if there is any uncertainty as to the patient’s tolerance of the weaning procedure.

   1. If SBT is tolerated for 30 minutes assess patient to consider up to another 90 minutes of SBT, permanent ventilator discontinuation, or even extubation if applicable.

   2. Repeated formal SBT daily until patient is able to tolerate 120 minutes minutes, then assess patient to consider permanent ventilator discontinuation, or even extubation.

   3. When short-term ventilator patients (24 hours - such as post anesthesia, or an acute fluid overload) meet the weaning criteria and tolerate the SBT for 60 to 120 minutes, draw ABG and consult the physician to confirm or deny extubation.

C. Pressure Support (PS) Weaning Procedure

   For patients who consistently fail SBT due to various conditions such a lack of muscular strength, upper airway issues, or marginally pulmonary issues, weaning via PS may be an affective option.

   1. Initial PS weaning settings:

      a. Set PEEP 5 cm H\textsubscript{2}O and F\textsubscript{1}O\textsubscript{2} 0.5 as tolerated.

      b. Set initial PS based on f during CPAP trial.

         (1) If during CPAP trial f < 25 /min set PS 10 cm H\textsubscript{2}O.

         (2) If during CPAP trial f = 25-35 /min set PS 20 cm H\textsubscript{2}O.

   2. Subsequent PS adjustments are based upon f every 10 - 15min.

      a. If f > 25, increase PS by 2 to 5 cm H\textsubscript{2}O. Maximum pressure allowed PEEP + PS = 30 cm H\textsubscript{2}O.

      b. Set pressure airway alarm at 35 cm H\textsubscript{2}O.

      c. If f < 20 decrease PS by 2 - 5 cm H\textsubscript{2}O.
d. If $f > 35$ and/or $\text{PEEP} + \text{PS} > 30 \text{ cm H}_2\text{O}$ weaning has failed. Abort weaning attempt and return to settings prior to weaning trial.

e. Abort PS weaning attempt if Weaning Cycle Parameters (above) are not maintained. Attempt weaning again the next day.

3. Subsequent Oxygen and PEEP adjustments are based upon Oxygenation Goals outlined above.

a. If $\text{FIO}_2 > 0.5$ and PEEP $> 10 \text{ cm H}_2\text{O}$ are required while on PS ventilation, strong consideration should be given to reinitiating a volume mode.

b. Inform the medical staff.

D. Extubation should be considered if the following criteria are met.

1. PEEP $\leq 5 \text{ cm H}_2\text{O}$ and F$_{1O2} \leq 0.4$.

   a. $f < 30$.

   b. Oxygenation goals are met.

2. Proceed toward extubation at the patient’s pace as efficiently as possible. Premature extubation can endanger the patient and lead to the trauma of another intubation. At the same time an unnecessarily delayed extubation has troubles as well; increased risk of VAP, weakening diaphragm, patient aggravation, etc.

3. Extubation must be ordered by the presiding physician or the physician covering for the presiding physician.