UCH Mechanical Ventilation Protocol

1. This protocol allows a trained RT to make changes within the parameters stated in the protocol. Any deviation from the protocol requires a specific healthcare provider’s order.

2. Use the patient’s ideal body weight to set the patient’s tidal volume with the formula below: Ideal Body Weight (IBW): Male = 50 + 2.3 (height in inches - 60); Female = 45.5 + 2.3 (height in inches - 60) See the NIH predicted body weight/tidal volume chart

3. The following goals are targeted: Pulse Oximetry: SpO2: 88% - 95%; pulmonary arterial oxygenation: PaO2: 55 – 80 (PaO2 takes precedence); cost containment; Plateau Pressure (Pplat): less than or equal to 30 cmH2O.

4. Initial ventilator settings:
   a. Mode-volume control/volume targeted
   b. Vt – Set initial Vt to 6 ml/kg IBW. If airway pressure remains below the Positive End Expiratory Pressure (PEEP) level during inspiration or the ventilator delivers frequent (greater than or equal to 3/min) double breaths, because airway pressure falls below trigger threshold at the end of inspiration, increase Vt 1 ml/kg up to 8 ml/kg provided Pplat is less than or equal to 30 cmH2O.
   c. Pplat Goals - less than or equal to 30 cmH2O
   d. Rate – Set to the patient’s required minute volume (Ve). (Do not exceed a respiratory rate (RR) of 35 breaths per minute.)
   e. Inspiratory: Expiratory Ratio (I:E) – I time less than or equal to E time. Adjust per the patient’s requirements. Longer expiratory times are appropriate for obstructive lung diseases. Do not inverse I:E without a provider’s order.
   f. Fraction of Inspired Oxygen: FIO2/PEEP – Use a combination from the table below to maintain PaO2 55-80 or SpO2 88 – 95%. If the patient’s PEEP/FIO2 is not compatible with the scale, adjust FIO2 in increments of 0.10 and/or PEEP in increments of 2 until on scale.

5. Ventilator management
   a. Twice per shift and after each PEEP or VT change, measure and record SpO2 and Pplat. Use inspiratory pause to obtain Pplat.
   b. Adjust ventilator according to ‘ventilator goals’ highlighted in following point #6: Pplat, pH, and oxygenation.
   c. Evaluate for weaning as needed per Weaning Protocol.

6. Ventilator Goals
   a. The Pplat should be less than or equal to 30 cmH2O.
      i. If Pplat greater than 30:
         a) Decrease Vt 1 ml/kg every 2-3 hours, keeping pH greater than 7.15; Adjust RR to maximum of 35 to keep Ve constant and flowrate for I:E ratio of 1:1--1:3. Minimum Vt is 4 ml/kg IBW.
         b) Exceptions: If any of the following conditions occur, then decreases in Vt should not be made: 1.) RR = 35, pH less than 7.15 & bicarb infused or considered 2.) Vt = 4 ml/kg.
      ii. If Pplat is less than 30:
         c) Changes only need to be made if Vt is less than 6 ml/kg or Pplat is less than 25. Increase Vt 1 ml/kg IBW until Vt = 6 ml/kg or Pplat is greater than 25 cm H2O;
         d) Vt may be increased to 7 or 8 ml/kg if air trapping or dis-synchrony occurs if Pplat remains 30cm H2O or less.
   b. pH Goals are 7.30 – 7.45
      i. pH greater than 7.45 – decrease RR if possible
ii. pH = 7.30 – 7.45 – may maintain current settings

iii. pH = 7.15 – 7.30 – increase RR to maximum of 35
   a. Bicarbonate may be given, when ordered, if RR 35.

iv. pH less than 7.15 – increase RR to 35; If RR = 35 and bicarbonate was infused or considered, increase Vt 1 ml/kg IBW until pH is 7.15 or greater. (Pplat may exceed 30 cmH2O.)

   c. Oxygenation goals: Use FiO2 / low PEEP scale recommendations (below) to maintain PaO2: 55 - 80 (PaO2 takes precedence) or SpO2 88 – 95 %.

   d. If the patient's PEEP/FiO2 is not compatible with FiO2/PEEP scale, then adjust FiO2 in increments of 0.10 and/or PEEP in increments of 2 until on scale.

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<th>FiO2</th>
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<th>.80</th>
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   i. Exceptions to Oxygenation Scale
   a) Brief periods (5minutes or less) of SpO2 less than 88% or greater than 95% may be tolerated without making changes in PEEP or FiO2.
   b) FiO2 = 1.0 may be used for brief intervals (10 minutes or less) of transient desaturation or to prevent desaturation during treatments.
   c) Pplat greater than 30 AND oxygenation less than the goal (PaO2 less than 55 or SpO2 less than 88%) and Vt = 4 ml/kg IBW (or the minimum Vt necessary for pH control), do not increase PEEP. Increase FiO2 in increments of 0.1 until PaO2 is 55 or greater or SpO2 is 88% or greater or FiO2 = 1.0, increase PEEP in increments of 2 if necessary.
   d) If FiO2 = 1.0, PEEP = 24, and oxygenation is less than the goal, PEEP increase trial may be performed.

   e. PEEP Increase Trial (when PEEP is 24 cm H20 or greater)
   **Only done with MD orders**
   i. Increase PEEP in increments of 2 – 5, to a maximum of 34 or until PaO2 is 55 or greater or SpO2 is 88% or greater.
   ii. If PEEP increase is not effective within 4 hours (PaO2 increased by 5) then PEEP will be returned to 24 cm H20.

   f. High PEEP Scale – For patients that remain on FiO2 of 0.60 or greater with PEEP = 10 cmH2O for more than 4 hours, contact the provider for consideration of High PEEP Scale or other alternative modalities. Patients may be switched to High PEEP arm according to scale below with a corresponding order from the provider.

<table>
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<tr>
<th>FiO2</th>
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<th>.40</th>
<th>.40</th>
<th>.50</th>
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<th>.60-.80</th>
<th>.80</th>
<th>.90</th>
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<td>16</td>
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