



NIH NHLBI ARDS Clinical Network  
Mechanical Ventilation Protocol Summary

**INCLUSION CRITERIA: Acute onset of**

1.  $\text{PaO}_2/\text{FiO}_2 \leq 300$  (corrected for altitude)
2. Bilateral (patchy, diffuse, or homogeneous) infiltrates consistent with pulmonary edema
3. No clinical evidence of left atrial hypertension

**PART I: VENTILATOR SETUP AND ADJUSTMENT**

1. Calculate predicted body weight (PBW)  
**Males** =  $50 + 2.3 [\text{height (inches)} - 60]$   
**Females** =  $45.5 + 2.3 [\text{height (inches)} - 60]$
2. Select any ventilator mode
3. Set ventilator settings to achieve initial  $V_T = 8 \text{ ml/kg PBW}$
4. Reduce  $V_T$  by  $1 \text{ ml/kg}$  at intervals  $\leq 2$  hours until  $V_T = 6 \text{ ml/kg PBW}$ .
5. Set initial rate to approximate baseline minute ventilation (not  $> 35 \text{ bpm}$ ).
6. Adjust  $V_T$  and RR to achieve pH and plateau pressure goals below.

**OXYGENATION GOAL:  $\text{PaO}_2$  55-80 mmHg or  $\text{SpO}_2$  88-95%**

Use a minimum PEEP of 5 cm  $\text{H}_2\text{O}$ . Consider use of incremental  $\text{FiO}_2$ /PEEP combinations such as shown below (not required) to achieve goal.

**Lower PEEP/higher  $\text{FiO}_2$**

<b><math>\text{FiO}_2</math></b>	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
<b>PEEP</b>	5	5	8	8	10	10	10	12

<b><math>\text{FiO}_2</math></b>	0.7	0.8	0.9	0.9	0.9	1.0
<b>PEEP</b>	14	14	14	16	18	18-24

**Higher PEEP/lower  $\text{FiO}_2$**

<b><math>\text{FiO}_2</math></b>	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
<b>PEEP</b>	5	8	10	12	14	14	16	16

<b><math>\text{FiO}_2</math></b>	0.5	0.5-0.8	0.8	0.9	1.0	1.0
<b>PEEP</b>	18	20	22	22	22	24

**PLATEAU PRESSURE GOAL:  $\leq 30 \text{ cm H}_2\text{O}$**

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

**If Pplat  $> 30 \text{ cm H}_2\text{O}$ :** decrease  $V_T$  by  $1 \text{ ml/kg}$  steps (minimum =  $4 \text{ ml/kg}$ ).

**If Pplat  $< 25 \text{ cm H}_2\text{O}$  and  $V_T < 6 \text{ ml/kg}$ ,** increase  $V_T$  by  $1 \text{ ml/kg}$  until Pplat  $> 25 \text{ cm H}_2\text{O}$  or  $V_T = 6 \text{ ml/kg}$ .

**If Pplat  $< 30$  and breath stacking or dys-synchrony occurs:** may increase  $V_T$  in  $1 \text{ ml/kg}$  increments to  $7$  or  $8 \text{ ml/kg}$  if Pplat remains  $\leq 30 \text{ cm H}_2\text{O}$ .

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**pH GOAL: 7.30-7.45**

**Acidosis Management: (pH < 7.30)**

**If pH 7.15-7.30:** Increase RR until pH > 7.30 or PaCO<sub>2</sub> < 25  
(Maximum set RR = 35).

**If pH < 7.15:** Increase RR to 35.

If pH remains < 7.15, V<sub>T</sub> may be increased in 1 ml/kg steps until pH > 7.15 (P<sub>plat</sub> target of 30 may be exceeded).

May give NaHCO<sub>3</sub>

**Alkalosis Management: (pH > 7.45)** Decrease vent rate if possible.

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**I: E RATIO GOAL:** Recommend that duration of inspiration be ≤ duration of expiration.

## **PART II: WEANING**

**A. Conduct a SPONTANEOUS BREATHING TRIAL daily when:**

1. FiO<sub>2</sub> ≤ 0.40 and PEEP ≤ 8.
2. PEEP and FiO<sub>2</sub> ≤ values of previous day.
3. Patient has acceptable spontaneous breathing efforts. (May decrease vent rate by 50% for 5 minutes to detect effort.)
4. Systolic BP ≥ 90 mmHg without vasopressor support.
5. No neuromuscular blocking agents or blockade.

## **B. SPONTANEOUS BREATHING TRIAL (SBT):**

**If all above criteria are met and subject has been in the study for at least 12 hours, initiate a trial of UP TO 120 minutes of spontaneous breathing with FiO<sub>2</sub> ≤ 0.5 and PEEP ≤ 5:**

1. Place on T-piece, trach collar, or CPAP ≤ 5 cm H<sub>2</sub>O with PS ≤ 5
2. Assess for tolerance as below for up to two hours.
  - a. SpO<sub>2</sub> ≥ 90: and/or PaO<sub>2</sub> ≥ 60 mmHg
  - b. Spontaneous V<sub>T</sub> ≥ 4 ml/kg PBW
  - c. RR ≤ 35/min
  - d. pH ≥ 7.3
  - e. No respiratory distress (distress= 2 or more)
    - HR > 120% of baseline
    - Marked accessory muscle use
    - Abdominal paradox
    - Diaphoresis
    - Marked dyspnea
3. If tolerated for at least 30 minutes, consider extubation.
4. If not tolerated resume pre-weaning settings.

### **Definition of UNASSISTED BREATHING (Different from the spontaneous breathing criteria as PS is not allowed)**

1. Extubated with face mask, nasal prong oxygen, or room air, OR
2. T-tube breathing, OR
3. Tracheostomy mask breathing, OR
4. CPAP less than or equal to 5 cm H<sub>2</sub>O **without pressure support or IMV assistance.**