

	Department:  <b>Respiratory Services</b>	Date Originated: April 1990  Reviewed/Revised: <b>July 2011</b>
<b>CLINICAL GUIDELINE</b>	Topic: <u>Critical Care</u> – PEEP Titration in Mechanical Ventilation (Respiratory Therapy)  Number: B-00-12-12030	Related Links:

### APPLICABLE SITES:

St. Paul's Hospital – ICU / CICU  
 Mount Saint Joseph Hospital - ICU

### GENERAL INFORMATION:

The use of lung protective strategies during mechanical ventilation to minimize or prevent ventilator-induced lung injury includes the provision of positive end expiratory pressure, or PEEP. Numerous studies have demonstrated that PEEP can actively protect the lung by preventing the repetitive opening and closing of unstable lung units.

Unfortunately, there is no consensus on the best method to determine the setting of PEEP on individual patients. Although numerous strategies have been proposed, in the absence of any other compelling data, in our ICU we will utilize a PEEP/FiO<sub>2</sub> table **as a guide**. Although significant debate still exists about the management of PEEP using a protocolized, and not an individualized, approach, evidence suggests that this approach will work for most patients with acute lung injury/ARDS.

After considering which table to utilize for this approach, the decision has been made to go with the table from the Oscillate study (control arm), which was adapted from the LOVs study.

### PROTOCOL for SETTING PEEP in PATIENTS with ALI/ARDS:

**GOALS OF THERAPY:** Maintain plateau pressure less than 30 cmH<sub>2</sub>O & FiO<sub>2</sub> less than

**0.5, with FiO<sub>2</sub>/PEEP to maintain oxygen saturation greater than 92% (unless otherwise ordered), while minimizing side effects**

1. Set PEEP initially according to the following PEEP/FiO<sub>2</sub> table:

FiO <sub>2</sub>	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5 - 0.8	0.8	0.9	1.0	1.0
PEEP	5	8	10	10	12	14	16	18	18	20	22	22	22	24

**NOTE:** Use lower levels of PEEP than indicated by the table and/or use caution when increasing PEEP if the patient has any of the following factors present:

- Hemodynamic instability
- Severe bullous lung disease
- History of pneumothorax
- Chest tube in situ

2. If PEEP setting results in plateau pressure greater than 30 cmH<sub>2</sub>O, consider the following:

- Decrease tidal volume to 6 mL/kg ideal body weight (if not already done). If plateau pressure remains greater than 30 cmH<sub>2</sub>O, consult physician before decreasing tidal volume any further.
- Are there signs that the lungs are over inflated on the current PEEP setting, based on calculation of compliance before and after PEEP change and/or after reviewing the chest x-ray with the physician? If so, decrease PEEP by 2 cmH<sub>2</sub>O and reassess.
- Is there any indication that the patient may have decreased chest wall compliance (for example, if abdominal pressure is elevated), in which case plateau pressure may not be truly reflective of alveolar overdistention. Consult physician to consider assessment of chest wall/lung compliance using the esophageal balloon. (Refer to procedure [RTD5195 Esophageal Pressure Monitoring with the AVEA Ventilator](#)).

**NOTE:** If plateau pressure remains greater than 30 cmH<sub>2</sub>O, decrease PEEP until able to achieve plateau less than 30 cmH<sub>2</sub>O & report findings to physician. Consider whether the patient is a candidate for high frequency oscillation (requires a physician's order).

3. If PEEP setting results in FiO<sub>2</sub> greater than 0.5 and/or inability to maintain oxygen saturation greater than 92%, consider the following:

- Are there signs that the lungs are over inflated on the current PEEP setting, based on

calculation of compliance before and after PEEP change and/or after reviewing the chest x-ray with the physician? If so, decrease PEEP by 2 cmH<sub>2</sub>O and reassess.

- Are there signs that the lungs are under inflated on the current PEEP setting after reviewing the chest x-ray with physician for signs of collapse? If so, consider a recruitment maneuver followed by a PEEP increase of 2 cmH<sub>2</sub>O (consult physician for order for recruitment maneuver).  
(Refer also to procedure [B-00-12-12046](#)).
- Would patient be a candidate for high frequency oscillatory ventilation? Consult physician for order.
- Does the patient have signs of pulmonary hypertension - would the patient benefit from an inhaled pulmonary vasodilator? Consult physician for order.  
(Refer also to procedure [Inhaled Aerosolized Flolan Administration](#) or procedure [Nitric Oxide Administration Protocol](#)).

## COMMUNICATION:

ICU Resident should be notified when the FiO<sub>2</sub> is greater than 0.5 and/or the plateau pressure is greater than 30 cmH<sub>2</sub>O.

## DOCUMENTATION:

Ensure documentation of all changes in ventilator settings, patient vital signs/assessment, and rationale for parameter changes are documented on the Respiratory Services Flowsheet according to procedure [Ventilatory Monitoring Protocol](#).

## REFERENCES:

1. Caramenz MP, Kacmarek RM, Helmy M, et al. A comparison of methods to identify open-lung PEEP. *Intensive Care Med* 2009; 35: 740-7
2. The Oscillation for ARDS Treated Early (Oscillate) Trial Study Protocol. March 2009. The Canadian Critical Care Trials Group. ND Ferguson and MO Meade, Principal Investigators.
3. Suarez-Sipman F, Bohn SH, Tusma G, et al. Use of dynamic compliance for open lung positive end-expiratory pressure titration in an experimental study. *Crit Care Med* 2007; 35(1): 214-221.
4. Thille AW, Richard JCM, Maggiore SM, et al. Alveolar recruitment in pulmonary and extrapulmonary acute respiratory distress syndrome. *Anesthesiology* 2007; 106(2): 212-7.
5. Kallet RH, Branson, RD. Do the NIH ARDS clinical trial network PEEP/FiO<sub>2</sub> tables provide the best evidence-based guide to balancing PEEP and FiO<sub>2</sub> settings in adults? *Respiratory Care* 2007; 52(4): 461-475.

6. Acosta P, Santisbon MS, Varon J. The use of positive end-expiratory pressure in mechanical ventilation. *Crit Care Clinics* 2007; 23: 251-261.
7. Grasso S, Fanelli V, et al. Effects of high versus low positive end-expiratory pressures in acute respiratory distress syndrome. *Am J Respir Crit Care Med* 2005; 172: 1002-1008.
8. The Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *N Engl J Med* 2000; 342: 1301-08.