

### Initial Ventilator Settings in Acute Respiratory Failure

(*Note:* Most common initial mode of ventilation used in critical care for respiratory failure is AC with volume cycled breaths.)

**Tidal volume:** ( $V_T$ ): Usually set at 8-10 ml/kg of ideal body weight. The lower end of the range is typically used. For patients with acute lung injury, lower tidal volumes of 5-8 ml/kg of ideal body weight are used to prevent additional lung injury.

**Respiratory Rate:** Usually set at 12-16 breaths per minute.

**Fraction of Inspired Oxygen ( $FIO_2$ ):** Started at 1.0 or 100%. Wean as quickly as possible to 0.4 or 40%, while maintaining an oxygen saturation of 92-94%.

**PEEP:** Usually started at 5 cm of  $H_2O$ . PEEP is titrated up as needed to achieve adequate oxygenation. > 15 cm  $H_2O$  of PEEP is rarely used.

Other ventilator settings:

- ◆ Peak Flow (gas flow): Speed and method of  $V_T$  delivery, velocity of air flow in liters per minute.
- ◆ Sensitivity: Determines patient's effort to initiate an assisted breath.
- ◆ I:E ratio (inspiratory to expiratory ratio): Typically set at 1:2 (can be altered to facilitate gas exchange).

### Measured Parameters During Mechanical Ventilation

#### Peak Inspiratory Pressure (PIP) (Figure 3.12)

- ◆ Pressure needed to get air through airways and distend the lung.
- ◆ Accounts for both airway resistance (tubing and patient airways) and lung and chest wall compliance.
- ◆ Used to set high and low alarm limits.
  - ❖ High pressure limit is maximum pressure the ventilator can generate to deliver the preset tidal volume, usually 10-20 cm  $H_2O$  above the Peak Inspiratory Pressure.
- ◆ Peak Inspiratory Pressure is different from peak flow that is set on the ventilator.

### Linking Knowledge to Practice

- ✓ *A high peak inspiratory pressure can result from a problem with airway resistance caused by excessive secretions or bronchospasm, or can be caused by a decrease in lung compliance, such as in pulmonary fibrosis. Decreased lung compliance can also occur in acute conditions, such as pulmonary edema.*

#### Inspiratory Plateau Pressure (IPP) (Figure 3.12)

- ◆ The inspiratory plateau pressure is measured by holding inspiration after delivered tidal volume is complete. This measurement takes airway resistance out of the equation.
- ◆ The plateau pressure is reflective of the pressure in the alveoli at the end of inspiration. This is the pressure needed to keep alveoli distended (independent of resistance).
- ◆ The plateau pressure therefore reflects lung and chest wall compliance.
- ◆ Decreasing  $V_T$  is a strategy to lower plateau pressure. A lower  $V_T$  may cause an increase in  $PaCO_2$ . Permissive hypercapnea (acceptance of increased  $PaCO_2$ ) may be indicated in order to reduce the plateau (and peak) airway pressure and protect the lung. Permissive hypercapnea is contraindicated with increased intracranial pressure.