### Volume Control

**Controlled Variables:** Pinsp + PEEP, Flow, Trigger, Rate, Minute Ventilation, and Target VE.

**Initial Setting:**
- **Flow:** Set at most recent RR (do not exceed 60); if in sedated, set at pt’s most recent RR (do not exceed 35; target <30).
- **Pressure modes:** Set for controlled ventilation (Pressure mode, PC); if Flow mode, set pressure limit & alarm; breath stacking (i.e. next breath delivered before end of prior breath).
- **I:E:** Determined by set T & flow demand >  vent settings.
- **Trigger:** 2-5 Lpm for flow; -2 cmH O for pressure.
- **Rise time:** Determined by set T & flow demand >  vent settings.
- **Expiration time (~0.3s):** Can be built into each breath, will increase mean airway pressure; can measure Pplat.
- **Target VE:** At 6-8 mL/kg predicted body weight (PBW) if sedated; 4-5 mL/kg PBW if not sedated.

**Pros:**
- Avoids high PIP.
- Effectively modulates ventilation, can reduce barotrauma risk.
- Provides high flow to maintain constant airway pressure (if needed).
- Inspiration pause (~0.3s) can be built into each breath, will increase mean airway pressure; can measure Pplat.
- Allows high pressure to be set, does not mechanically unload alveoli; can occur simultaneously.
- Pressure rise time can be set at pt’s most recent RR (do not exceed 35; target <30).
- Respiratory rate (i.e. guaranteed VE)

**Cons:**
- Standard setting ~25%; ~40-50% if respiratory rate is <60.
- Requires high pressure source relative to the ventilator.
- Decreasing flow (Breath Shaping) will increase the risk of hypoxia and respiratory arrest.
- Upper flow limit is fixed; cannot be increased.
- Target VE: ~1.5-2.0L/min/kg (adults) or ~2.0-2.5L/min/kg (peds). Target V̇E <15 if in sedated; ~20 if not sedated.

### Pressure Support

**Controlled Variables:** Pinsp, Flow/Pressure, Target VE, Rate, Minute Ventilation, and T & I.

**Initial Setting:**
- **Flow:** Set at most recent RR (do not exceed 60); if in sedated, set at pt’s most recent RR (do not exceed 35).
- **Pressure modes:** Set for pressure-controlled ventilation (Pressure mode, PC); if Flow mode, set pressure limit & alarm; breath stacking (i.e. next breath delivered before end of prior breath).
- **I:E:** Determined by set T & flow demand >  vent settings.
- **Trigger:** 2-5 Lpm for flow; -2 cmH O for pressure.
- **Rise time:** Determined by set T & flow demand >  vent settings.
- **Expiration time (~0.3s):** Can be built into each breath, will increase mean airway pressure; can measure Pplat.
- **Target VE:** At 6-8 mL/kg predicted body weight (PBW) if sedated; 4-5 mL/kg PBW if not sedated.

**Pros:**
- Avoids high PIP.
- Provides high flow to maintain constant airway pressure (if needed).
- Inspiration pause (~0.3s) can be built into each breath, will increase mean airway pressure; can measure Pplat.
- Allows high pressure to be set, does not mechanically unload alveoli; can occur simultaneously.
- Pressure rise time can be set at pt’s most recent RR (do not exceed 35; target <30).
- Respiratory rate (i.e. guaranteed VE)

**Cons:**
- Standard setting ~25%; ~40-50% if respiratory rate is <60.
- Requires high pressure source relative to the ventilator.
- Decreasing flow (Breath Shaping) will increase the risk of hypoxia and respiratory arrest.
- Upper flow limit is fixed; cannot be increased.
- Target VE: ~1.5-2.0L/min/kg (adults) or ~2.0-2.5L/min/kg (peds). Target V̇E <15 if in sedated; ~20 if not sedated.

### Notes

- No patient trigger: Deliver flow only at set rate and time.
- Breath Termination: Time cycled (~1.5 s, set breath air volume).

### Respiratory Mechanics

- **Tidal Volume (VT):** The volume of air that is moved in and out of the lungs during a single breath.
- **Respiratory Rate (RR):** The number of breaths per minute.
- **Minute Ventilation (MV):** The product of VT and RR, measured in liters per minute (L/min).
- **Tidal Airway Occlusion Pressure (Paw):** The pressure recorded in the airway during inspiration.
- **Peak Airway Occlusion Pressure (Pp):** The highest pressure recorded in the airway during inspiration.
- **Inspiratory Pressure (PIP):** The pressure recorded in the airway during inspiration.
- **End Expiratory Pressure (PEEP):** The pressure recorded in the airway during expiration.
- **Mean Airway Pressure (Paw):** The average pressure recorded in the airway over a breath.
- **Inspiratory Time (ti):** The duration of inspiration.
- **Expiratory Time (te):** The duration of expiration.
- **Minute Ventilation (MV):** The product of VT and RR, measured in liters per minute (L/min).
- **Tidal Volume (VT):** The volume of air that is moved in and out of the lungs during a single breath.
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- **Inspiratory Time (ti):** The duration of inspiration.
- **Expiratory Time (te):** The duration of expiration.
**Ventilator Setup (prior to connecting patients)**

- **Respiratory Care, Setup, & Monitoring**
  - May be considered in severe ARDS if high PEEP and FiO2, especially if infection. Review for signs of ventilator malfunction, especially if new symptoms or 植入 device.
  - Ensure proper setup and rinse filters.
  - Minimize instrumental/filter deadspace (e.g., viral filters should be placed proximal to external intake filters) and ensure filters are cleaned at least monthly. For ventilators that allow, bacterial filters may be removed or replaced when damaged/soiled (may require special procedure). Consider O2 Heated & Humidified (HME) in some circumstances to avoid high levels of heat and moisture (HME). The manufacturer’s recommendations or if damaged/soiled (may require special procedure).

**Lung-Protective Ventilation (LPV)**

**Acute Respiratory Distress Syndrome (ARDS)**

**Ventilator Performance**

- **Planning Filters**
  - Prior to high flow (e.g., Epilize, Fiox, Respironics, etc.) to third flow or HME to third flow.
  - Reposition & secure endotracheal tube with ski hooks.

- **Respiratory Efficiency**
  - Airway pressure monitoring (APM) and permissive hypercapnia may be considered in ventilator- associated pneumonia (VAP) patients.
  - Monitor instrumental filtration efficiency.

- **Continuous pulse oximetry**
  - If unable then spot check as frequently as possible, especially after major ventilator settings changes.

- **Evaluate vent & patient within ~1h of ventilator settings changes** (ensure leak test included).

- **Tube & Circuit Setup (prior to connecting patients)**
  - Wipe down ventilator with approved disinfection qShift.
  - Fans (e.g., centrifugal, compressor ventilators, etc.) require inspection. Ensure the manufacturer’s recommendations or if damaged/soiled (may require special procedure).

- **Continuous pulse oximetry**
  - If unable then spot check as frequently as possible, especially after major ventilator settings changes.

- **Evaluate vent & patient within ~1h of ventilator settings changes** (ensure leak test included).

- **Organization of ventilator room**
  - Consider 'minimal occluding volume' in peds.

- **Setup**
  - Minimize instrumental/filter deadspace.

- **Filters**
  - In patient fearful should be addressed (e.g., endotracheal intubation, etc.)
  - Monitor instrumental filtration efficiency.

- **Heat & Humidification**
  - Active humidifier may be added at single rate (e.g., 50%–60% relative humidity), which may produce a desired water volume.