

Mechanical Ventilation Study Sheet

Modes of Ventilation

The mode refers to the way the patient receives breaths from the ventilator. Two common types are volume-cycled and pressure-cycled. When selecting a mode, consider which mode will provide for adequate gas exchange while synchronizing with the pt's own respiratory efforts, while also decreasing the potential for barotrauma (Black, pg 1641-1642).

Pressure-cycled ventilation:

- pressure is pre-selected
- delivers a volume of gas using positive pressure until the pressure level has been reached
- disadvantage: volume delivered may not be sufficient depending on lung compliance and integrity of the ventilatory circuit (kinked tubing would be a problem)

Volume-cycled ventilation

- delivers a preset tidal volume regardless of how much pressure is required
- TV is preselected based on pt weight
- pressure limit can be set to prevent dangerously high pressures

Continuous Mandatory Ventilation (CMV) (also known as assist control or "A/C")

- delivers a preset volume of gas each time the pt initiates a breath
- if pt fails to initiate within a specified time period, the vent delivers a breath

Synchronous Intermittent Mandatory Ventilation (SIMV)

- delivers the preset volume or pressure breath for ONLY those breaths that are ventilator initiated
- this mode is often used for weaning

Triggering Mechanisms

Triggering mechanisms can be based on time, negative pressure, flow or volume

- Time-triggered inhalation is used to manage pts who cannot breathe on their own. Vent triggers a breath after a preset time, serving as a back-up in case pt's breath falls below a preset value.
- Negative pressure inhalation is triggered by the initial negative pressure that begins inspiration. The pt initiates a breath and the vent is triggered to produce inhalation.
- Flow-triggered inhalation occurs when the pt CAN initiate a breath. The vent completes the breath by sensing the flow of air into the chest. This works well in combination with PEEP.
- Volume-triggered occurs when the vent completes the breath to maximize volumes.

Ventilator Settings

- Rate
 - the number of breaths the vent delivers per minute
 - typical setting is 6-20 breaths/min
- Tidal Volume (Vt)
 - volume of gas delivered to pt with each breath
 - 10-12 mL/kg or 6-8 mL/kg in acute lung injury
- FiO₂
 - may be set between 21% and 100%.
 - adjusted to maintain PaO₂ > 60 mmHg or SpO₂ > 90%
- PEEP (positive end expiratory pressure)

- used to apply positive pressure that keeps alveoli open and reduce shunting
- goal is that the FiO₂ be reduced to the lowest possible level to maintain gas exchange
- increased pressure increase FRC and enhances oxygenation as a result of greater surface area
- in normal conditions, 10 cm H₂O is needed to keep alveoli open
- high tidal volumes and continuous cyclic expansion/collapse of alveoli deplete surfactant and create the need for higher PEEP
- positive pressures of 10-25 cm H₂O are typical in adults (another source said 3-5?)
- Pressure Support (PS)
 - Positive pressure used to augment inspiratory efforts (reduces WOB)
 - 5-10 cm H₂O

Black, Joyce M., and Jane Hokanson Hawks. *Medical-Surgical Nursing: Clinical Management for Positive Outcomes - Single Volume (Medical Surgical Nursing- 1 Vol (Black/Luckmann))*. St. Louis: Saunders, 2009. Print.

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