

Modes of Mechanical Ventilation

- CMV modes include or Assist Control (AC) includes Pressure Controlled (PC), or Volume Controlled (VC) ventilation.
- Pressure controlled ventilation is when a patient has a pressure setting on the ventilator and when the ventilator cycles a breath the pressure will continue to rise on the ventilator until the pre-set pressure limit is reached.

Mechanical Ventilation

- When the pressure setting is reached the ventilator will then cycle off and the patient will then exhale.
- How much the patient's tidal volume is determined on how high the pressure limit is set.
- If the lungs are stiff or non-compliant the pressure will build more slowly and the inspiratory time will have to be adjusted to accommodate the need of the patient.

Mechanical Ventilation

- A longer inspiratory time will allow the patient to obtain a full tidal volume with each breath.
- If the lungs are very pliable such as a patient with COPD a shorter inspiratory time will be needed because the lungs will inflate very quickly.
- Inspiratory time on the ventilator is a critical factor when using pressure control ventilation.

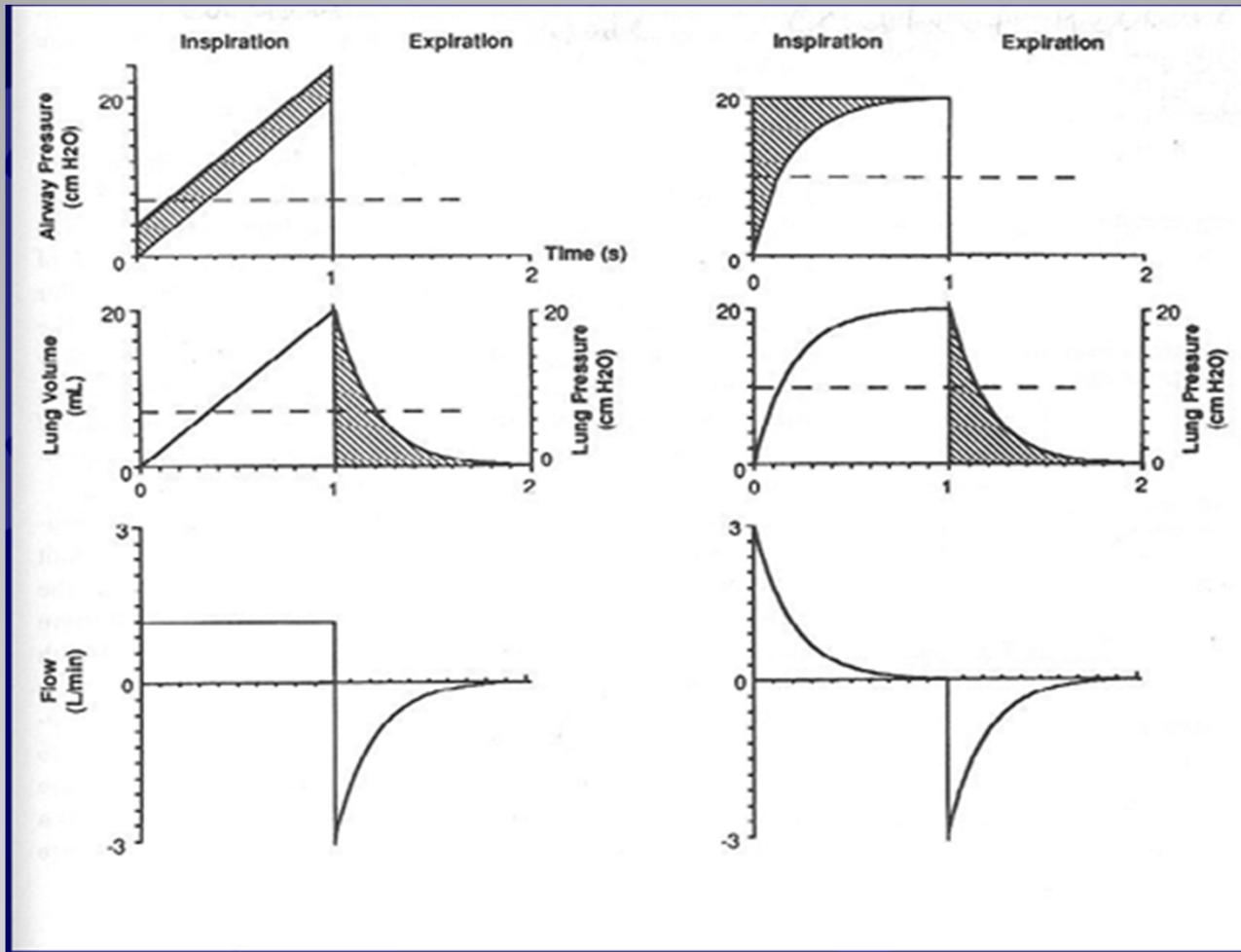
Mechanical Ventilation

- Although inspiratory time can be controlled with its own setting on the vent most of time it is determined by the dialed in rate set on the ventilator.
- Usually the inspiratory/expiratory ratio for ventilator patients is 1:2. A patient with a rate of 10 breaths per minute would be allowed 6 seconds for a cycled breath which would contain 2 seconds for inspiration and 4 seconds for expiration.

Mechanical Ventilation

- Volume Controlled ventilation is exactly as it sounds. A pre-determined volume is dialed in and every time the ventilator cycles on the patient receives that tidal volume.
- Inspiratory time is also a factor with volume control but not as critical when using pressure control.

Mechanical Ventilation



Pressure vs. Volume

- These modes are classified as control modes because they do 100% of the work for the patients while on the ventilator.
- These modes are the most efficient for the patient in complete respiratory failure.

Mechanical Ventilation

- Triggering a breath in AC can be achieved by
 - Pressure trigger
 - Pressure triggering for the patient is achieved by either **flow** or **negative pressure** against the endotracheal tube to initiate the breath supplied by the machine.
 - Timed trigger
 - The breath is given at a set time according to what the rate of the machine is, such as a rate of 10 breaths a minute means every 6 seconds a breath is initiated by the machine.

Mechanical Ventilation

- Patients that are sedated, paralyzed or need to rest will need to be in this mode for proper ventilation.
- This mode allows the patient's breathing to be "controlled".
- If the patient begins to actively participate in breathing this mode will become less effective and could lead to the patient over breathing.

Mechanical Ventilation

- AC mode will give the full tidal volume of the breath every time it is triggered. If the tidal volume is set for 500 ml for each breath the waking patient will get 500 ml of air with each triggered breath
- This can lead to “air trapping”. Air trapping results when the lungs can not fully expel the air before another breath is initiated.

Mechanical Ventilation

- If the patient's rate increases from 10 to 15 breaths per minute due to possible poor sedation the patient has drastically changed his I:E ratio which will accommodate air trapping.
- If the patient is waking up then the mode of ventilation should change from assist control to SIMV.

Mechanical Ventilation

- SIMV (Synchronized Intermittent Mandatory Ventilation) is the most common mode of ventilation used for conscious patients who don't require 100% of the work being done for them.
- This mode allow the patient to breath on their own between the set rate of breaths given by the machine

Mechanical Ventilation

- If the patient has a ventilator rate of 10 breaths a minute and the patient is able to spontaneously breath on his own he can take small breaths between the cycles of the ventilator.
- The machine will sense the patient's effort and will time the next breath around the patient's effort thus preventing air trapping.

Mechanical Ventilation

- The patient is not forced a pre-set tidal volume and can have a small one of it's own.
- This can also decrease the anxiety of the patient by not forcing a full breath on him each time he tries to breathe on his own.
- If a patient is successful in the SIMV mode he may then be placed on CPAP.

Mechanical Ventilation

- CPAP (Continuous Positive Airway Pressure) this mode of ventilation uses pressure support and peep to allow the patient to spontaneously breathe on his own without any mechanical breaths being given.
- If a patient in this mode can maintain his own respiratory effort without excess work, if the ABG's are good, and the patient has good respiratory mechanics then extubation is at hand.

Mechanical Ventilation

- <http://www.nhlbi.nih.gov/health/health-topics/topics/cpap/>
- <http://www.mmcwm.com/BiPAP>
- wwwappskc.lonestar.edu/programs/respcare/modes.ppt

References