

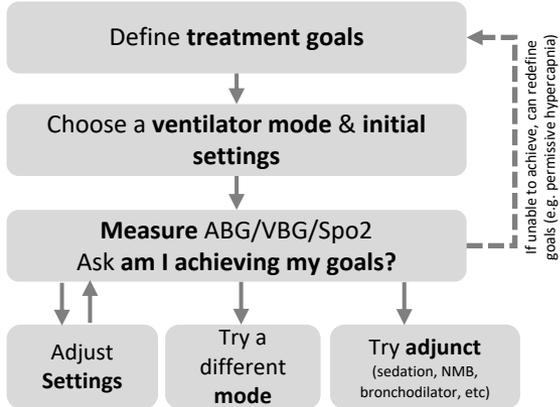
# OVERVIEW OF VENTILATOR MODES by Nick Mark MD



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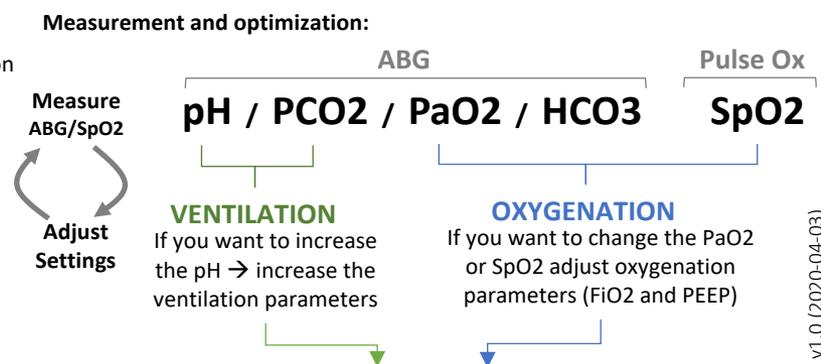


- Goals for mechanical ventilation:**
- Oxygenation** – support PaO<sub>2</sub>/SpO<sub>2</sub>
  - Ventilation** – maintain pH
  - Patient comfort** – vent synchrony, ↓ sedation
  - Facilitate weaning** – minimize muscle loss, promote readiness to wean from support

**Ventilator Modes:**  
Fall into two broad categories: **pressure** and **volume** modes. Each mode has three features:

- Trigger (T) – what initiates a breath?
- Cycle (C) – what ends a breath?
- Limit (L) – what stops a breath early?

Each mode has **Pros** and **Cons** to consider.



Mode	Description	Pros	Cons	Major settings / example	Monitor
<b>VC</b> Volume Control <small>(a.k.a. assist control volume)</small>	Every breath delivered (mandatory and patient triggered) is the same set <b>volume (TV)</b>  T – time/pressure/flow, C – volume, L – volume	Good general-purpose mode; Ensures a minimum MV is achieved. Good mode for lung protective ventilation ( <a href="#">LPV</a> )	Requires you to monitor pressures to avoid barotrauma. (See my <a href="#">OnePager</a> on ARDS for details.)	<b>RR, TV, PEEP, FIO<sub>2</sub></b>  12 bpm, 450cc, +8, 60% <small>(RR – respiratory rate, TV – tidal volume)</small>	Pressures (Ppeak, Pplat)
<b>PC</b> Pressure Control <small>(a.k.a. assist control pressure)</small>	Every breath delivered (mandatory & patient triggered) is a set <b>pressure (IP)</b> for a <b>set time (T<sub>i</sub>)</b>  T - time/pressure/flow, C – time, L - pressure	Good for limiting pressure; may be more comfortable for select patients. Also can be used for LPV (no difference in <a href="#">mortality</a> )	Requires you to monitor volumes to avoid volutrauma or hypoventilation	<b>RR, IP, T<sub>i</sub>, Risetime, PEEP, FIO<sub>2</sub></b>  12 bpm, 25 cmH <sub>2</sub> O, 0.9 sec, 0.15 sec, +8, 60% <small>(IP – inspiratory pressure, T<sub>i</sub> – inspiratory time)</small>	Volumes (TV, MV)
<b>PRVC</b> Pressure Regulated Volume Control <small>(a.k.a. VC+, APV, Autoflow)</small>	<b>Hybrid</b> PC mode that dynamically changes inspiratory pressure to deliver a desired volume  T - time/pressure/flow, C – volume, L - volume	Guarantees TV but delivers pressure-controlled breaths; (e.g. low risk of causing VILI), which potentially may be more comfortable for patients	In patients who are struggling (e.g. high WOB) this mode will provide <b>less</b> support	<b>RR, TV, T<sub>i</sub>, Risetime, P<sub>max</sub>, PEEP, FIO<sub>2</sub></b>  12 bpm, 450cc, 0.9 sec, 0.15 sec, 30 cmH <sub>2</sub> O, +8,60% <small>(P<sub>max</sub> – maximum pressure)</small>	Pressures & volumes
<b>SIMV</b> Synchronous Intermittent Mandatory Ventilation	Delivers mandatory breaths with a fixed volume but patient <b>can't</b> trigger (patient breaths are not the same as mandatory breaths); can use PS  T – time , C – volume, L - volume	May be useful for patients with hiccups to avoid alkalemia	Seldom used; not effective for weaning; often found to be uncomfortable	<b>RR, TV, PEEP, FIO<sub>2</sub></b>  12 bpm, 450 cc, +8, 60%	Pressure (Ppeak, Pplat)
<b>PS</b> Pressure Support	<b>All</b> breaths are patient initiated; ventilation determined solely by patient (no backup rate).  T – pressure/flow, C – flow, L - pressure	<b>Ideal weaning mode</b> (used in SBTs and for prolonged periods); <b>most comfortable</b> because it allows patient to control ventilation	Does not guarantee a rate; need to monitor to ensure adequate ventilation	<b>PS, PEEP, FiO<sub>2</sub></b>  +10, +5, 40% <small>Note that <b>PS</b> is above <b>PEEP</b> so "Ten over Five" PIP = 15cmH<sub>2</sub>O</small>	Volumes (TV, MV)
<b>APRV</b> Airway Pressure Release Ventilation <small>(a.k.a. Bi-Vent)</small>	<b>Inverse ratio ventilation</b> (e.g. I time > E time) that allows patient to breath spontaneously; can combine w/ PS  T – time, C – time, L - pressure	Great for ARDS patients who are spontaneously breathing (e.g. not on NMB); <b>may improve comfort &amp; oxygenation</b> (but <b>no mortality benefit</b> )	Complex mode/settings; Risk of VILI if settings are done improperly; doesn't make sense if on NMB	<b>T<sub>High</sub>, T<sub>Low</sub>, P<sub>high</sub>, P<sub>low</sub>, FIO<sub>2</sub></b>  5.5 sec, 0.5 sec, 25 cmH <sub>2</sub> O, 0 cmH <sub>2</sub> O, 60% <small>(T<sub>High/Low</sub> – time high/low, P<sub>High/Low</sub> – pressure high/low, also note that <b>Plow</b> is analogous to <b>PEEP</b>)</small>	Volumes & gas exchange PCO <sub>2</sub> / EtCO <sub>2</sub>