OVERVIEW OF VENTILATOR MODES by Nick Mark MD

Goals for mechanical ventilation:
1. **Oxygenation** – support PaO2/SpO2
2. **Ventilation** – maintain pH
3. **Patient comfort** – vent synchrony, ↓ sedation
4. **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**
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**VC**
Volume Control (a.k.a. assist control volume) | Every breath delivered (mandatory and patient triggered) is the same set volume (TV) | Good general-purpose mode; Ensures a minimum MV is achieved. Good mode for lung protective ventilation (LPV) | Requires you to monitor pressures to avoid barotrauma. (See my OnePager on ARDS for details.) | RR, TV, PEEP, FIO2 | Pressures (Ppaw, Pplat)
| T – time/pressure/flow, C – volume, L – volume | | | | |
**PC**
Pressure Control (a.k.a. assist control pressure) | Every breath delivered (mandatory & patient triggered) is a set pressure (IP) for a set time (T) | Good for limiting pressure; may be more comfortable for select patients. Also can be used for LPV (no difference in mortality) | Requires you to monitor volumes to avoid volutrauma or hypoventilation | RR, IP, T, Risetime, PEEP, FIO2 | Volumes (TV, MV)
| T – time/pressure/flow, C – time, L – pressure | | | | |
**PRVC**
Pressure Regulated Volume Control (a.k.a. VC+, APV, AutoFlow) | Hybrid PC mode that dynamically changes inspiratory pressure to deliver a desired 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 less support | RR, TV, T, Risetime, P_max PEEP, FIO2 | Pressures & volumes
| T – time/pressure/flow, C – volume, L – volume | | | | |
**SIMV**
Synchronous Intermittent Mandatory Ventilation | Delivers mandatory breaths with a fixed volume but patient can’t trigger (patient breaths are not the same as mandatory breaths); can use PS | May be useful for patients with hiccups to avoid alkalemia | Seldom used; not effective for weaning; often found to be uncomfortable | RR, TV, PEEP, FIO2 | Pressure (Ppaw, Pplat)
| T – time, C – volume, L – volume | | | | |
**PS**
Pressure Support | All breaths are patient initiated; ventilation determined solely by patient (no backup rate). | Ideal weaning mode (used in SBTs and for prolonged periods); most comfortable because it allows patient to control ventilation | Does not guarantee a rate; need to monitor to ensure adequate ventilation | PS, PEEP, FIO2 | Volumes (TV, MV)
| T – pressure/flow, C – flow, L – pressure | | | | |
**APRV**
Airway Pressure Release Ventilation (a.k.a. Bi-Vent) | Inverse ratio ventilation (e.g. I time > E time) that allows patient to breathe spontaneously; can combine w/ PS | Great for ARDS patients who are spontaneously breathing (e.g. not on NMB); may improve comfort & oxygenation (but no mortality benefit) | Complex mode/settings; Risk of VILI if settings are done improperly; doesn’t make sense if on NMB | T_{High}, T_{Low}, P_{High}, P_{Low}, FIO2 | Volumes & gas exchange PCO2 / EtCO2
| T – time, C – time, L – pressure | | | | |

**Measurement and optimization:**

- **ABG**
  - **pH / PCO2 / PaO2 / HCO3**
  - Measure ABG/SpO2
  - Adjust Settings
- **Pulse Ox**
  - **SpO2**
  - If you want to increase the pH → increase the ventilation parameters
  - If you want to change the PaO2 or SpO2 adjust oxygenation parameters (FIO2 and PEEP)