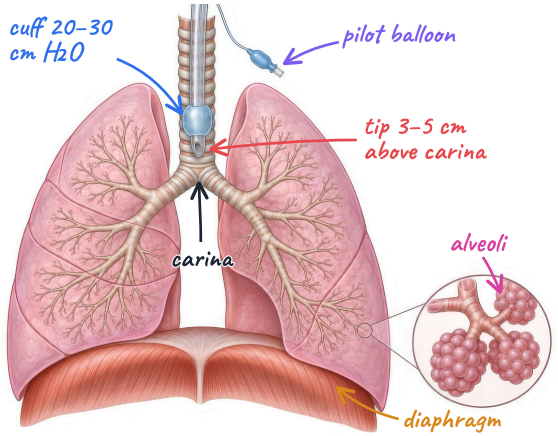
ER BASICS · ONE-PAGER

# Ventilator Modes and Settings

Modes, lung-protective targets, peak vs plateau, alarms and SBT readiness

24 sources + more detail
erbasics.com/sheets/vent-modes.html
checked Nov 2026

## AIRWAY The tube in place




## 1 Modes: what you set vs what varies

Typical adult values for exam study, not a bedside tool; follow your institution's protocols. PEEP and $FiO_2$ are set in every mode.

| MODE | YOU SET | VARIES | KNOW |
|---|---|---|---|
| **AC/VC** | Vt, rate, flow | Pressure | Full Vt every breath |
| **AC/PC** | Pressure, insp time, rate | Vt | Vt falls as lungs stiffen |
| **PRVC** | Target Vt, rate | Pressure | Adjusts pressure to hit set Vt |
| **SIMV** | Rate, Vt or pressure | Vt of extra breaths | Weans slower than SBTs |
| **PSV** | PS level | Vt, rate, insp time | Patient-triggered; no set rate |
| **CPAP** | One pressure | Vt, rate | No inspiratory boost; SBTs |
| **APRV** | P-high, P-low, T-high, T-low | Vt | Refractory hypoxemia; traps air in COPD |
| **BiPAP (NIV)** | IPAP, EPAP by mask | Vt | COPD flare, cardiogenic edema |

- BiPAP: IPAP – EPAP = pressure support; widen the gap to blow off $CO_2$
- For oxygenation, raise EPAP (acts like PEEP) and IPAP together to keep support
- COPD flare with pH ≤7.35 and $PaCO_2$ >45: bilevel NIV (ERS/ATS)

EXAM TIP Exams swap these: stiff lungs raise pressure in volume modes (high-pressure alarm) but drop Vt in pressure modes (low-volume alarm).

SAFETY NIV needs an awake patient who protects the airway. Obtunded, heavy secretions or unstable BP: plan to intubate instead. Vomiting or ileus: no sealed mask.

## 2 Lung-protective settings and ABG fixes

| TO FIX | CHANGE |
|---|---|
| **$PaCO_2$ and pH** | Rate or Vt (minute ventilation = RR × Vt) |
| **$PaO_2$ or $SpO_2$** | $FiO_2$ or PEEP |

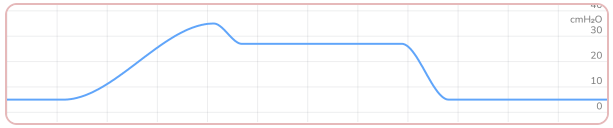
- Vt 4–8 mL/kg predicted body weight (PBW); ARDS target 6
- PBW: men 50 kg, women 45.5 kg, + 2.3 kg per inch over 5 feet
- Plateau ≤30 cm $H_2O$ on a 0.5-second inspiratory hold
- Driving pressure = plateau – PEEP; aim under about 15 (observational data)
- Paired PEEP/$FiO_2$ steps to $SpO_2$ 88–95% or $PaO_2$ 55–80
- ARDS by P/F: mild 201–300, moderate 101–200, severe ≤100
- Moderate–severe: higher PEEP, no prolonged recruitment maneuvers; prone over 12 h/day if P/F stays <150 (PROSEVA used ≥16 h)

Example: a 70-inch man's PBW is 73 kg whatever he weighs, so 6 mL/kg ≈ 440 mL. SSC 2026 (sepsis): 6 mL/kg with ARDS, 6–8 without.

Permissive hypercapnia (ARDSNet): pH goal 7.30–7.45; raise the rate first (max 35).

## 3 Peak vs plateau

Read these on volume breaths. In pressure modes peak is set, so watch exhaled Vt instead.




Inspiratory hold: peak 35, plateau 27, PEEP 5 cm $H_2O$. Plateau is under 30, yet driving pressure (27 – 5 = 22) is above 15.

| PATTERN | MEANS | THINK |
|---|---|---|
| **High peak, normal plateau** | ↑ Airway resistance | Secretions, biting, kink, bronchospasm |
| **High peak and high plateau** | ↓ Compliance | ARDS, edema, pneumothorax, mainstem tube, tense abdomen |
| **Low peak** | Leak or disconnect | Circuit off, cuff leak, tube out |

EXAM TIP Peak – plateau = resistive pressure (over about 10 cm $H_2O$ is high). Suction, bite block or bronchodilator fixes resistance; poor compliance needs a cause hunt.

## 4 Auto-PEEP (air trapping)

- Next breath starts before exhalation ends; air stacks up
- Clue: expiratory flow does not return to zero
- Measure: end-expiratory hold; total PEEP – set PEEP = auto-PEEP
- Risks: hypotension, barotrauma, missed triggers
- At risk: asthma, COPD, high rate or minute ventilation
- Fix: longer exhale (lower rate, shorter inspiration, smaller Vt); treat bronchospasm

SAFETY Air trapping with severe hypotension or PEA: briefly disconnect the ventilator to let air out, then resume at a lower rate.

## 5 Alarms and sudden distress: DOPE

- Displacement: tube depth, capnography, breath sounds
- Obstruction: kink, biting, mucus plug; pass a suction catheter
- Pneumothorax: one-sided breath sounds, rising pressures, falling BP
- Equipment: disconnection, leak, $O_2$ supply, ventilator failure

SAFETY Distress with no obvious cause: disconnect and bag with 100% $O_2$ while you work through DOPE. Check the patient before silencing alarms.

## 6 Ready to wean? Spontaneous breathing trial

Screen daily, paired with a sedation awakening trial.

- Cause improving; triggers own breaths; no paralytic
- $FiO_2$ ≤0.40 and PEEP ≤8; SBP ≥90 off vasopressors (ARDSNet)
- Trial 30–120 min on PS 5–8 cm $H_2O$, CPAP or T-piece; don't raise $FiO_2$
- Stop for RR >35, $SpO_2$ <90%, pH <7.30, Vt <4 mL/kg, or 2+ distress signs: HR >120% of baseline, accessory muscles, paradox, sweating, marked dyspnea
- High failure risk (older, COPD, heart failure, $CO_2$ rise on SBT): extubate to preventive NIV
- Stridor risk: cuff leak test; no leak → steroids ≥4 h before extubation

EXAM TIP RSBI = RR ÷ Vt in liters; under 105 favors success. Still tested, though AARC 2024 says it isn't needed before an SBT.

## MORE Respiratory mechanics: the equation of motion

Every ventilator breath obeys one equation: airway pressure = (Vt ÷ compliance) + (flow × resistance) + total PEEP. The terms are the elastic load (lungs and chest wall), the resistive load (tube and airways) and end-expiratory pressure. A breathing patient's own muscle pressure adds to the ventilator's, so pressures and volumes vary breath to breath.



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