Ventilator Modes and Settings

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

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, unstable BP or ileus: plan to intubate instead.

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

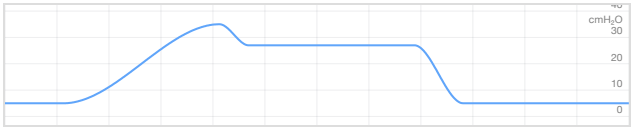
- Vt 4–8 mL/kg predicted body weight (PBW); ARDS target 6
- PBW: men 50 kg, women 45.5 kg, + 2.3 kg per inch over 5 feet
- Plateau ≤30 cm H_2O on a 0.5-second inspiratory hold
- Driving pressure = plateau – PEEP; aim under about 15 (observational data)
- Paired PEEP/FiO_2 steps to SpO_2 88–95% or PaO_2 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).

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.

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.

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.

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.

Sources (19) are listed with links at icubasics.com/sheets/vent-modes.html. For education and exam preparation only. Not medical advice; follow current guidelines and your institution's protocols. ICU Basics is an independent study aid not affiliated with any certifying body.