MECHANICAL VENTILATION

Modes · Initial Settings · Alarms & Troubleshooting

BAG IF
in doubt

HOW A BREATH WORKS

BREATH PHASES

Each breath: a trigger (start), limit (target) and cycle (end).

VOLUME vs PRESSURE

VC: set VT, pressure varies. PC: set pressure, VT varies.

MINUTE VENTILATION

VT × RR clears CO_2 (ventilation).

FiO_2 + PEEP

Mean airway pressure drives O_2 (oxygenation).

COMMON MODES

Mode	How it works	Typical use
A/C (volume or pressure)	Every triggered breath fully supported	Initial mode; full rest
SIMV	Set mandatory breaths + patient's own (± PS)	Largely superseded
PSV (pressure support)	Patient triggers all; you set PS + PEEP	Weaning / spontaneous trial

INITIAL SETTINGS

typical adult, non-ARDS

MODE	TIDAL VOL	RATE	FiO_2	PEEP	I : E
A/C	**6-8**	**12-16**	**100%**	**5**	**1 : 2**
volume	*mL/kg PBW*	*/min*	*→ SpO_2 92-96*	*cmH_2O*	*flow 60 L/min*

PEAK vs PLATEAU

keep plateau ≤ 30 cmH_2O

Pattern	Problem	Do
PIP high · Pplat NORMAL	Airway RESISTANCE: secretions, bronchospasm, kinked / bitten tube, plug	Suction, bronchodilate, unkink
PIP high · Pplat HIGH	Lung COMPLIANCE: pneumothorax, oedema, ARDS, main-stem, abdo distension, auto-PEEP	Treat cause; check tube depth

Auto-PEEP (breath stacking): check with an expiratory hold; suspect in COPD / asthma / high RR. Disconnect to let the patient exhale if hypotensive.

OBSTRUCTIVE (asthma / COPD): low RR 8-10, VT 6 mL/kg, high flow / short Ti for a long expiratory time, permissive hypercapnia, minimal PEEP. Sudden hypotension → disconnect for auto-PEEP.

SUDDEN DETERIORATION

DOPES

Patient unstable? Disconnect and BAG with 100% O_2 first.

- **D** Displacement of the ETT (too deep, out, oesophageal)
- **O** Obstruction: secretions, kink, biting, mucous plug
- **P** Pneumothorax
- **E** Equipment failure (circuit, O_2 supply, ventilator)
- **S** Stacking of breaths / auto-PEEP

THE LEVERS

Raise PaO_2 / SpO_2
↑ FiO_2 and / or PEEP
Lower $PaCO_2$
↑ minute vent (RR or VT)
Raise $PaCO_2$
↓ RR or VT
Watch
↑ RR can cause auto-PEEP

PEARLS & PITFALLS

- When in doubt, take the patient OFF the vent and bag - it separates patient problems from machine problems.
- Always dose tidal volume on PREDICTED (height-based) body weight, not actual.
- Auto-PEEP is an under-recognised cause of hypotension / PEA in obstruction - disconnect to let them exhale.
- Rising peak with a stable plateau is airway resistance (suction / bronchodilate), not lung stiffness.

References: ARDSNet 2000 · PADIS 2018 · ATS/ACCP Ventilator Liberation 2017 · critical-care references.