

RESPIRATORY • CRITICAL CARE • PHARM/SAFETY

# Ventilator Settings

Mechanical ventilation modes, parameters, alarms, VAP prevention, and emergency response — built for NGN clinical judgment items and the 2026 NCLEX test plan.

**SOURCE TRANSPARENCY:** This topic was not present in Diane's uploaded reference notes for this project. Content compiled from Saunders Comprehensive Review for the NCLEX-RN (2026), ATI Adult Medical-Surgical Nursing: Critical Care, AACN Procedure Manual for High Acuity, Progressive, and Critical Care, the IHI Ventilator Bundle, and ARDSNet lung-protective ventilation guidelines. Cross-referenced with current 2025–2026 evidence-based practice standards.

## 1 Definition & Overview

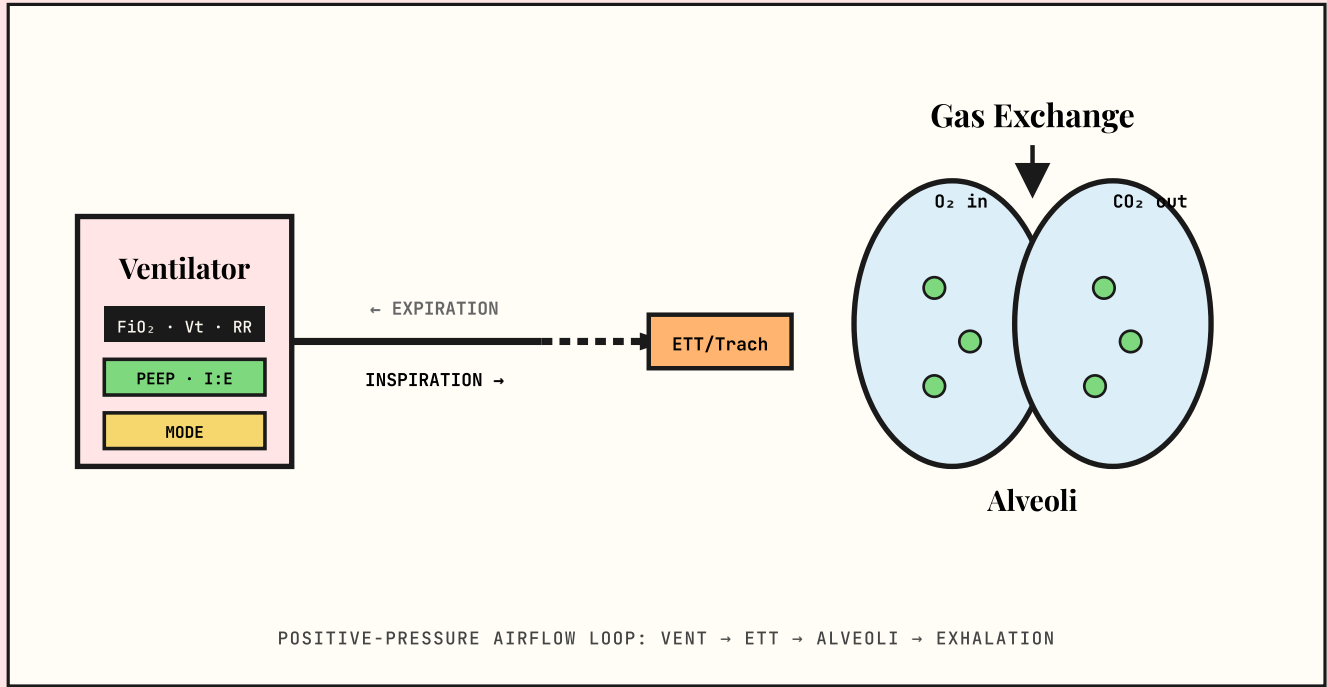
- **Mechanical ventilation** = invasive or noninvasive support that moves air in/out of the lungs when the client cannot maintain adequate gas exchange independently.
- **Goal:** Maintain **PaO<sub>2</sub> 80–100**, **SpO<sub>2</sub> ≥ 92%**, **PaCO<sub>2</sub> 35–45** (or "permissive hypercapnia" in ARDS), and reduce work of breathing.
- **Indications:** respiratory failure (Type I hypoxemic / Type II hypercapnic), apnea, airway protection (GCS < 8), neuromuscular failure, post-op recovery, severe acidosis (pH < 7.25).

**WHY IT MATTERS** The ventilator does not *cure* the underlying disease — it buys time for treatment to work. Every NGN scenario asks you to treat the patient, not the machine.

## 2

## Mechanics & Airflow Pathway

Positive-pressure ventilation reverses the normal negative-pressure breathing cycle. Air is *pushed* into the lungs under pressure rather than pulled in by diaphragm contraction.



### Key Physiologic Trade-offs

- ↑ PEEP → improves oxygenation BUT ↑ intrathoracic pressure → ↓ venous return → ↓ cardiac output → **hypotension**.
- ↑ FiO<sub>2</sub> above 60% for > 24 hr → free-radical lung injury (**oxygen toxicity**).
- High Vt / high pressures → **barotrauma** (pneumothorax) and **volutrauma**.

## 3 Core Settings — Know These Cold

| SETTING                                                    | TYPICAL RANGE                                                | WHAT IT CONTROLS                     | NCLEX PEARL                                                       |
|------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------|
| <b>FiO<sub>2</sub></b><br>Fraction Inspired O <sub>2</sub> | <b>0.21 - 1.0</b><br>(21–100%)                               | Oxygenation                          | Wean below 60% ASAP — >60% × 24 hr risks O <sub>2</sub> toxicity  |
| <b>Vt</b><br>Tidal Volume                                  | <b>6–8 mL/kg IBW</b>                                         | Volume per breath                    | Lung-protective (ARDSNet) = 6 mL/kg ideal body weight, NOT actual |
| <b>RR</b><br>Resp. Rate                                    | <b>12–20/min</b>                                             | Breaths/min the vent delivers        | ↑ RR blows off CO <sub>2</sub> ; ↓ RR retains CO <sub>2</sub>     |
| <b>PEEP</b><br>Positive End-Expiratory Pressure            | <b>5 cmH<sub>2</sub>O</b><br>baseline<br>(up to 20+ in ARDS) | Keeps alveoli open at end-expiration | ↑ PEEP improves SpO <sub>2</sub> but drops BP                     |
| <b>I:E Ratio</b>                                           | <b>1:2</b> (normal)                                          | Inspiratory : expiratory time        | Reverse ratio (1:1, 2:1) used for refractory hypoxemia            |
| <b>Plateau Pressure</b>                                    | <b>&lt; 30 cmH<sub>2</sub>O</b>                              | Alveolar pressure                    | >30 = barotrauma risk → lower Vt                                  |
| <b>PIP</b><br>Peak Inspiratory Pressure                    | <b>&lt; 35 cmH<sub>2</sub>O</b>                              | Highest airway pressure              | Sudden ↑ PIP = obstruction or pneumothorax                        |

### Common Ventilator Modes

| MODE                           | HOW IT WORKS                                                                       | BEST FOR                                 |
|--------------------------------|------------------------------------------------------------------------------------|------------------------------------------|
| <b>AC</b><br>Assist-Control    | Delivers preset Vt for every breath — patient's OR vent's                          | Full support; sedated patients           |
| <b>SIMV</b>                    | Mandatory breaths synced with patient effort; spontaneous breaths get no preset Vt | Weaning; allows diaphragm work           |
| <b>PSV</b><br>Pressure Support | Patient triggers every breath; vent assists with pressure boost                    | Weaning; SBT trials                      |
| <b>CPAP</b>                    | Continuous airway pressure; no rate, no Vt                                         | Sleep apnea; extubation readiness        |
| <b>BiPAP</b>                   | Two pressure levels (IPAP/EPAP) — noninvasive mask                                 | COPD exacerbation, CHF, avoid intubation |

## 4 Alarms — Decode & Act

**Never silence an alarm without identifying the cause.** Alarms = your earliest warning. Assess the *patient first*, then the ventilator.

### ▲ HIGH PRESSURE ALARM

**Cause:** resistance to airflow ↑

- Secretions / mucus plug → **suction**
- Kinked tubing → straighten
- Biting ETT → bite block, sedation
- Coughing / fighting vent → assess
- Bronchospasm → bronchodilator
- **Pneumothorax** 🚑 → ↓ breath sounds, tracheal deviation
- ↓ lung compliance (ARDS, pulm edema)

### ▼ LOW PRESSURE ALARM

**Cause:** air leak or disconnect

- **Patient disconnected** 🚑 → reconnect
- Cuff leak → check pilot balloon
- Tubing disconnect anywhere in circuit
- Accidental extubation → **bag & call for help**
- Tracheoesophageal fistula (long-term)

### 🚑 IF YOU CANNOT FIX THE ALARM IMMEDIATELY

**Disconnect from the vent and manually bag the patient with 100% O<sub>2</sub> using a BVM** while calling for respiratory therapy. *The patient comes off the broken machine, not the broken machine off the patient.*

## DOPE — Sudden Deterioration on the Vent

### D

#### DISPLACEMENT

ETT slipped out or down into right mainstem

### O

#### OBSTRUCTION

Mucus plug, kink, bitten tube

### P

#### PNEUMOTHORAX

Tension PTX → tracheal shift, JVD, ↓ BP

### E

#### EQUIPMENT

Vent failure, dead battery, circuit fault

## 5 Signs of Vent Problems — Early vs Late

### EARLY / SUBTLE

- **Restlessness** (hypoxia's #1 early sign)
- Tachycardia
- Tachypnea / fighting vent
- ↑ Peak pressures trending up
- ↓ SpO<sub>2</sub> from baseline
- Diaphoresis
- Anxiety, confusion onset

### LATE / CRITICAL

- **Cyanosis** (perioral, peripheral)
- Bradycardia (pre-arrest!)
- Hypotension, decreased CO
- Absent breath sounds on one side (PTX or mainstem)
- Tracheal deviation
- JVD, subcutaneous emphysema
- LOC change → unresponsive

### RED FLAG

Sudden **absent breath sounds on the right side after intubation** = ETT advanced into the left mainstem (or vice versa). Confirm placement: chest X-ray, ETCO<sub>2</sub>, equal bilateral breath sounds, condensation in tube, symmetric chest rise.

## 6 Priority Nursing Interventions (ABCs)

### A

#### AIRWAY

Verify ETT depth at teeth (22 cm avg). Confirm placement with auscultation +  $\text{ETCO}_2$  + CXR. Secure tube. Suction PRN *only*.

### B

#### BREATHING

Monitor  $\text{SpO}_2$ ,  $\text{ETCO}_2$ , chest rise.  
Check vent settings q shift.  
Auscultate q 2–4 hr. ABG as ordered.

### C

#### CIRCULATION

PEEP ↓ preload → watch BP.  
Hemodynamic monitoring.  $\text{UO} \geq 30$  mL/hr. Assess for ↓ CO signs.

### Suctioning — Do It Right

- **Hyperoxygenate to 100%  $\text{FiO}_2$  for 30–60 seconds** before AND after suctioning.
- Apply suction **only on withdrawal**, not insertion.
- **Limit each pass to  $\leq 10$ –15 seconds**; allow recovery between passes.
- Closed (in-line) suction = sterile, reduces VAP and hypoxia risk → preferred.
- Indications: visible secretions, ↑ peak pressures, coarse breath sounds, ↓  $\text{SpO}_2$ , patient cues — **never on a fixed schedule**.

### VAP Bundle — Ventilator-Associated Pneumonia Prevention

#### HOB ↑ 30–45°

Unless contraindicated (e.g., spinal injury)

#### ORAL CARE Q 2–4 HR

Chlorhexidine 0.12% per protocol

#### DAILY SEDATION VACATION

Assess readiness to wean

#### DAILY SAT + SBT

Spontaneous Awakening + Breathing Trial

#### PUD PROPHYLAXIS

PPI or H2 blocker (stress ulcer)

#### DVT PROPHYLAXIS

SCDs + LMWH

#### SUBGLOTTIC SUCTION

Removes pooled secretions above cuff

#### HAND HYGIENE

Before/after every contact — non-negotiable

## 7 Pharmacology — Sedation, Analgesia, Paralysis

| DRUG / CLASS                                                | MECHANISM                                                         | KEY ADVERSE EFFECTS                                                                             | NURSING CONSIDERATIONS                                                                                                                                                              |
|-------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Propofol</b><br>(Diprivan)<br>Sedative-hypnotic          | GABA agonist — rapid sedation, short half-life                    | Hypotension, bradycardia, ↑ triglycerides, <b>PRIS</b> (propofol infusion syndrome)             | Monitor BP, lipid panel, lactate, CK, liver enzymes. White milky drip — change tubing q 12 hr. Lipid-based = 1.1 kcal/mL.                                                           |
| <b>Midazolam</b><br>(Versed)<br>Benzodiazepine              | GABA potentiation — sedation, amnesia, anxiolytic                 | Resp depression, hypotension, delirium                                                          | Antidote = <b>Flumazenil</b> . Titrate to RASS. Risk of accumulation in renal/hepatic failure.                                                                                      |
| <b>Dexmedetomidine</b><br>(Precedex)<br>$\alpha_2$ agonist  | Central $\alpha_2$ stimulation — sedation without resp depression | Bradycardia, hypotension                                                                        | Patient is sedated yet <i>arousable</i> — good for weaning. Does NOT suppress respiratory drive.                                                                                    |
| <b>Fentanyl</b><br>Opioid analgesic                         | $\mu$ -opioid agonist — analgesia + mild sedation                 | Resp depression, hypotension, ileus, chest-wall rigidity (rapid bolus)                          | Antidote = <b>Naloxone</b> . Pair with sedative for full comfort.                                                                                                                   |
| <b>Cisatracurium / Rocuronium</b><br>Neuromuscular blockers | Block ACh at neuromuscular junction — paralysis                   | <b>No analgesic or sedative effect</b> 🚫 — patient feels & hears everything if not also sedated | <b>ALWAYS pair with sedation + analgesia.</b> Monitor with train-of-four (TOF) — goal 1–2 twitches of 4. Use artificial tears, reposition q 2 hr, DVT & pressure-injury prevention. |
| <b>Pantoprazole / Famotidine</b><br>PPI / H2 blocker        | ↓ Gastric acid                                                    | C. diff risk (PPI), confusion in elderly (H2)                                                   | Stress-ulcer prophylaxis — part of VAP bundle.                                                                                                                                      |
| <b>Enoxaparin / Heparin SC</b><br>Anticoagulant             | Anti-Xa / antithrombin potentiation                               | Bleeding, HIT (heparin)                                                                         | DVT prophylaxis. Monitor CBC, platelets, occult bleeding.                                                                                                                           |

🚫 **CRITICAL PAIRING RULE** **Paralytics + sedation + analgesia ALWAYS go together.** A paralyzed patient who is not sedated is fully aware, terrified, and in pain — but cannot move, blink, or signal you. Train-of-four (TOF) monitoring is required.

## 8 NCLEX Test Traps ⚠️

### ✖ WRONG / DISTRACTOR ANSWER

- "Silence the alarm and reassess in 15 min."
- "Suction the patient on a fixed q 2-hour schedule."
- "Increase PEEP to 15 because SpO<sub>2</sub> is 89%" (without considering BP)
- "Disconnect the vent and call RT" (without bagging)
- "Give Vt of 10 mL/kg in ARDS" (too high)
- "Restrain the patient to keep them on the vent"

### ✔ CORRECT PRIORITY ACTION

- **Identify and treat the cause** of the alarm
- Suction **PRN only** based on assessment cues
- Recognize ↑ PEEP can drop BP — assess hemodynamics
- **Disconnect AND bag with 100% O<sub>2</sub>**, then call
- Use **6–8 mL/kg IBW** (lung-protective)
- Sedate + treat pain; restraints are last-resort with order

### Classic Question Twists

- **"First action"** when alarm sounds → **assess the patient**, not the machine.
- **Sudden high-pressure alarm + ↓ breath sounds left side + tracheal deviation right** → tension pneumothorax (left side) — needle decompression needed.
- **BP drops after PEEP increase** → expected; notify provider, consider fluids.
- **SBT fails** (RR > 35, SpO<sub>2</sub> < 90%, ↑ HR, anxiety) → return to prior support and try again later.
- **Communication**: vent patient is awake → provide writing board, picture board, yes/no questions — never assume incompetence.



## 9 Patient & Family Education

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- **You cannot speak with the tube in** — we'll give you a board, alphabet card, or tablet to communicate.
- **You may hear and feel everything** even if you appear "asleep" — we'll talk to you and explain every procedure.
- **The vent is doing the work of breathing for now** — it's temporary while your lungs heal.
- **Alarms are normal** and don't always mean something is wrong; we respond to every one.
- **Family touch, voice, and presence** reduce delirium and ICU anxiety — encourage visiting.
- Post-extubation: expect a **sore throat, hoarse voice, and weak cough** for several days — these resolve.
- Long-term ventilation (trach): teach **suctioning, cuff care, stoma care, emergency tube replacement**.
- **ICU-acquired weakness** is common — early mobility, PT/OT, and nutrition are part of recovery.

## 10 Memory Boosters & Mnemonics

### DOPE

#### SUDDEN DETERIORATION

Displacement · Obstruction ·  
Pneumothorax · Equipment

### DOPES

#### EXTENDED VERSION

+ Stacked breaths / breath-stacking  
(auto-PEEP)

### FAST HUG

#### DAILY ICU BUNDLE

Feeding · Analgesia · Sedation ·  
Thromboprophylaxis · HOB · Ulcer  
prophylaxis · Glucose

### CHASTE

#### VAP BUNDLE

Chlorhexidine · HOB ↑ · Awakening  
daily · Suction subglottic ·  
Thromboprophylaxis · Eradicate  
stress ulcer

### ↑P ↓B

#### PEEP & BP

↑ PEEP often ↓ BP — anticipate  
hypotension

### 6–8

#### LUNG-PROTECTIVE VT

6–8 mL/kg **IBW** — not actual body  
weight

### SOAP

#### PRE-INTUBATION

Suction · Oxygen · Airway equipment ·  
Pharmacology

### A-B-C

#### ALWAYS FIRST

Airway → Breathing → Circulation —  
including vent patients

## Quick Pattern Recognition

#### PATTERN RULES

- **High Pressure Alarm** = "Something is in the way" → suction, unkink, check for PTX.
- **Low Pressure Alarm** = "Something is open" → disconnect, leak, extubation.
- **↑ PIP + Normal Plateau** = airway problem (secretions, bronchospasm).
- **↑ PIP + ↑ Plateau** = lung problem (ARDS, pulm edema, PTX).
- **SpO<sub>2</sub> drops on the vent** → bag, suction, check tube, call.

# ★ NCJMM Clinical Judgment Scenario

**CASE** A 62-year-old client with ARDS is on AC mode: FiO<sub>2</sub> 0.70, Vt 450 mL (8 mL/kg IBW), RR 16, PEEP 10. Two hours into your shift the high-pressure alarm sounds repeatedly. You assess: **RR 34, SpO<sub>2</sub> 84%, BP 92/56, HR 128, restless, diminished breath sounds on the right, tracheal deviation toward the left.** Subcutaneous crepitus is palpable over the right chest.

**1**

## RECOGNIZE CUES

High-pressure alarm × repeated · SpO<sub>2</sub> 84% · tachypnea 34 · tachycardia · hypotension · unilateral diminished breath sounds (R) · tracheal deviation (L) · subcutaneous emphysema · restlessness.

**2**

## ANALYZE CUES

Pattern = unilateral lung collapse + mediastinal shift away + air leaking into tissue. High-pressure alarm = airway obstruction OR ↓ compliance. Together this is **tension pneumothorax**, a barotrauma complication of high PEEP/positive pressure in ARDS.

**3**

## PRIORITIZE HYPOTHESIS

**#1 priority:** tension pneumothorax — life threat, will progress to PEA cardiac arrest within minutes if untreated. Hypoxia and hypotension are downstream of this. Address before chasing ABG or sedation.

**4**

## GENERATE SOLUTIONS

Call rapid response/provider STAT · prepare for **emergent needle decompression** (2nd ICS midclavicular line, R side) followed by chest tube · disconnect from vent and bag with 100% O<sub>2</sub> at low pressures · ↑ FiO<sub>2</sub> to 1.0 · stop the offending PEEP if possible · large-bore IV access · prepare fluids/vasopressors for shock.

**5**

## TAKE ACTION

Position upright if tolerated · 100% O<sub>2</sub> via BVM · assist with needle decompression · set up chest tube to water-seal drainage · administer fluids / vasopressor per order · continuous SpO<sub>2</sub>, ET CO<sub>2</sub>, ECG, BP · document tube output, chest rise, breath sounds q 15 min.

## 6

## EVALUATE OUTCOMES

Goal:  $\text{SpO}_2 \geq 92\%$ ,  $\text{BP} \geq 90/60$ ,  $\text{MAP} \geq 65$ , equal bilateral breath sounds, trachea midline, no crepitus expansion, chest tube tidaling without continuous bubbling, ABG improving ( $\text{PaO}_2 > 60$ ,  $\text{pH} > 7.30$ ). Reassess  $\text{Vt}/\text{PEEP}$  — consider **lower Vt (6 mL/kg)** and lower plateau pressure target to prevent recurrence.

DIANE'S NGN NCLEX 2026 VISUAL STUDY LIBRARY • VENTILATOR SETTINGS • PAIR WITH THE MATCHING FLASHCARD DECK