

△ CRITICAL CARE PHARMACOLOGY • NGN 2026

Ventilator *Alarms* Nursing Priorities & Intervention

A high-pressure, high-stakes topic. Every alarm is a clinical question: **what changed in resistance or volume?** Master the difference between High vs. Low pressure alarms, the priority action when troubleshooting fails, and the bundle that keeps the patient alive between alarms.

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2026 TEST PLAN

CRITICAL CARE • RESPIRATORY

COMPANION FLASHCARD DECK AVAILABLE



Source Transparency

This topic is

not present in Diane's uploaded reference notes

. Content compiled and cross-referenced from authoritative external sources to maintain clinical accuracy and NCLEX 2026 alignment.

» Saunders Comprehensive Review for the NCLEX-RN, 2026 Ed. • ATI RN Adult Medical-Surgical Nursing Module • AACN (American Assoc. of Critical Care Nurses) Practice Alerts • AARC (American Assoc. for Respiratory Care) Clinical Guidelines • CDC VAP Prevention Bundle • Lippincott Critical Care Nursing

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DEFINITION • OVERVIEW

What Is a Ventilator Alarm — and Why It Matters

- ◆ **Mechanical ventilation** delivers preset volumes and/or pressures to a patient who cannot breathe adequately on their own. The ventilator *monitors* every breath against the prescribed parameters.
- ◆ **An alarm signals deviation** from the set parameters — most often a change in **airway resistance** (high-pressure alarms) or a change in **circuit/lung volume** (low-pressure alarms).
- ◆ **An alarm is never "just noise."** Every alarm requires immediate nursing assessment because the underlying cause may be life-threatening: airway obstruction, pneumothorax, disconnection, or unplanned extubation.

PIP

Peak Inspiratory Pressure

The maximum pressure the ventilator generates during inspiration. Rising PIP = rising resistance.

PEEP

Positive End-Expiratory Pressure

Pressure kept in alveoli at end-expiration to prevent collapse. Typical 5 cmH₂O.

V_t

Tidal Volume

Volume of one breath delivered. Low V_t → low-pressure / low-volume alarms.

FiO₂

Fraction of Inspired Oxygen

Percentage of O₂ delivered (21–100%). Goal: lowest FiO₂ that maintains SpO₂ ≥ 92%.



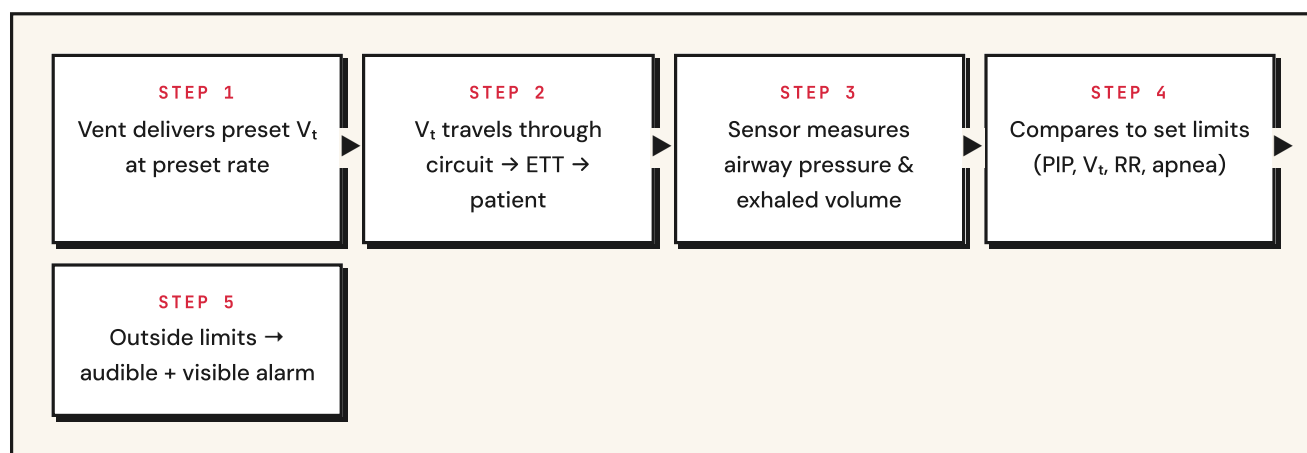
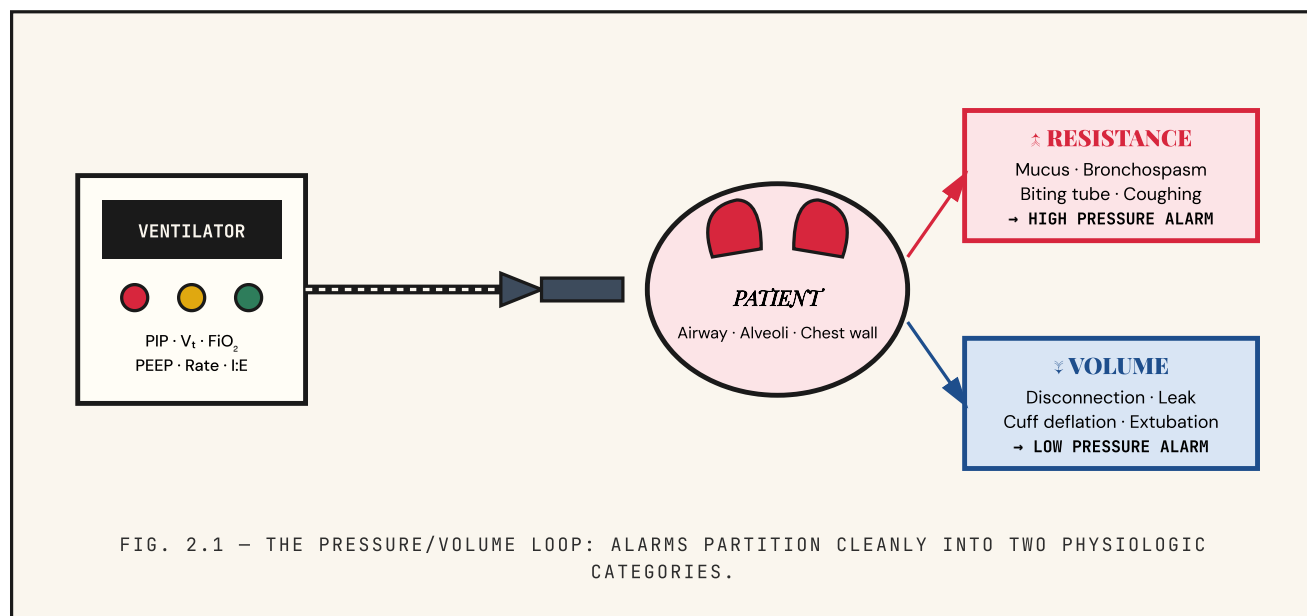
NCLEX framing

Test items rarely ask you to "fix" the ventilator. They ask: *what does the nurse do FIRST?* The answer is almost always assess the patient, then troubleshoot the alarm, then call respiratory therapy — never silence the alarm.

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PATHOPHYSIOLOGY · MECHANISM

Why Alarms Fire — The Resistance-vs-Volume Loop



The ventilator senses two things primarily: the **pressure it takes to push air in** and the **volume of air that comes back out**. If pressure climbs (something is blocking flow) or volume drops (air is escaping), the alarm fires. Knowing which physiology each alarm represents tells you exactly where to look.



SIGNS · RECOGNITION · DIFFERENTIATION

High-Pressure vs. Low-Pressure Alarms — Side-by-Side

This is the single most testable distinction in ventilator content. Most NCLEX items hinge on whether you can correctly identify the alarm **category** from the patient's clinical picture — then respond accordingly.

HIGH PRESSURE Alarm

↑ PIP · RESISTANCE ↑ · "SOMETHING IS BLOCKING FLOW"

MOST COMMON CAUSES — MNEMONIC: D·O·P·E

- ▶ Displaced tube (kinked, biting on tube, mainstem intubation)
- ▶ Obstruction (secretions, mucus plug, water in tubing)
- ▶ Pneumothorax / Pulmonary edema (↓ compliance)
- ▶ Equipment problem / Elevated airway resistance (bronchospasm, coughing, patient fighting vent)

WHAT YOU'LL SEE / HEAR

- ▶ Gurgling, coarse crackles, audible secretions
- ▶ Diminished or absent breath sounds on one side (pneumothorax / mainstem)
- ▶ Patient grimacing, biting tube, anxious, ↓ SpO₂
- ▶ Wheezing → bronchospasm

PRIORITY NURSING ACTION

- ▶ Assess patient → auscultate → suction PRN
- ▶ Straighten / unkink tubing · drain water
- ▶ Insert bite block if patient biting tube
- ▶ Call provider/RRT for suspected pneumothorax

LOW PRESSURE Alarm

↓ PIP · VOLUME ↓ · "AIR IS ESCAPING SOMEWHERE"

MOST COMMON CAUSES — MNEMONIC: L·E·A·K

- ▶ Loose connections / Leak in the circuit
- ▶ Extubation (unplanned tube displacement OUT)
- ▶ Air cuff leak / cuff deflation
- ▶ Kaput tubing — tear, crack, holes in circuit

WHAT YOU'LL SEE / HEAR

- ▶ Gurgling / phonation around the ETT (cuff leak → air past vocal cords)
- ▶ Patient suddenly able to make sounds, cough out tube
- ▶ Low exhaled tidal volume on display
- ▶ ↓ SpO₂, restlessness, ↓ chest rise

PRIORITY NURSING ACTION

- ▶ Check all tubing connections — reconnect immediately
- ▶ Assess cuff pressure (goal 20–30 cmH₂O) · re-inflate if leak
- ▶ Verify tube placement at lip line · breath sounds bilateral
- ▶ If extubated → bag-mask ventilate, call for reintubation

★ MEMORY ANCHOR — HIGH PRESSURE CAUSES

D · O · P · E

D Displaced
tube kinked /
biting / mainstem

O Obstruction
secretions /
mucus plug /

P Pneumothorax
or pulm edema ·
↓ compliance

E Equipment
or Elevated
resistance ·

water

bronchospasm



BEYOND PRESSURE · OTHER ALARMS

Apnea, Volume, Rate & FiO₂ Alarms

Pressure alarms get the spotlight, but the ventilator monitors several other parameters. Each has a different physiologic meaning and a different nursing priority.

ALARM	WHAT IT MEANS	PRIORITY NURSING ACTION
APNEA NO BREATH SENSED × SET INTERVAL (OFTEN 20 SEC)	Patient stopped breathing spontaneously (on SIMV/PSV modes) or vent failed to trigger a breath.	Assess responsiveness · check pulse · verify circuit · switch to AC MODE if patient cannot trigger · prepare for RAPID RESPONSE if pulseless/unresponsive.
LOW EXHALED V_t RETURNING VOLUME BELOW SET LIMIT	Air not coming back out — leak in circuit, cuff deflation, or partial extubation.	Same workflow as low-pressure alarm: check all connections, assess cuff, listen for leak around ETT, verify lip-line measurement.
HIGH RR / Tachypnea RESPIRATORY RATE EXCEEDS SET LIMIT	Pain, anxiety, hypoxia, hypercapnia, fever, or insufficient sedation. Patient is "overbreathing."	Assess SpO ₂ , ABG, pain · sedation level · reassure patient · notify provider if persistent (may need vent setting change or sedation titration).
LOW MINUTE VENT (MV) MV = RR × V _t ; BELOW SET THRESHOLD	Patient hypoventilating — sedated too deeply, fatigued, leak, or apnea developing.	Assess LOC · sedation · circuit integrity · ABG · may need to reduce sedation or change mode.
FiO₂ Alarm OXYGEN BLENDER MALFUNCTION	The vent cannot deliver the prescribed oxygen concentration.	Call respiratory therapy immediately · disconnect and bag-mask ventilate with 100% O ₂ until corrected.
HIGH PEEP / Auto-PEEP TRAPPED AIR IN ALVEOLI AT END- EXPIRATION	Inadequate expiratory time — common in COPD/asthma. ↑ intrathoracic pressure → ↓ venous return.	Notify provider · may need ↑ expiratory time, ↓ rate, or bronchodilator · monitor BP for compromise.
POWER FAILURE VENT LOSES ELECTRICAL OR PNEUMATIC SUPPLY	Catastrophic — patient has no ventilation.	Disconnect & bag-mask ventilate at 100% FiO₂ immediately · call respiratory therapy · move to backup vent.

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ACTION • ABC • PRIORITY FRAMEWORK

The Universal Priority Sequence

When an alarm sounds, follow this exact sequence. The NCLEX wants **the patient first, the equipment second**. Never silence an alarm without assessing.

Assess the patient first

- 1 Check responsiveness, color, chest rise, SpO₂, breath sounds, work of breathing. *Look at the patient before you look at the machine.*

Identify the alarm type

- 2 High pressure (resistance ↑) vs. Low pressure / Low volume (leak / escape) vs. Apnea vs. Power. Read the display.

Troubleshoot the cause

- 3 Work distally from patient → ETT → circuit → ventilator. Suction if indicated. Reposition tubing. Unkink. Reconnect.

If you CANNOT identify or fix the cause in seconds → disconnect & bag

- 4 **DISCONNECT FROM VENTILATOR • BAG-MASK VENTILATE AT 100% FiO₂** — this is the priority NCLEX action when you can't troubleshoot quickly.

Call respiratory therapy / RRT / provider

- 5 Communicate cleanly: patient status, alarm type, interventions tried, current response.

Document

- 6 Alarm type, time, cause, intervention, patient response, who was notified, outcome. Documentation is your medico-legal record.



NEVER silence an alarm without assessing first.

Silencing an alarm *without* investigating the cause is a sentinel-event level error. The ventilator alarm is keeping your patient alive — treat it like a code blue trigger every time it fires.

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PREVENTION • CDC VAP BUNDLE

The Ventilator Bundle — Care Between Alarms

Per CDC and AACN, the **Ventilator-Associated Pneumonia (VAP) Bundle** is the evidence-based standard for every intubated patient. NCLEX loves bundle items as priority interventions.

1 HOB elevated 30–45°
The single most powerful VAP-prevention intervention. Reduces aspiration of oropharyngeal secretions.

2 Oral care with chlorhexidine q2–4h
Decontaminates oropharynx. Suction subglottic secretions if equipped tube.

3 Daily "sedation vacation" (SAT)
Lighten sedation each day to assess readiness and reduce vent days.

4 Daily spontaneous breathing trial (SBT)
Paired with SAT. Identifies extubation readiness as early as possible.

5 DVT prophylaxis
SCDs and/or pharmacologic (heparin / enoxaparin) per protocol.

6 Peptic ulcer (stress) prophylaxis
PPI (pantoprazole) or H₂-blocker. ICU patients on vents are at high risk for stress ulceration.

7 Reposition q2h
Prevents pressure injuries and atelectasis. Verify ETT remains at the same lip-line cm marking after every turn.

8 Hand hygiene before every patient contact
The foundation of every bundle. No exceptions.

★ MEMORY ANCHOR — VAP BUNDLE

W • H • A • P

W

Wash hands
+ wean daily
(SAT/SBT)

H

HOB up 30–45°
elevate every
time

A

**Antiseptic
mouth care**
chlorhexidine
q2–4h

P

Prophylaxis
DVT + PUD
(stress ulcer)

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PHARMACOLOGY • SEDATION & ADJUNCTS

Drugs You'll See on the Vented Patient

Mechanical ventilation rarely happens without sedation. Recognize the drug classes, titration parameters, and red-flag side effects.

DRUG • CLASS	MECHANISM	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Propofol GENERAL SEDATIVE- HYPNOTIC	Enhances GABA → rapid sedation. Onset/offset in minutes — ideal for sedation vacations.	↓ BP • bradycardia • respiratory depression • propofol infusion syndrome (metabolic acidosis, rhabdo, ↑ triglycerides) • greenish urine	Titrate to RASS goal • monitor BP, HR, triglycerides, lipase • "any - ASE" lab • change tubing q12h (lipid carrier = infection risk)
Midazolam (Versed) BENZODIAZEPINE	GABA potentiation → sedation, anxiolysis, amnesia, anticonvulsant.	Respiratory depression • ↓ BP • paradoxical agitation • accumulation in renal/hepatic dysfunction	Titrate to LOC/RASS • antidote = flumazenil • monitor for delirium with prolonged use
Fentanyl OPIOID ANALGESIC	μ-opioid agonist → analgesia + mild sedation. Use for pain (analgo-sedation strategy).	Respiratory depression • ↓ BP • chest wall rigidity (high-dose bolus) • constipation	Pair with sedative for true comfort • antidote = naloxone • monitor RASS, CPOT pain score, bowel function
Dexmedetomidine (Precedex) A ₂ -AGONIST	Central α ₂ stimulation → sedation WITHOUT significant respiratory depression. Patient stays arousable.	Bradycardia • ↓ BP • dry mouth • rebound HTN if stopped abruptly	Preferred for weaning • holds airway reflexes • monitor HR/BP closely • taper if used >24h
Vecuronium / Rocuronium / Cisatracurium NEUROMUSCULAR BLOCKER (NMB)	Blocks ACh at NM junction → skeletal muscle paralysis. Used when patient must NOT fight vent (ARDS, severe asynchrony).	TOTAL paralysis — patient can hear and feel everything if not sedated • prolonged weakness • skin breakdown • corneal abrasion	ALWAYS sedate + provide analgesia FIRST • monitor with Train-of-Four (TOF) • protect eyes (lubrication + tape) • reposition + skin care • DVT prophylaxis essential
Albuterol / Ipratropium BRONCHODILATOR (B ₂ -AGONIST + ANTICHOLINERGIC)	Bronchial smooth muscle relaxation → reduces airway resistance (treats high-pressure alarms from bronchospasm).	Tachycardia • tremor • hypokalemia (albuterol); dry mouth • urinary retention (ipratropium)	Administer in-line via nebulizer / MDI with spacer • reassess breath sounds, PIP, SpO ₂ post-dose



Paralytic + No Sedation = Catastrophic

A neuromuscular blocker only paralyzes muscles. The patient is fully *aware*, can feel pain, hear conversation, and experience suffocation panic. Sedation and analgesia must be initiated

before

the paralytic and titrated to deep sedation throughout. This is one of the most tested NGN safety scenarios.

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TEST TRAPS • WRONG-VS-RIGHT

NCLEX Question Patterns to Master

*"The high-pressure alarm sounds on a mechanically ventilated client. What is the nurse's **FIRST** action?"*

- ~~A Silence the alarm and call respiratory therapy.~~
- ~~B Suction the endotracheal tube immediately.~~
- C Assess the client (LOC, breath sounds, chest rise, SpO₂).**
- ~~D Increase the FiO₂ to 100% and document.~~

WHY C IS RIGHT

The patient comes before the machine. Suctioning (B) is a possible cause-driven intervention but only AFTER assessment confirms secretions. Never silence (A) without assessing. FiO₂ increase (D) does nothing if the alarm cause is unresolved.

"A nurse hears a low-pressure alarm and observes that the client is making vocal sounds. What is the priority action?"

- ~~A Document that the client is awake and alert.~~
- B Assess for tube displacement and prepare for possible reintubation.**
- ~~C Reposition the client and resume routine care.~~
- ~~D Increase the cuff pressure to 40 cmH₂O.~~

WHY B IS RIGHT

Vocalization through an ETT means air is passing the cuff — the patient is either partially extubated OR the cuff has lost integrity. This is a respiratory emergency. Cuff overinflation (D) above 30 cmH₂O causes tracheal ischemia and is contraindicated.

"A client on a ventilator becomes agitated, SpO₂ drops to 86%, and the high-pressure alarm fires. The nurse cannot quickly identify the cause. What is the priority?"

- ~~A Administer prescribed albuterol nebulizer.~~
- ~~B Increase the propofol infusion rate.~~

c Disconnect the client from the ventilator and bag-mask ventilate with 100% O₂.

~~**a Call the provider for a stat chest X-ray.**~~

WHY C IS RIGHT

When you cannot identify or fix the cause within seconds, manual ventilation with a bag-valve-mask at 100% FiO₂ is the lifesaving intervention. This preserves oxygenation while you (or respiratory therapy) troubleshoot the machine. *Bag & call* — the universal rescue.

*"Which intervention by the nurse caring for a ventilated client requires immediate **correction** by the charge nurse?"*

~~**A Performing oral care with chlorhexidine every 2 hours.**~~

~~**B Maintaining HOB elevation at 35°.**~~

c Suctioning the endotracheal tube every 2 hours on a strict schedule.

~~**d Administering DVT prophylaxis as prescribed.**~~

WHY C IS WRONG

Suctioning is performed *PRN* based on assessment findings (audible secretions, ↑ PIP, ↓ SpO₂, visible secretions) — NOT on a routine schedule. Routine suctioning damages mucosa, increases infection risk, and causes hypoxia. A, B, and D are all evidence-based VAP-bundle elements.

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PATIENT & FAMILY EDUCATION

What to Teach Before, During, and After

Mechanical ventilation is terrifying for patients and families. Education reduces fear, improves cooperation, and supports weaning success.

①

Cannot speak with the tube in

Provide a communication board, dry-erase board, or eye-blink yes/no. Reassure that voice returns after extubation.

②

Alarms are normal — the team responds

Explain to family that alarms sound for many reasons (coughing, position change). The team is monitoring continuously.

③

Do not pull on the tube

Restraints (if used) are for safety. Encourage family to hold the patient's hand and remind them to keep their hands away from the face.

④

Why we're waking you up

Daily sedation vacations help us check that you're ready to come off the ventilator. It's normal to feel anxious — we are right here.

⑤

After extubation expectations

Sore throat, hoarseness, weak cough for 24–72 hours. Coughing and deep breathing exercises will be essential.

⑥

Post-ICU recovery

Weakness, vivid dreams, sleep disturbance, memory gaps are common (ICU delirium / PICS). Refer to post-ICU clinic if available.



MEMORY BOOSTERS • MNEMONICS

Quick-Recall Anchors for the Exam

★ HIGH PRESSURE ALARM

D • O • P • E

D

Displacement
kinked / biting /
mainstem

O

Obstruction
secretions /
mucus plug

P

Pneumothorax
or pulm edema

E

Equipment
+ Elevated
resistance /
bronchospasm

★ LOW PRESSURE ALARM

L • E • A • K

L

Loose
connection /
tubing

E

Extubation
(tube out)
unplanned

A

Air cuff leak
cuff deflation

K

Kaput tubing
tear / crack / hole

★ WHEN YOU CAN'T TROUBLESHOOT

B • A • G

B

Break
the patient off the vent
circuit

A

Ambu
bag-valve-mask ventilate

G

Get
100% FiO₂ & get RT/RRT
now



Quick Pattern Recognition

High pressure = something is *blocking* ·
call.

= something is *leaking* · **When in doubt** = bag and
call.

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NGN CLINICAL JUDGMENT · 6-STEP MODEL

NCJMM Case Application

● PATIENT SCENARIO

A 64-year-old male, intubated 48 hours ago for acute respiratory failure secondary to COPD exacerbation, is on Assist-Control ventilation: V_t 450 mL, RR 14, FiO_2 40%, PEEP 5. The high-pressure alarm sounds. The nurse observes the patient is restless, coughing, SpO_2 has dropped from 96% to 88%, and coarse rhonchi are heard on auscultation. PIP has climbed from baseline 22 cmH₂O to 38 cmH₂O.

Step 1

Recognize Cues

High-pressure alarm · ↑ PIP (22 → 38) · ↓ SpO_2 (96 → 88) · coarse rhonchi · restless · coughing · history of COPD exacerbation.

Step 2

Analyze Cues

Pattern matches HIGH-pressure alarm physiology. Rhonchi + cough strongly suggest **secretion obstruction** (the "O" in DOPE). PIP rise is acute, not gradual — favors mucus plug over progressive lung injury.

Step 3

Prioritize Hypotheses

#1 Secretions/mucus plug (most likely) · #2 bronchospasm · #3 patient-vent asynchrony · #4 tube displacement. Rule out pneumothorax with bilateral breath sound check.

Step 4

Generate Solutions

Assess bilateral breath sounds · suction ETT (closed-system, sterile) · pre-oxygenate with 100% FiO_2 × 30 sec before suctioning · limit pass to ≤10 sec · monitor for bradycardia/hypoxia during suctioning.

Step 5

Take Action

Pre-oxygenate → suction ETT → reassess PIP, SpO_2 , breath sounds. If PIP normalizes and SpO_2 recovers, secretions confirmed. If no improvement, escalate: bag-mask ventilate, call RT, prepare for chest X-ray to rule out pneumothorax.

Step 6

Evaluate Outcomes

PIP returns to baseline 22 cmH₂O · SpO_2 recovers to 95–98% · breath sounds clear post-suction · patient settled · alarm resolved. **Document** alarm, intervention, response. Continue VAP bundle & ongoing assessment.

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VENTILATOR ALARMS · CRITICAL CARE · RESPIRATORY

SOURCES: SAUNDERS 2026 · ATI MEDICAL-SURGICAL · AACN PRACTICE ALERTS · AARC GUIDELINES · CDC VAP BUNDLE · LIPPINCOTT CRITICAL CARE