

• NGN NCLEX 2026 • RESPIRATORY • EMERGENCY

SERIES • CARD 18

Pneumothorax & Chest Tubes

PRIORITY • ABC

Air where it doesn't belong — collapsing the lung, threatening the mediastinum. A core respiratory emergency tested heavily on NCLEX for assessment, prioritization, and chest drainage system management.

03
DRAINAGE CHAMBERS

01 Definition & Overview

WHAT • WHY

CORE CONCEPT

Air enters the *pleural space* and collapses the lung.

Normally, the pleural space holds only a thin film of fluid and a **negative pressure** that keeps the lung expanded against the chest wall. When air breaches that space, the negative pressure is lost and the lung recoils inward — partial or complete collapse.

A **chest tube** is inserted to evacuate the air (or blood/fluid), restore negative pressure, and re-expand the lung. The drainage system is a closed, three-chamber setup that must never be compromised.

-4 to -8 cmH₂O

NORMAL PLEURAL PRESSURE

Lost when air enters — lung collapses.

2nd ICS

TENSION DECOMPRESSION SITE

Midclavicular line, affected side — large-bore needle.

02 Three Types to Know

CLASSIFY

TYPE 01

Spontaneous

NO TRAUMA • BLEB RUPTURE

Occurs without injury. **Primary:** tall, thin, young males or smokers. **Secondary:** underlying COPD, asthma, TB, cystic fibrosis.

Classic cue: **sudden sharp chest pain** while at rest or coughing.

TYPE 02

Traumatic

OPEN OR CLOSED INJURY

Penetrating (stab/gunshot) or blunt trauma, rib fracture, or iatrogenic (central line, thoracentesis, mechanical ventilation barotrauma).

Open ("sucking") chest wound: apply occlusive dressing taped on **3 sides** — never 4.

LIFE THREAT

Tension

ONE-WAY VALVE • MEDIASTINAL SHIFT

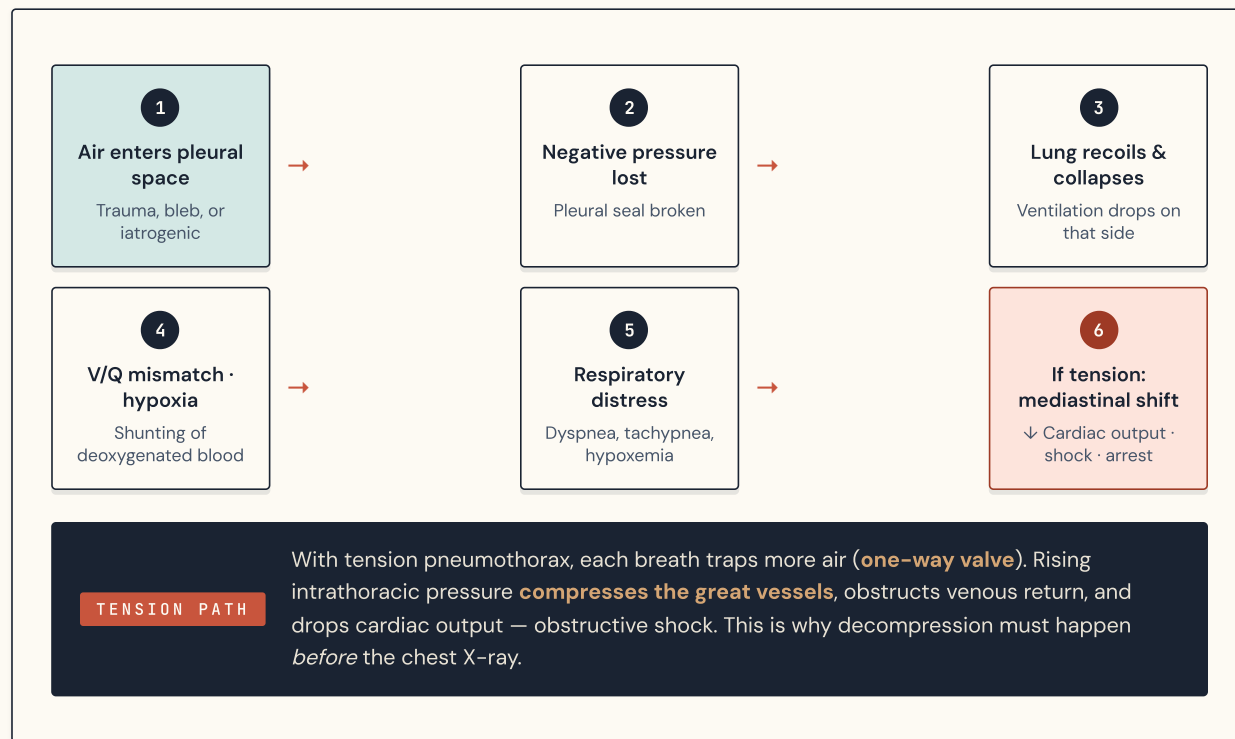
Air enters the pleural space but cannot escape. Pressure builds, collapses the lung, pushes heart and great vessels to the opposite side.

Hallmark: tracheal deviation **AWAY** from affected side, JVD, severe

hypotension. Needle
decompression NOW.

03 Pathophysiology — Simplified

MECHANISM



04 Signs & Symptoms

RECOGNIZE CUES

S Simple / Expected Findings

- ◇ **Sudden sharp chest pain** — unilateral, pleuritic, worsens with breathing
- ◇ **Dyspnea & tachypnea** — effort to breathe against collapsed lung
- ◇ **Diminished or absent breath sounds** on the affected side
- ◇ **Hyperresonance to percussion** — air trapped in pleural space
- ◇ **Asymmetric chest rise** — affected side lags
- ◇ Tachycardia, anxiety, restlessness (early hypoxia)
- ◇ Decreased SpO₂, possible subcutaneous emphysema (crepitus)

T TENSION RED FLAGS

- ◆ **Tracheal deviation AWAY** from affected side — LATE sign
- ◆ **Jugular vein distension (JVD)** — venous return obstructed
- ◆ **Severe hypotension** — obstructive shock
- ◆ **Cyanosis** & rapid deterioration
- ◆ **Absent breath sounds** on affected side
- ◆ **Extreme air hunger**, impending doom
- ◆ **Do NOT wait for X-ray** — act on clinical findings

05 Priority Nursing Interventions

ABC FRAMEWORK

A

AIRWAY

- Assess patency
- Intubation may be needed
- Watch for tracheal deviation

B

BREATHING

- **High Fowler's** position
- Administer **high-flow** O₂
- Monitor SpO₂, RR, breath sounds
- Prepare for chest tube

C

CIRCULATION

- Continuous cardiac monitoring
- IV access · fluids for hypotension
- Assess for shock (tension)

S

SPECIFIC

- **Tension:** needle decompression 2nd ICS midclavicular
- **Open wound:** 3-sided occlusive dressing
- Pain management for tube placement

06 The 3-Chamber Drainage System

CORE TESTED CONCEPT

A chest drainage unit (CDU) has three interconnected chambers. Understanding what each chamber *should* and *should not* do is the single most common NCLEX question on this topic.

Drainage Collection

CLOSEST TO PATIENT

01

- Collects blood, serous fluid, air
- Mark level & time hourly on the chamber
- Expected: serosanguineous, gradually decreasing
- Report >100 mL/hr bright red drainage to HCP
- Never empty — replace full unit

MONITOR · DOCUMENT

Water Seal

ONE-WAY VALVE · FILLED TO 2 CM

02

- **Tidaling (fluctuation) with breathing** = normal ✓
- **Intermittent bubbling** during exhale/cough = normal ✓
- **Continuous bubbling** = **AIR LEAK** 🚫
- No tidaling = lung re-expanded OR tube kinked/clamped
- Keep at or below patient's chest level — always

CONTINUOUS BUBBLING = BAD

Suction Control

SET TO -20 CMH₂O (TYPICAL)

03

- **Gentle continuous bubbling** = normal ✓
- Vigorous bubbling = suction too high → turn down
- No bubbling = no suction (check wall unit, tubing)
- Suction level set by water column height, not wall dial
- Dry suction units use a regulator dial

GENTLE BUBBLING = GOOD

07 Chest Tube Management

DO'S & DON'TS



DO

- ✓ **Keep drainage system BELOW chest level** at all times to prevent backflow



DON'T

- ✗ **Do NOT clamp** the tube routinely — can cause tension pneumothorax

- ✓ **Assess every 1–2 hours:** drainage, tidaling, bubbling, VS, breath sounds
- ✓ **Encourage deep breathing & coughing +** incentive spirometry hourly
- ✓ Ensure all connections are **taped/secured**
- ✓ Keep **sterile water/saline** and **petrolatum gauze** at bedside
- ✓ Keep **two padded clamps** at bedside for specific emergencies
- ✓ Turn & reposition patient frequently for comfort and drainage
- ✓ Notify HCP: drainage >100 mL/hr bright red, sudden stop, worsening SOB

- ✗ **Do NOT milk or strip** the tubing routinely (damages tissue, ↑ negative pressure)
- ✗ **Do NOT empty** the drainage chamber — replace the whole unit
- ✗ **Do NOT lift** the drainage unit above chest level
- ✗ **Do NOT let tubing loop or kink** below the unit
- ✗ **Do NOT remove** the chest tube without HCP order — Valsalva on removal
- ✗ Do NOT ignore sudden cessation of tidaling — investigate cause
- ✗ Do NOT apply an occlusive 4-sided dressing to an open chest wound

08 Emergency Troubleshooting

IF THIS → DO THAT

SCENARIO A

Chest tube is **ACCIDENTALLY PULLED OUT** of the patient

→ Immediate Action

Cover the insertion site immediately with a **sterile petrolatum (Vaseline) gauze taped on 3 sides** — this allows air to escape but not re-enter. Notify HCP STAT. Monitor for tension pneumothorax.

SCENARIO B

Chest tube **DISCONNECTS** from the drainage system

→ Immediate Action

Submerge the end of the chest tube into a bottle of sterile water or normal saline (≈2 cm deep) to create a temporary water seal. Keep patient calm, notify HCP, replace system.

SCENARIO C

CONTINUOUS BUBBLING in water seal chamber

→ Troubleshoot

Indicates an **air leak**. Starting at the patient and moving toward the unit, **briefly clamp** sections of tubing to find the leak. If bubbling stops, the leak is proximal to the clamp. Tighten connections; if leak is at insertion site, notify HCP.

SCENARIO D

Drainage system **TIPS OVER** or **BREAKS**

→ Immediate Action

If it tips — set it upright, refill water seal if needed, reassess. If the collection unit breaks — submerge distal chest tube in sterile water/saline, notify HCP, prepare a new unit. **Never clamp** unless changing the entire unit briefly.

09 Pharmacology

ADJUNCTIVE MEDS

MEDICATION	PURPOSE & MECHANISM	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Morphine / Fentanyl OPIOID ANALGESIC	Controls severe pleuritic pain from injury & chest tube insertion — enables deep breathing & coughing.	Respiratory depression, hypotension, constipation, sedation.	Monitor RR (hold if <12), pain score, LOC. Have naloxone available.
Lidocaine (local) LOCAL ANESTHETIC	Infiltrated at insertion site before chest tube placement.	Numbness, tingling, rare systemic toxicity.	Verify no allergy; monitor for arrhythmia at high systemic doses.
Ceftriaxone / Cefazolin CEPHALOSPORIN ANTIBIOTIC	Prophylaxis or treatment of infection (empyema, pneumonia) with penetrating trauma.	GI upset, rash, C. diff with prolonged use.	Assess penicillin cross-allergy. Monitor insertion site for redness, warmth, drainage.
Albuterol SHORT-ACTING BETA-2 AGONIST	For underlying bronchospasm (asthma, COPD) contributing to dyspnea.	Tachycardia, tremor, jitteriness, hypokalemia.	Monitor HR & K ⁺ . Not first-line for pneumothorax itself.
Oxygen (100% non-rebreather) THERAPEUTIC GAS	Promotes nitrogen washout — accelerates reabsorption of small pneumothoraces.	Drying of mucosa; caution in CO ₂ -retaining COPD.	Humidify. Titrate to SpO ₂ ≥ 92% (or 88–92% in chronic CO ₂ retainer).

10 NCLEX Test Traps

WATCH FOR THESE



Commonly Missed Distinctions

- Tidaling vs. Bubbling in water seal.** Tidaling = fluctuation rising with inhale, falling with exhale — *normal*. Continuous bubbling = *air leak*.
- Tracheal deviation direction.** In tension pneumothorax, the trachea deviates *AWAY* from the affected side (pressure pushes it over).
- "Clamp if anything happens." Wrong.** Routine clamping risks tension pneumothorax. Only clamp briefly to locate air leaks or change the unit.
- Occlusive dressing sides.** Open chest wound gets *3-sided* dressing (flutter valve). A 4-sided seal traps air → tension.
- No tidaling — is that good?** Maybe. Could mean lung re-expanded *OR* tube kinked/clamped/occluded. Always *verify* with breath sounds & X-ray.
- Milking vs. no milking.** NCLEX: *do not routinely milk or strip* tubes — causes excessive negative pressure and tissue damage.
- On chest tube removal.** Patient takes a deep breath and *bears down* (Valsalva) or holds breath — prevents air from being sucked back in.
- Wait for the X-ray? Not for tension.** Tension pneumothorax is a *clinical diagnosis* — decompress first, image after.

11 Patient Education

TEACH & COACH

Teaching Points for Recovery & Discharge

EMPOWER • PREVENT • RECOGNIZE

01

Breathing Exercises

Use incentive spirometer **every 1–2 hours while awake**. Deep breathe and cough to re-expand the lung and prevent pneumonia or atelectasis.

02

Protect the Tubing

Do not lie on the chest tube. Keep drainage unit **upright and below chest** when ambulating. Walk with assistance at first.

03

Pain Management

Take pain meds *before* pain is severe so you can breathe deeply. Splint the chest with a pillow when coughing.

04

Wound & Site Care

Keep insertion site clean and dry. Report **redness, drainage, fever > 100.4°F**, or separation at the site.

05

Activity Restrictions

After removal, avoid **heavy lifting (>10 lb)**, strenuous activity, and **air travel or scuba diving** until cleared by HCP.

06

When to Call

Call HCP or 911 for **sudden SOB, sharp chest pain, cyanosis, or chest tightness** — could signal recurrence.

12 NCJMM Clinical Judgment Scenario

RECOGNIZE • ANALYZE • PRIORITIZE • EVALUATE

Apply the *Clinical Judgment* Model

NEXT-GENERATION NCLEX FRAMEWORK

Scenario: A 24-year-old post-MVA patient with a right-sided chest tube suddenly reports increased shortness of breath. You note *absent breath sounds on the right, tracheal deviation to the left*, JVD, BP 82/48, HR 132. The water seal chamber shows *no bubbling or tidaling*.

STEP 01 • RECOGNIZE CUES

Recognize

Trach deviation, JVD, hypotension, tachycardia, absent breath sounds, no tidaling — all point to **tension pneumothorax**. The lack of tidaling suggests the tube is occluded or kinked.

STEP 02 • ANALYZE CUES

Analyze

Air is trapped in pleural space with no escape route. Rising pressure is shifting mediastinum, compressing vena cava — cardiac output is dropping. This is an **immediate life threat**.

STEP 03 • PRIORITIZE ACTIONS

Prioritize

(1) Check for kinks/clamps on tubing. (2) Call Rapid Response/HCP. (3) Administer high-flow O₂. (4) Prepare for **needle decompression** — 2nd ICS midclavicular, affected side. (5) IV access, fluids.

STEP 04 • EVALUATE OUTCOMES

Evaluate

After decompression: breath sounds return, BP rises, HR normalizes, trachea midline, tidaling resumes. If not — escalate. Document trends, reassess chest tube function, obtain stat CXR.

13 Memory Boosters

MNEMONICS

MNEMONIC 01

TRACHEA Tension Signs

- Tracheal deviation (away)
- Respiratory distress
- Absent breath sounds
- Cyanosis
- Hypotension
- Elevated JVD
- Air hunger / anxiety

MNEMONIC 02

Bubbles *Bad*, Tidalging *Terrific*

In the **water seal chamber**, **continuous** bubbles = air leak (bad). Tidalging (the fluid rising and falling with each breath) is terrific — a sign the system is working.

MNEMONIC 03

Trachea runs *AWAY* from the trouble

Tension pushes structures to the **opposite side**. The trachea "runs away" from the affected lung — classic NCLEX cue.

MNEMONIC 04

3 sides *out*, never 4

Open chest wound → tape dressing on **three sides** to allow exhaled air to escape. Four-sided seal traps air and causes tension.

MNEMONIC 05

Water to the unit, tube to the water

If the **tube falls out of patient** → petrolatum gauze on **3 sides**. If the **tube disconnects from the unit** → submerge end in sterile **water**. Two scenarios, two answers.

MNEMONIC 06

Three C's of *Chambers*

- **Collect** — drainage chamber (mark & measure)
- **Control** — water seal (one-way, watch for air leaks)
- **Create** — suction (gentle bubbling only)