NGN NCLEX 2026 · CARDIOVASCULAR / RESPIRATORY · HIGH-YIELD REVIEW

Deep Vein Thrombosis & Pulmonary Embolism

A clot that starts quiet in a leg vein can end loud in a lung artery. Master Virchow's triad, recognize the early unilateral signs, act on sudden dyspnea, and know your anticoagulants cold.

ABC PRIORITY | LIFE-THREATENING | ANTICOAGULANT HEAVY | NCJMM INTEGRATED

3	2–3	46–70	☎
VIRCHOW'S TRIAD	WARFARIN INR GOAL	HEPARIN APTT (SEC)	SUDDEN DYSPNEA = ACT

01 Definition & Overview

WHAT IT IS · WHY IT MATTERS

DVT DEEP VEIN THROMBOSIS

A clot in a deep vein — usually the calf or thigh.

Blood stagnates, clots, and occludes flow back to the heart. The leg becomes swollen, warm, red, and painful on the affected side only.

Why it matters: A piece of that clot can break loose, travel through the right heart, and lodge in the lungs — becoming a **pulmonary embolism**.

PE PULMONARY EMBOLISM

A clot blocking a pulmonary artery — a medical emergency.

Usually originates from a DVT. Blocks gas exchange, strains the right heart, and drops oxygenation fast.

Why it matters: **Sudden dyspnea + pleuritic chest pain** in a patient with any clot risk factor = call the rapid response. PE is a leading cause of preventable inpatient death.

02 Pathophysiology — Virchow's Triad

THE 3 INGREDIENTS FOR A CLOT

VIRCHOW'S TRIAD · "SHE FORMS A CLOT"

Stasis + Hypercoagulability + Endothelial injury → THROMBUS

Venous Stasis

Blood pools from immobility, long flights, bed rest, heart failure, pregnancy, or varicose veins.

+

Hypercoagulability

Blood clots too easily — cancer, oral contraceptives / estrogen, pregnancy, smoking, dehydration, inherited disorders (Factor V Leiden).

+

Endothelial Injury

Vessel wall damage from surgery (esp. orthopedic), trauma, fractures, central lines, IV drug use.

DVT → PE Cascade

STEP 1
Triad factor triggers clot in deep leg vein

→

STEP 2
Clot fragments dislodge & travel up IVC

→

STEP 3
Passes through R atrium → R ventricle → pulmonary artery

→

STEP 4
Occlusion → ↓ gas exchange, ↑ RV strain, hypoxemia

03 Signs & Symptoms

DVT VS PE · RED FLAGS HIGHLIGHTED

Category	DVT (leg)	PE (lung)
Onset	Gradual over hours–days	RED FLAG **SUDDEN** — classic NCLEX cue
Pain	Calf / thigh pain, tenderness, heaviness; worse with dorsiflexion (Homan's sign — present but unreliable)	Sharp, **pleuritic** chest pain (worse with deep breath or cough)
Breathing	Not affected	**Dyspnea**, tachypnea, hypoxemia (↓ SpO_2), possible hemoptysis (blood-tinged sputum)
Skin / Vein	**UNILATERAL** swelling, warmth, redness, palpable cord; >3 cm calf-circumference difference	Cyanosis, diaphoresis, pallor
Heart	Normal	Tachycardia, hypotension (massive PE), JVD, S3 / loud P2
Mental status	Normal	Restlessness, anxiety, **impending doom**, confusion, syncope
Labs / Imaging	↑ D-dimer · Duplex (Doppler) ultrasound = gold standard · venography	↑ D-dimer · **CT pulmonary angiography (CTPA)** = gold standard · V/Q scan if contrast contraindicated · ABG: respiratory alkalosis + hypoxemia early

04 Risk Factors at a Glance

KNOW YOUR HIGH-RISK PATIENT

Stasis

- Post-op (orthopedic esp. hip/knee)
- Prolonged bed rest / immobility
- Long flights or car rides
- Heart failure, stroke, paralysis
- Obesity, pregnancy
- Varicose veins

Hypercoagulability

- Cancer & chemotherapy
- Oral contraceptives / HRT / estrogen
- Pregnancy & postpartum (≤6 wks)
- Smoking
- Dehydration
- Factor V Leiden, antiphospholipid syndrome

Endothelial injury

- Surgery (abdominal, pelvic, ortho)
- Trauma, fractures (esp. femur, pelvis)
- Central venous catheters / PICC
- IV drug abuse
- Sepsis / inflammation
- Prior DVT/PE

05 Priority Nursing Interventions

ABCS · SAFETY · NCLEX PRIORITIZATION

A DVT — Acute Management

- ✓ **Bed rest** initially (per HCP order) — reduces risk of clot dislodging → PE
- ✓ **Elevate** the affected extremity above heart level to reduce edema
- ✓ **Measure calf circumference** daily at the same marked spot — track progression
- ✓ Apply **warm, moist heat** as ordered (relieves pain/inflammation)
- ✓ Administer prescribed **anticoagulants** (heparin drip, enoxaparin, then warfarin or DOAC)
- ✓ Monitor for signs of PE: sudden dyspnea, chest pain, tachycardia, hypoxemia
- ✓ Assess for bleeding (gums, stool, urine, bruising, neuro changes)
- ✗ **DO NOT massage** the affected leg — dislodges the clot → PE
- ✗ **DO NOT** use knee gatch or cross legs

B PE — Emergency Response (ABCs!)

- ! **CALL RAPID RESPONSE** — PE is a true emergency
- ✓ **High-Fowler's** position (unless hypotensive) — maximizes lung expansion
- ✓ **O_2** via non-rebreather → titrate to SpO_2 > 94%
- ✓ Establish **2 large-bore IVs**; begin IV fluids if hypotensive
- ✓ Continuous **cardiac monitor, pulse ox, VS q15min**

- ✓ Prepare for **heparin drip, thrombolytics (tPA)**, or embolectomy
- ✓ Obtain ABG, D-dimer, CTPA, ECG (S1Q3T3 pattern possible)
- ✓ Stay with the patient — anxiety worsens oxygen demand
- ✗ **DO NOT** leave the patient; **DO NOT** give thrombolytics if active bleeding, recent stroke/surgery

C Prevention — The Real Win

- ✓ **Early ambulation** after surgery — the #1 prevention
- ✓ **Sequential compression devices (SCDs)** in bed-bound patients — remove daily to inspect skin
- ✓ **TED / anti-embolism stockings** — measure and apply correctly
- ✓ Teach **leg / ankle pumping exercises** q1–2h while awake
- ✓ Encourage **hydration** (prevents hemoconcentration)
- ✓ Prophylactic low-dose **enoxaparin** or heparin per protocol
- ✗ **DO NOT** place pillows under knees (compresses popliteal vein)

06 Pharmacology — Anticoagulants & Thrombolytics

LABS · ANTIDOTES · NURSING PEARLS

PARENTERAL ANTICOAGULANT

Heparin (IV/SQ)

Action: Enhances antithrombin III → inactivates thrombin & factor Xa. Does not dissolve existing clots — prevents new ones.

Monitor: `aPTT 46–70 sec` (1.5–2.5× control) · `Platelets` (HIT risk)

ORAL ANTICOAGULANT (LONG-TERM)

Warfarin (Coumadin)

Action: Vitamin K antagonist → blocks synthesis of clotting factors II, VII, IX, X.

Monitor: `PT` `INR 2.0–3.0` (2.5–3.5 for mechanical valves)

Onset: 3–5 days — overlap with heparin or LMWH until therapeutic

Side effects: Bleeding, HIT (heparin-induced thrombocytopenia — platelets < 150,000 or drop ≥ 50%)

Nursing: IV pump required for drip · no IM injections · soft toothbrush · electric razor

ANTIDOTE
PROTAMINE SULFATE — 1 mg per 100 units heparin

Nursing: Teach **consistent** vit-K intake (not "avoid" — don't fluctuate). Interacts with MANY drugs & foods. No herbal supplements (ginkgo, garlic, ginseng).

ANTIDOTE
VITAMIN K (PHYTONADIONE) · FFP for emergent reversal

LOW-MOLECULAR-WEIGHT HEPARIN

Enoxaparin (Lovenox)

Route: SQ, **abdomen** (2" from umbilicus)

Monitor: No routine aPTT needed · baseline CBC, creatinine

Nursing: Do NOT expel air bubble · do NOT aspirate · do NOT rub/massage site · rotate sites

ANTIDOTE: Protamine (partial reversal only)

DIRECT ORAL ANTICOAGULANTS

DOACs — Rivaroxaban, Apixaban, Dabigatran

Action: Direct factor Xa inhibitors (-xabans) or direct thrombin inhibitor (dabigatran)

Monitor: No routine labs · renal & hepatic function at baseline

Nursing: Fewer interactions than warfarin · teach bleeding precautions · take with food (rivaroxaban)

ANTIDOTES: Andexanet alfa (Xa); Idarucizumab (dabigatran)

THROMBOLYTIC (CLOT BUSTER)

Alteplase (tPA) — massive PE only

Action: Converts plasminogen → plasmin → **dissolves existing clot**

Use: Hemodynamically unstable / massive PE

Contraindications: Active bleeding, recent stroke/surgery (<10 days), severe HTN, intracranial mass

Nursing: Minimize punctures · monitor for bleeding q15min · neuro checks

REVERSAL: Aminocaproic acid · stop infusion · FFP

07 NCLEX Test Traps

WHERE STUDENTS LOSE POINTS

TRAP 01

"Massage the leg to relieve DVT pain"

NEVER. Massage dislodges the clot → PE. Correct answer: elevate, warm compress, rest.

TRAP 02

Bilateral vs unilateral swelling

DVT = **UNILATERAL** warmth/swelling. Bilateral edema suggests CHF or fluid overload — not DVT.

TRAP 03

Heparin uses PT? No — aPTT.

Heparin → aPTT (both have "a"s). **Warfarin → PT/INR**. Mixing these up is a classic distractor.

TRAP 04

"Avoid all leafy greens on warfarin"

WRONG. Teach **consistent** intake — don't yo-yo vitamin K. Sudden changes destabilize INR.

TRAP 05

Aspirating Lovenox / expelling air

Do NOT aspirate, do NOT expel the air bubble (it seals in the dose), do NOT massage the site. Give in the **love handles** (abdomen).

TRAP 06

Sudden dyspnea in post-op patient

Think PE first. Even without classic leg signs. Post-op, immobile, or orthopedic patients are at very high risk.

TRAP 07

"Give heparin IM for faster action"

NEVER IM. Heparin is IV (continuous) or SQ (subcutaneous, abdomen). IM causes hematoma.

TRAP 08

Homan's sign as the diagnostic

Homan's (calf pain on dorsiflexion) is **unreliable** and not recommended as a diagnostic — but may still appear on NCLEX. Duplex ultrasound is the gold standard.

08 NCJMM Clinical Judgment Framework

RECOGNIZE → ANALYZE → PRIORITIZE → EVALUATE

RECOGNIZE CUES

What stands out?

- → Unilateral calf swelling, warmth, redness
- → Sudden dyspnea + pleuritic chest pain
- → SpO_2 drop, tachycardia, anxiety
- → Hemoptysis, impending doom
- → Post-op day 2–5 immobility

ANALYZE CUES

What do they mean?

- → Virchow's triad factor present?
- → Unilateral = vascular (DVT) vs bilateral = fluid overload
- → Sudden onset respiratory change = think PE over pneumonia
- → ↑ D-dimer + symptoms → imaging needed

PRIORITIZE

What do I do first?

- → **ABCs:** O_2, high-Fowler's, assess airway/breathing
- → Rapid response for suspected PE
- → Hold if bleeding; notify HCP
- → DVT: stop ambulation, bed rest, elevate
- → Give anticoagulant — never massage

EVALUATE

Did it work?

- → $SpO_2 \geq 94\%$, RR & HR trending down
- → Calf circumference unchanged or smaller
- → INR 2–3 / aPTT 46–70 sec therapeutic
- → No bleeding (gums, stool, urine, neuro)
- → Patient verbalizes bleeding precautions

09 Patient Education

DISCHARGE TEACHING ESSENTIALS

Bleeding Precautions

- Use a soft-bristled toothbrush; avoid flossing too vigorously

Warfarin & Daily Living

- Electric razor instead of a blade
- Avoid contact sports, activities with fall risk
- Apply firm pressure 5–10 min to any cut
- Report black/tarry stools, blood in urine, nosebleeds, unusual bruising
- Report headache, vision changes, confusion (intracranial bleed)
- Wear **medical alert ID** indicating anticoagulant use
- Tell ALL providers (dentist, surgeon) about anticoagulant

- **Consistent** vitamin K intake — don't binge or eliminate leafy greens (kale, spinach, broccoli, Brussels sprouts)
- Avoid grapefruit juice, cranberry juice in large amounts
- Limit alcohol (potentiates warfarin)
- Take at the same time each day
- Do NOT double up on missed doses
- Keep ALL lab appointments for INR monitoring
- Avoid NSAIDs, aspirin, herbal supplements without HCP approval
- **Prevent**: hydrate, walk hourly on flights, avoid crossing legs, wear stockings if prescribed

10 Memory Boosters & Mnemonics

PATTERN RECOGNITION · QUICK RECALL

"SHE" — Virchow's Triad

S **Stasis** — immobility, bed rest, long flights, heart failure

H **Hypercoagulability** — cancer, OCPs, pregnancy, smoking

E **Endothelial injury** — surgery, trauma, central lines

"THROMBUS" — Recognizing PE

T **Tachycardia** + tachypnea

H **Hypoxemia** / hemoptysis

R **Respiratory** distress — sudden dyspnea

O **Oh-no** anxiety / impending doom

M Massive clot risk — ↓ BP in severe PE

B **Blood-tinged** sputum

U **Unilateral** calf swelling (the DVT)

S **Sudden** pleuritic chest pain

💊 Match the Drug to the Lab

H **Heparin** → **aPTT** (both have "a") · works fast · antidote **Protamine**

W **Warfarin** → **PT / INR** · "Warfarin WAITS" (slow onset) · antidote **Vitamin K**

L **Lovenox** → **love handles** (abdomen, SQ, don't expel bubble)

⚠️ "DO NOT" — Clot Safety Rules

1. DO NOT **massage** a painful, swollen calf
2. DO NOT **cross legs** or use the knee gatch
3. DO NOT **aspirate** or massage after Lovenox
4. DO NOT give **heparin IM** — ever
5. DO NOT **leave** a patient with suspected PE

DVT & PE — Master This, Save a Life

Recognize the unilateral leg · Act on sudden dyspnea · Know your anticoagulant labs & antidotes · Never massage a clot.