

NEUROLOGICAL SYSTEM

NGN NCLEX 2026

HIGH-YIELD TOPIC

STROKE

Ischemic vs Hemorrhagic

Cerebrovascular Accident (CVA) · Brain Attack · 5th Leading Cause of Death in U.S.

1 Definition & Overview

Ischemic Stroke

87%

A **blocked** cerebral artery (clot) cuts off blood flow to the brain. Two types:

- **Thrombotic:** clot forms **IN** the brain vessel (often from atherosclerosis)
- **Embolic:** clot travels **TO** the brain (often from A-fib/heart)

Hemorrhagic Stroke

13%

A **ruptured** cerebral vessel bleeds into brain tissue. Two types:

- **Intracerebral:** bleeding **INTO** brain tissue (often from uncontrolled HTN)
- **Subarachnoid:** bleeding **around** brain (often from ruptured aneurysm)

🕒 **TIME IS BRAIN · 1.9 MILLION NEURONS DIE EVERY MINUTE UNTREATED**

2 Pathophysiology (Simplified)



Ischemic Pathway

- 1 Thrombus or embolus lodges in cerebral artery



Hemorrhagic Pathway

- 1 Weakened vessel (HTN/aneurysm/AVM) ruptures

2 Blood flow to brain tissue is blocked

3 Oxygen/glucose deprivation in ischemic zone

4 Cellular anaerobic metabolism → lactic acid

5 Neuronal death → infarction → permanent deficit

2 Blood leaks INTO brain tissue or subarachnoid space

3 Hematoma forms → compresses brain tissue

4 Increased intracranial pressure (ICP)

5 Brain herniation risk → death if uncontrolled

⚡ **TIA (Transient Ischemic Attack):** A "mini-stroke" — temporary blockage with symptoms that resolve within 24 hours (usually <1 hour), no permanent damage on imaging. **WARNING:** A TIA is a RED ALERT for an impending full stroke — treat as emergency.

3 Signs & Symptoms



B·E·F·A·S·T — Public Stroke Screen

B

BALANCE

Sudden dizziness or loss of balance

E

EYES

Sudden vision loss/blurring

F

FACE

Facial droop (ask to smile)

A

ARM

Arm weakness/drift (raise both arms)

S

SPEECH

Slurred/garbled speech (repeat phrase)

T

TIME

Call 911 NOW — note onset time

Ischemic Stroke Clues

- Symptom onset gradual/stepwise over minutes–hours
- Often occurs during sleep or upon waking
- Contralateral hemiparesis/hemiplegia

Hemorrhagic Stroke Clues

- Symptom onset sudden and dramatic
- Often during activity/stress/straining



"Worst headache of my life" 🚑

- ▶ Aphasia (expressive or receptive)
- ▶ Dysarthria · dysphagia
- ▶ Homonymous hemianopia (loss of same visual field both eyes)
- ▶ Confusion, memory loss

Usually NO severe headache at onset

Sudden ↓ LOC or coma

- ▶ Vomiting (projectile)
- ▶ Nuchal rigidity (stiff neck — SAH)
- ▶ Seizures (more common than ischemic)
- Severe BP elevation (often >220/120)
- ▶ Cushing's triad (late ICP: ↑BP, ↓HR, irregular RR)

Hemisphere-Specific Deficits (either stroke type)

Feature	LEFT Hemisphere Stroke	RIGHT Hemisphere Stroke
Motor/sensory	RIGHT-sided weakness	LEFT-sided weakness
Language	Aphasia (expressive/receptive) — language center	Language usually intact
Behavior	Slow, cautious, anxious	Impulsive, quick, overestimates ability (SAFETY RISK)
Awareness	Aware of deficits → depression common	Unilateral neglect (ignores LEFT side) · denies deficit
Memory	Intellectual/math deficits	Short-term memory deficits · spatial-perceptual issues

4 Priority Nursing Interventions

★ AIRWAY · BREATHING · CIRCULATION · DISABILITY (GCS/NIHSS) · EXPOSURE ★

Universal Priorities (Both Stroke Types)

1. **Establish/maintain airway** — risk of aspiration from dysphagia; suction available at bedside
2. **Obtain CT scan STAT without contrast** — this MUST happen before ANY treatment to differentiate ischemic vs hemorrhagic
3. **Establish "Last Known Well" time** — critical for tPA eligibility (not the time symptoms were noticed, but when pt was last seen normal)
4. **NPO until swallow screen passed** — no food/water/meds by mouth until cleared
5. **NIH Stroke Scale (NIHSS)** every 1–2 hrs × 24 hrs, then per protocol

6. **Neuro checks q1h** × 24 hrs: LOC, pupils, motor, speech, GCS
7. **Monitor for ↑ ICP:** ↓ LOC, unequal pupils, Cushing's triad, vomiting, posturing
8. **Seizure precautions** — padded rails, O₂ and suction ready
9. **DVT prevention:** SCDs, reposition q2h (pharmacologic varies by type)

■ Ischemic-Specific

1. **HOB FLAT (0–15°)** initially to maximize cerebral perfusion (unless ↑ICP or aspiration risk)
2. **Permissive hypertension:** do NOT aggressively lower BP unless >220/120 (or >185/110 if tPA candidate)
3. **Administer tPA (alteplase)** within 3–4.5 hrs of onset IF eligible
4. Prepare for mechanical thrombectomy (up to 24 hrs for large-vessel occlusion)
5. Start antiplatelet (aspirin) AFTER 24 hrs post-tPA (or immediately if no tPA)
6. Anticoagulation if cardioembolic (e.g., A-fib) — after acute phase
7. Maintain O₂ sat >94%
8. Maintain normothermia (fever worsens outcomes)
9. Glucose 140–180 mg/dL (hyper AND hypoglycemia worsen injury)

⚠ tPA candidate? NO anticoagulants, antiplatelets, heparin, or IM injections for 24 hrs after.

■ Hemorrhagic-Specific

1. **HOB 30°** (elevate) to promote venous drainage and ↓ ICP
2. **AGGRESSIVE BP control** — target SBP <140–160 mmHg (nicardipine, labetalol drips)
3. Reverse anticoagulation: Vitamin K, PCC (Kcentra), FFP, platelets, protamine PRN
4. Prepare for surgery: clipping/coiling aneurysm, craniotomy, hematoma evacuation
5. **Nimodipine** for SAH × 21 days (prevents vasospasm)
6. Stool softeners — prevent Valsalva (spikes ICP → re-bleed)
7. Quiet, dark, low-stimulation environment (esp. SAH)
8. Avoid hip flexion, coughing, straining
9. Only SCDs for DVT — NO pharmacologic anticoagulation in acute phase

⚠ ABSOLUTELY NO tPA, NO aspirin, NO heparin, NO warfarin during acute phase.

● NEVER DO THIS — Stroke Edition

- ✗ Give ANY medication or fluid by mouth BEFORE swallow screen passes
- ✗ Administer tPA before CT scan confirms ischemic stroke (no bleed)
- ✗ Administer aspirin/heparin/warfarin for hemorrhagic stroke in acute phase
- ✗ Aggressively lower BP in ischemic stroke (the brain needs pressure to perfuse around the clot — permissive HTN up to 220/120)
- ✗ Place BP cuff, start IV, or draw labs from the affected (weak) side

- ✗ Leave the client unattended during feeding
- ✗ Approach left-neglect (right-sided stroke) clients from their neglected side without announcing yourself
- ✗ Delay imaging — "Time is brain"

5 Pharmacology

tPA (Alteplase) — The Clot-Buster

IV thrombolytic that dissolves the clot in ischemic stroke. **Only treatment that can reverse neurological deficits if given in time.**

3 – 4.5 hour window

from "last known well" time · up to 24 hrs for endovascular thrombectomy in select cases

✓ INCLUDE (CANDIDATES)

- ✓ Ischemic stroke confirmed by CT
- ✓ Age ≥ 18
- ✓ Measurable neuro deficit
- ✓ Within 3 hrs (extended to 4.5 hrs in select pts)
- ✓ BP < 185/110 (treat to this range first if needed)

✗ EXCLUDE (CONTRAINDICATIONS)

- ✗ Any intracranial hemorrhage on CT
- ✗ Active internal bleeding
- ✗ Recent surgery/trauma/stroke within 3 mo
- ✗ INR > 1.7 · platelets < 100,000
- ✗ BP > 185/110 uncontrolled
- ✗ Glucose < 50 or > 400 mg/dL
- ✗ Seizure at stroke onset

DRUG / CLASS	MECHANISM	USE	SIDE EFFECTS	NURSING CONSIDERATIONS
Alteplase (tPA) <i>Thrombolytic</i>	Converts plasminogen to plasmin → dissolves fibrin clot	Acute ischemic stroke within 3–4.5 hrs of onset	Bleeding (intracranial #1), angioedema, hypotension	2 large-bore IVs · No invasive procedures · BP q15 min × 2 hrs · NO antiplatelets/anticoagulants × 24 hrs · Neuro checks q15 min
Aspirin <i>Antiplatelet</i>	Inhibits COX-1 → blocks platelet aggregation	Ischemic stroke prevention and 24+ hrs post-tPA	GI bleeding, tinnitus (toxicity), bruising	Give with food · hold if active bleed · delay 24 hrs post-tPA
Clopidogrel <i>Antiplatelet</i>	Blocks ADP receptor on platelets	Secondary stroke prevention (ischemic)	Bleeding, rash, bruising	Monitor for bleeding · hold 5–7 days before surgery

DRUG / CLASS	MECHANISM	USE	SIDE EFFECTS	NURSING CONSIDERATIONS
Warfarin <i>Anticoagulant</i>	Inhibits Vit K-dependent clotting factors (II, VII, IX, X)	Long-term A-fib stroke prevention	Bleeding, skin necrosis, teratogenic	Monitor INR (goal 2–3) · antidote: Vitamin K · teach consistent vit K intake
Heparin <i>Anticoagulant</i>	Potentiates antithrombin III	Selected cardioembolic cases (NOT routine acute)	HIT, bleeding	Monitor aPTT · antidote: protamine sulfate · NEVER in hemorrhagic
Nimodipine <i>Calcium channel blocker</i>	Cerebral-selective vasodilator	Prevent vasospasm in SAH × 21 days	Hypotension, headache, flushing	Give on empty stomach · monitor BP closely · oral route only (NEVER IV)
Labetalol / Nicardipine <i>Antihypertensives</i>	Beta-blocker / CCB — lower BP	Aggressive BP control in hemorrhagic stroke	Bradycardia (labetalol), hypotension	Titrate by BP · continuous BP monitoring · hold if HR < 60
Mannitol <i>Osmotic diuretic</i>	Pulls fluid from brain into vasculature	↓ ICP from cerebral edema	Dehydration, electrolyte imbalance, CHF	Use filter needle · monitor I&O, serum osmolality · crystals = warm & filter
Atorvastatin <i>Statin</i>	Inhibits HMG-CoA reductase → ↓ cholesterol	Secondary stroke prevention	Myopathy, ↑ liver enzymes, rhabdomyolysis	Monitor LFTs · report muscle pain/dark urine · give at bedtime

6

NCLEX Test Traps ⚠

TRAP #1

Patient arrives with one-sided weakness and slurred speech. What's the FIRST action?

CT scan of the head — NOT tPA. You MUST rule out hemorrhagic stroke before giving any thrombolytic. tPA given to a bleeder = catastrophic.

TRAP #2

Ischemic stroke patient's BP is 200/110. What do you do?

Leave it alone (if not tPA candidate). In ischemic stroke, permissive hypertension up to 220/120 maintains cerebral perfusion around the clot. Lowering BP too fast worsens the infarct. (Only lower to <185/110 if tPA is planned.)

TRAP #3

Hemorrhagic stroke patient's BP is 200/110. What do you do?

Lower it aggressively. In hemorrhagic stroke, HIGH BP worsens the bleed. Target SBP <140–160 with labetalol or nicardipine drip.

TRAP #4

HOB position — flat or elevated?

It DEPENDS on stroke type! Ischemic = flat (0–15°) to perfuse brain. Hemorrhagic = 30° elevated to drain blood and reduce ICP. *Never* pick a one-size answer.

TRAP #5

Nurse finds patient with right-sided weakness trying to get out of bed alone. Which hemisphere was affected?

Left hemisphere stroke causing RIGHT-sided weakness — BUT the impulsive unsafe behavior is classic of RIGHT-hemisphere strokes (LEFT-sided weakness). Watch for the mismatch: right-brain patients overestimate ability and fall.

TRAP #6

Nimodipine is ordered — can you give it IV since the patient is NPO?

NEVER IV. Nimodipine is ORAL only. IV administration has caused death. If patient is NPO, the capsule must be punctured and given via NG tube with saline flush.

TRAP #7

Which is a LATE sign of increased ICP?

Cushing's Triad: ↑BP (widening pulse pressure), ↓HR, irregular respirations. This is a pre-herniation sign — notify provider IMMEDIATELY. Early signs are changes in LOC, headache, and pupil changes.

TRAP #8

Left hemisphere stroke with expressive aphasia — how do you communicate?

Ask yes/no questions · use picture boards · allow time. Do NOT shout (hearing is intact). Do NOT finish sentences for them. Speak slowly and face the patient.

TRAP #9

Patient swallow screen not yet done — ordered meds are due. What do you do?

HOLD all PO meds and notify provider for IV/alternate route. Never assume it's safe. Aspiration pneumonia is a top cause of post-stroke death.

TRAP #10

Why is a stool softener (docusate) priority in hemorrhagic stroke?

To prevent Valsalva maneuver. Straining ↑ ICP and can cause re-bleeding. Same reason we avoid coughing, hip flexion, and isometric exercises.

7 Patient Education

Lifestyle & Prevention

- ✓ Call 911 at the FIRST sign of BE-FAST symptoms — never "wait and see"
- ✓ Control BP: check daily, take meds as prescribed, limit sodium to <2,300 mg/day (DASH diet)
- ✓ Stop smoking (doubles stroke risk) · avoid secondhand smoke
- ✓ Manage A-fib, diabetes, and cholesterol strictly
- ✓ Limit alcohol: ≤1 drink/day (women), ≤2 drinks/day (men)
- ✓ Exercise 30 min × 5 days/week (cleared by provider)
- ✓ Maintain healthy weight · manage sleep apnea

Medication Safety

- ✓ Warfarin: monitor INR, avoid sudden changes in vit K (leafy greens) — keep intake consistent
- ✓ Antiplatelets/anticoagulants: use soft toothbrush · electric razor · no aspirin/NSAIDs unless cleared
- ✓ Report: unusual bruising, black tarry stools, nosebleeds, blood in urine
- ✓ Wear medical alert bracelet
- ✓ Never skip or double up on BP meds
- ✓ Keep a current medication list at all times

Home Safety & Rehab

- ✓ Remove throw rugs, secure handrails, night lights
- ✓ Use assistive devices (cane, walker) as prescribed · physical therapy is KEY
- ✓ For left neglect: teach to scan the neglected side, approach pt from unaffected side initially
- ✓ For dysphagia: upright 90° when eating, chin tuck, thickened liquids, small bites
- ✓ Speech therapy for aphasia — communication boards at home
- ✓ Depression screening — very common post-stroke

When to Call 911

- ✓ Any new BE-FAST sign — even if it resolves (could be TIA warning)
- ✓ Worst headache of life / sudden severe headache
- ✓ Sudden confusion, trouble seeing, trouble walking
- ✓ Seizure activity
- ✓ Uncontrolled bleeding that doesn't stop with 10 min of pressure
- ✓ Chest pain / difficulty breathing

✓ Driving: must be cleared by provider (vision, cognition, reaction time)

8 NCJMM Clinical Judgment Framework

Recognize → Analyze → Prioritize → Evaluate

RECOGNIZE

Identify BE-FAST cues. Note exact "last known well" time. Differentiate stroke type from history (sudden HA + ↓LOC = bleed; gradual deficit = ischemic).

ANALYZE

Connect cues: A-fib + sudden weakness = embolic ischemic · uncontrolled HTN + severe HA + vomiting = hemorrhagic. Rule out mimics (hypoglycemia, Bell's palsy).

PRIORITIZE

ABC first → CT scan → NIHSS → swallow screen → position HOB by type → BP management by type → tPA if eligible (ischemic only).

EVALUATE

Reassess LOC, GCS, NIHSS, motor/speech, pupils, BP, and for signs of ↑ICP or bleeding. Improvement = effective. Decline = escalate immediately.

9 Memory Boosters

"The 'H' Rules" — Hemorrhagic Stroke

H igh BP → lower aggressively

H OB at 30°

H eadache (worst of life)

H old all blood thinners

H ush — quiet dark room (SAH)

"Ischemic = I CLOT"

I — Ischemia from blocked vessel

C — Check CT first, then tPA

L — Let BP ride (permissive HTN)

O — O₂ >94%, HOB flat

T — Time window: 3–4.5 hours

 **Right-Brain Stroke: "R-I-G-H-T"**

 **Left-Brain Stroke: "L-E-F-T"**

R — Reckless / impulsive

I — Ignores left side (neglect)

G — Gross motor deficit (left side)

H — "Happy"/unaware of deficit

T — Trouble with spatial tasks

L — Language deficit (aphasia)

E — Emotional (anxious, depressed)

F — Functions on right side affected

T — Thinks slowly, cautious



tPA Contraindications: "BLEED"

B — Bleeding (active or recent)

L — Labs abnormal ($\uparrow$ INR, $\downarrow$ plts)

E — Elevated BP ($>185/110$)

E — Earlier stroke/surgery <3 months

D — Deadly hemorrhage on CT



Cushing's Triad (Late ICP)

$\uparrow$ BP (widening pulse pressure)

$\downarrow$ HR (bradycardia)

$\leftrightarrow$ Irregular respirations

This is LATE — herniation coming



At-a-Glance Comparison

Feature	ISCHEMIC (87%)	HEMORRHAGIC (13%)
Cause	Clot blocks vessel	Vessel ruptures / bleeds
Onset	Gradual, stepwise	Sudden, dramatic
Headache	Usually absent	"Worst ever" — severe
LOC	Usually maintained	Often rapidly decreased
Vomiting	Rare	Common (projectile)

BP Goal	Permissive HTN ($\leq 220/120$)	Aggressive ↓ ($<140-160$ SBP)
HOB Position	Flat to 15°	Elevated 30°
tPA	YES — if within window	ABSOLUTELY NOT
Antiplatelets/Anticoag	Yes (timing varies)	NO in acute phase · REVERSE if already on
Surgery	Thrombectomy (select)	Clipping, coiling, evacuation
Unique drug	tPA (alteplase)	Nimodipine (SAH × 21 days)
Top risk factor	A-fib · atherosclerosis · HTN	Uncontrolled HTN · aneurysm · AVM

NGN NCLEX 2026 · Neurological Emergencies · Clinical Judgment Measurement Model

Remember: *Time is Brain*. Every minute counts. CT FIRST. Type determines treatment.