NGN NCLEX 2026 · NEUROLOGICAL SYSTEM

Brainstem Nursing Assessment

A focused, high-yield review of brainstem anatomy, reflex testing, herniation cues, and clinical judgment priorities for the unresponsive or neurologically deteriorating client.

DIANE'S NGN NCLEX 2026 VISUAL STUDY LIBRARY

📚 **Source disclosure:** This topic was not present in your uploaded reference notes. Content has been drawn from standard NGN NCLEX 2026 references including *Saunders Comprehensive Review for the NCLEX-RN*, ATI Neurological Review Module, Lippincott Manual of Nursing Practice, and AANN brain-death assessment guidelines.

1

Definition & Overview

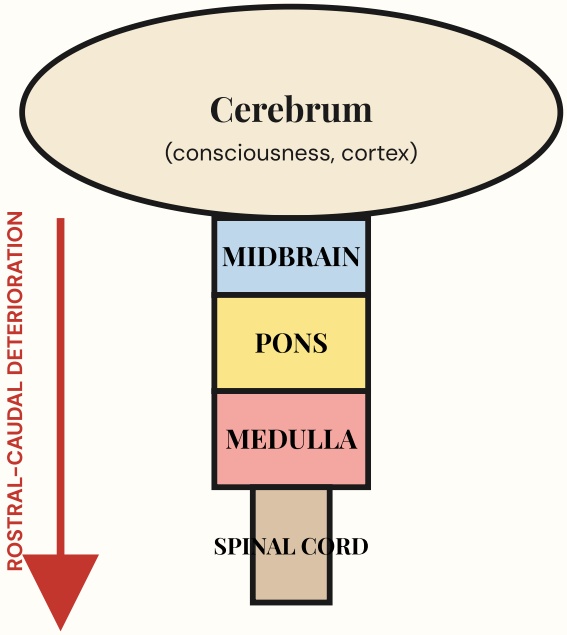
- The **brainstem** is the lowest portion of the brain, connecting the cerebrum to the spinal cord. It houses cranial nerve nuclei **III–XII** and controls all vital, involuntary life functions.
- It contains three regions (top → bottom): **Midbrain → Pons → Medulla oblongata**.
- Nursing assessment of the brainstem is performed in the **unresponsive, comatose, or neurologically declining client** to detect **herniation, brain death, or rising ICP**. Loss of brainstem reflexes is a late, ominous sign.

VITAL FUNCTIONS | CRANIAL NERVE HUB | LOSS = CRITICAL

2

Pathophysiology & Anatomy

The brainstem is organized vertically. Each level controls specific reflexes and vital functions — when ICP rises, dysfunction descends from **top → bottom**, a process called **rostral-caudal deterioration**.



CN III, IV
→ Pupillary reflex
→ Eye movement

CN V, VI, VII, VIII
→ Corneal reflex
→ Doll's eyes

CN IX, X, XI, XII
→ Gag, cough, swallow
→ HR, BP, breathing

Injury / Bleed / Tumor
↑ Pressure inside the skull (rigid box) — Monro-Kellie doctrine

↓

Cortex / Diencephalon fails first
LOC declines → Cheyne-Stokes respirations → decorticate posturing

↓

Midbrain compression
Fixed/dilated pupil → loss of pupillary reflex → decerebrate posturing

↓

Pons / Medulla failure
Loss of corneal/gag reflex → ataxic respirations → Cushing's triad → apnea

3

Signs & Symptoms — Early vs Late

🟢 EARLY (RECOVERABLE)

- ↓ **LOC** — confusion, lethargy, drowsiness *(EARLIEST and most sensitive sign)*
- Restlessness, irritability
- Mild headache
- Subtle pupil sluggishness
- One-sided weakness
- Slurred speech
- Slight ↑ BP, slight ↓ HR

🔴 LATE (BRAINSTEM COMPRESSION)

- **Fixed, dilated pupils** (uni- or bilateral)
- **Cushing's triad** ↑ BP w/ widening pulse pressure + ↓ HR + irregular respirations
- **Decorticate → Decerebrate → Flaccid** posturing
- Loss of corneal, gag, cough reflex
- Ataxic (Biot's) breathing → apnea
- GCS ≤ 8 (intubate!)
- Projectile vomiting (no nausea)

🚨 **RED FLAG — CUSHING'S TRIAD = LATE HERNIATION:** Bradycardia + Hypertension with widening pulse pressure + Irregular respirations. The body's last attempt to perfuse a dying brain. *Notify provider IMMEDIATELY.*

🚨 **RED FLAG — A "BLOWN PUPIL":** Sudden unilateral fixed/dilated pupil = uncal herniation pressing on CN III. Surgical emergency.

4

Priority Nursing Assessment Techniques

Assess in **ABC + neuro order**. Each reflex tests a specific brainstem level — absent reflex = damage at that level.

REFLEX / TEST	CRANIAL NERVE(S)	BRAINSTEM LEVEL	HOW TO ASSESS	ABNORMAL = ?
Pupillary Light	CN II, III	Midbrain	Shine penlight; check direct + consensual response, size, equality (PERRLA)	Fixed/dilated, sluggish, unequal >1 mm
Corneal	CN V, VII	Pons	Touch cornea with cotton wisp from the side — should blink bilaterally	No blink = pontine damage
Oculocephalic (Doll's Eyes)	CN III, VI, VIII	Pons / Midbrain	**Only if C-spine cleared!** Rotate head side-to-side; eyes should move opposite to head	Eyes move WITH head = abnormal
Oculovestibular (Cold Caloric)	CN VIII	Pons / Medulla	HCP instills 30–50 mL ice water in ear (intact TM, HOB 30°)	No eye deviation = severe brainstem injury
Gag / Cough	CN IX, X	Medulla	Tongue blade to posterior pharynx; suction stimulation	Absent = aspiration risk + medulla involvement
Motor Response (GCS-M)	Corticospinal tract	Cortex → Brainstem	Apply central painful stimulus (trapezius squeeze)	Decorticate → Decerebrate → Flaccid (worsening)
Respiratory Pattern	—	All levels	Observe rate, rhythm, depth for ≥1 min	See table below

RESPIRATORY PATTERNS & BRAINSTEM LEVEL

PATTERN	DESCRIPTION	LEVEL AFFECTED
Cheyne-Stokes	Crescendo-decrescendo with apnea pauses	Bilateral hemispheres / diencephalon
Central Neurogenic Hyperventilation	Sustained, rapid, deep breaths	Midbrain / upper pons
Apneustic	Prolonged inspiratory pauses	Lower pons
Ataxic (Biot's)	Completely irregular, unpredictable	Medulla — *impending death*
Apnea	No spontaneous breathing	Complete brainstem failure

PRIORITY NURSING INTERVENTIONS (ABC)

- **Airway:** GCS ≤ 8 → prepare for intubation. Maintain patent airway, oral airway PRN.
- **Breathing:** Apply O2 to maintain SpO2 > 95%; PaCO2 35–40 mmHg (avoid both hypo & hypercapnia).
- **Circulation:** Maintain SBP > 90 mmHg; treat hypotension aggressively (CPP = MAP - ICP).
- **Position:** HOB elevated 30°, head midline, neutral neck — promotes venous drainage and reduces ICP.
- **Monitor:** Neuro checks q1h (or per order); GCS, pupils, motor, vital signs, ICP if monitored.
- **Avoid ICP spikes:** No Valsalva, no clustering care, suction < 10 sec, no hip flexion, prevent shivering/fever.
- **Notify HCP immediately:** Any deterioration in LOC, new pupil change, posturing, Cushing's triad.

5

Pharmacology — ICP & Brainstem Support

DRUG / CLASS	MECHANISM	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Mannitol (osmotic diuretic)	Pulls fluid from brain tissue into vasculature → ↓ ICP	Hypotension, dehydration, electrolyte loss, rebound ICP, crystallization in line	Use **filter needle** (crystals!); monitor I&O, serum osmolality (goal 300–320), BUN/Cr
3% Hypertonic Saline	Osmotic shift; ↓ cerebral edema, ↑ MAP	Hypernatremia, pulmonary edema, central pontine myelinolysis (if too fast)	Central line preferred; monitor Na q4–6h; cap rise at ≤ 0.5 mEq/L/hr
Dexamethasone (corticosteroid)	↓ vasogenic edema (tumors, abscesses — NOT for trauma!)	Hyperglycemia, immunosuppression, GI bleed	Monitor BG, give with food/PPI, taper — never stop abruptly
Phenytoin / Levetiracetam	Seizure prophylaxis (post-TBI, tumor)	Phenytoin: gingival hyperplasia, ataxia, tox >20; Keppra: agitation, drowsy	Phenytoin level 10–20 mcg/mL; flush IV with NS only (not D5W)
Propofol (drip)	Sedation → ↓ cerebral metabolic demand → ↓ ICP	Hypotension, ↑ triglycerides, propofol infusion syndrome	Titrate to RASS; daily sedation holiday for neuro exam; monitor lipids
Acetaminophen	Antipyretic — fever raises cerebral metabolism & ICP	Hepatotoxicity > 4 g/day	Aggressively treat fever; cooling blanket if needed

BLACK BOX REMINDER: Avoid *narcotics and sedatives* when possible — they mask LOC, the EARLIEST sign of deterioration. If used, document baseline first.

6

NCLEX Test Traps ⚠️

✗ WRONG THINKING	✓ RIGHT THINKING
"Vital sign changes are the earliest sign of rising ICP."	**Change in LOC** is the EARLIEST and most sensitive sign. Cushing's triad is LATE.
"Decorticate posturing is worse than decerebrate."	**Decerebrate** (Extension) = deeper brainstem injury, worse prognosis than decorticate (flexion).
"Suction frequently to keep the airway clear."	Suction **< 10 seconds**, hyperoxygenate before/after — suctioning spikes ICP.
"Test doll's eyes on every comatose patient."	**Never** test oculocephalic reflex until **C-spine is cleared** — neck rotation can sever the cord.
"Pinpoint pupils mean the patient is fine."	**Pinpoint pupils** = **pontine hemorrhage** or opioid OD — always abnormal in altered LOC.
"Position with hips flexed for comfort."	Avoid hip flexion & head turning — both ↑ intra-abdominal/thoracic pressure → ↑ ICP. **Head midline, HOB 30°.**

7

Patient & Family Education

FOR THE FAMILY OF A COMATOSE CLIENT

- **Talk to the patient** — hearing is presumed intact even when unresponsive.
- Explain each procedure before performing it; orient with day, date, location.
- Avoid emotional/upsetting conversations at the bedside — stress can raise ICP.
- Encourage soft touch, low lighting, calm voice; cluster visits, allow rest periods.
- Report immediately: change in LOC, new vomiting, seizure, posturing, unequal pupils.

BRAIN DEATH & END-OF-LIFE COUNSELING

- Brain death = irreversible loss of **all brain & brainstem function**, including apnea.
- Confirmed by two physician exams plus apnea test; ancillary tests (EEG, cerebral blood flow) if needed.
- Once declared brain dead, the client is legally dead — even with a heartbeat on the monitor.
- Offer organ donation discussion via the Organ Procurement Organization (OPO) — *nurses do not approach the family about donation directly*.
- Support family with chaplain, social work, and clear, compassionate language.

FOR THE RECOVERING TBI CLIENT (DISCHARGE)

- No alcohol, no driving until cleared; avoid contact sports for 3–6 months.
- Return for: worsening headache, vomiting, vision changes, drowsiness, seizure, clear fluid from nose/ear.
- Fall precautions at home; assist devices PRN; cognitive rehab referral.

8

Memory Boosters & Mnemonics

MID · PONS · MED

Top-to-bottom brainstem: *M*idbrain → *P*ons → *M*edulla. Reflexes lost in this same order as ICP rises.

DECO = CORE · DECE = E xtend

Decorticate: arms flexed toward the *CORE* (chest). **Decerebrate:** arms *E*xtended out. Decerebrate is worse.

CUSHING'S = "HI-LO-IRR"

HIgh BP (widening pulse pressure) · **LO**w HR · **IRR**egular respirations. LATE sign of brainstem compression.

PERRLA

Pupils **E**qual, **R**ound, **R**eactive to **L**ight and **A**ccommodation — the standard pupil documentation.

GCS < 8 = INTUBATE

Glasgow Coma Scale score of 8 or less = airway is unprotected. Eye (4) + Verbal (5) + Motor (6) = 15 max.

AVPU (quick)

Alert · responsive to **V**oice · responsive to **P**ain · **U**nresponsive. Rapid bedside LOC check.

"PINPOINT = PONS"

Pinpoint pupils in altered LOC = pontine hemorrhage (until proven otherwise — also r/o opioid OD).

9

NCJMM Clinical Judgment Scenario

Case: A 42-year-old client was admitted 6 hours ago after an MVC with closed head injury. Initial GCS was 12. The nurse is performing the 2200 neuro check.

1

Recognize Cues

- GCS now 7 (was 12)
- Right pupil 6 mm, sluggish; Left pupil 3 mm, brisk
- BP 168/62 (was 128/78), HR 52 (was 88), RR irregular at 10
- Right arm extends to painful stimulus; left arm localizes
- SpO2 94% on 2 L NC; reports vomited × 1 without nausea

2

Analyze Cues

- **Cushing's triad** present (↑ BP w/ widening pulse pressure, ↓ HR, irregular RR) — LATE ICP sign
- Unilateral fixed/dilated right pupil → **uncal herniation** compressing right CN III
- Decerebrate posturing on right → brainstem (midbrain) involvement
- Projectile vomiting without nausea → classic for ↑ ICP
- GCS dropped 5 points → meets intubation threshold (≤ 8)

3

Prioritize Hypotheses

- **#1 PRIORITY:** Acute brainstem herniation from worsening intracranial hypertension
- #2: Impending respiratory failure / airway loss
- #3: Risk for seizure
- #4: Aspiration risk from vomiting + ↓ LOC

4

Generate Solutions

- Call rapid response / notify neurosurgery STAT
- Prepare for emergent intubation (GCS ≤ 8)
- Elevate HOB 30°, head midline, ensure neutral neck alignment
- Prepare IV mannitol or 3% saline per protocol
- Stat CT head; obtain ABG, CBC, BMP, coags, glucose
- Place patient NPO; prepare for OR (possible craniotomy)

5

Take Action

- Activate rapid response; notify provider with SBAR
- Maintain airway — apply 100% O2 via NRB, prepare BVM & intubation tray
- Position HOB 30°, head neutral midline, no hip flexion
- Suction PRN < 10 sec; hyperoxygenate before/after

- Establish 2nd large-bore IV; draw labs
- Administer mannitol 1 g/kg IV via filter needle as ordered
- Keep family informed; chaplain/social work to bedside

6

Evaluate Outcomes

- **Expected:** GCS stabilizes/improves; pupils equalize; BP/HR/RR return toward baseline; SpO2 ≥ 95% post-intubation; ICP < 20 mmHg if monitored
- **Concerning:** Bilateral fixed/dilated pupils, flaccid posturing, ataxic breathing → herniation progressing
- Reassess GCS, pupils, motor q15 min until stable
- Trend ICP, CPP (goal > 60 mmHg), MAP, serum sodium, osmolality
- Document response to each intervention; escalate if no improvement in 15–30 min