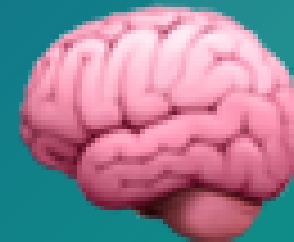


NGN NCLEX 2026 · NEUROLOGICAL SYSTEM

Neuro Diagnostics

High-yield review of CT Scan, MRI, Lumbar Puncture, and the Glasgow Coma Scale — with priority nursing actions, contraindications, and the NCJMM clinical judgment framework.



Neuro



Diagnostics



Priority Actions



NCJMM-Aligned

1

Overview — Why It Matters

Neurologic diagnostics guide rapid decisions in stroke, trauma, and altered LOC

The Four Core Tools

Neurologic emergencies demand speed and precision. Each tool answers a different question — **Is there bleeding?** (CT) · **Is there soft-tissue damage?** (MRI) · **Is there infection or pressure?** (LP) · **How awake is the patient?** (GCS).



IMAGING

CT Scan



IMAGING

MRI



INVASIVE

Lumbar Puncture



ASSESSMENT

Glasgow Coma Scale

2

Quick Compare — CT vs MRI vs LP

Know which test answers which question

Feature	CT Scan	MRI	Lumbar Puncture
Uses	X-rays (ionizing radiation)	Magnets + radio waves	Needle into subarachnoid space
Best For	Acute bleeds, skull fracture, stroke rule-out	Soft tissue, tumors, MS, spinal cord	CSF sampling — meningitis, SAH, MS
Speed	Fast (minutes) — ER first-line	Slow (30–90 min) — elective	Bedside (20–30 min)
Contrast Risk	Iodine — check kidneys, shellfish allergy	Gadolinium — avoid if kidney disease (NSF risk)	Not applicable
Key Contraindication	Pregnancy (radiation); renal failure if contrast	Pacemaker, aneurysm clips, metal implants, shrapnel	Increased ICP → risk of brain herniation 🚫
Pre-Procedure	NPO 4 hr if contrast; hold metformin	Remove ALL metal; screen implants	Empty bladder; consent; position
Post-Procedure	↑ Fluids to flush contrast	Resume normal activity	Lie flat 4–12 hr; ↑ fluids; monitor headache

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CT Scan — Computed Tomography

Fast. First-line for trauma and suspected stroke.



CT Scan

Cross-sectional X-ray imaging · With or without iodinated contrast

HOW IT WORKS

- X-ray beam rotates around the body capturing "slices"
- Computer reconstructs 3D images of bone, brain, organs
- Contrast (iodine IV) enhances vessels and lesions
- Exposes patient to ionizing radiation

COMMON INDICATIONS

- **Suspected stroke** — rules out hemorrhage before tPA
- Head trauma / skull fracture
- Tumors, abscess, hydrocephalus
- PE, aortic dissection (with contrast)

PRE-PROCEDURE NURSING

- **ALLERGY** Ask about **iodine / shellfish** allergy
- **RENAL** Check **BUN & creatinine** (contrast is nephrotoxic)
- **NPO** 4 hours if contrast is used
- **MEDS** **Hold metformin 48 hr** before & after contrast (lactic acidosis risk)
- Remove metal from scan field; confirm pregnancy status
- Establish IV access; obtain informed consent

Red Flags During CT with Contrast

-  Sudden flushing, warmth, itching → early anaphylaxis
-  Wheezing, throat tightness, hypotension → STOP contrast, call rapid response
-  Decreased urine output post-scan → suspect contrast-induced nephropathy
-  Metallic taste is NORMAL and expected — reassure the patient

POST-PROCEDURE NURSING

- **Push fluids** (2–3 L/day unless contraindicated) to flush contrast
- Monitor for **delayed allergic reaction** — hives, itching, wheezing
- Assess IV site for extravasation
- Monitor urine output — first sign of contrast-induced nephropathy
- Resume metformin only after creatinine confirmed normal

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MRI — Magnetic Resonance Imaging

Superior soft-tissue detail. Strong magnet = strict metal screening.



MRI

Powerful magnet + radio waves · Gadolinium contrast optional · NO radiation

HOW IT WORKS

- Strong magnetic field aligns hydrogen protons in the body
- Radio waves disturb them; signal creates detailed image
- No ionizing radiation — safer for repeat imaging

COMMON INDICATIONS

- Multiple sclerosis (MS) plaques — gold standard
- Brain tumors, spinal cord lesions
- Ischemic stroke (more sensitive than CT early on)

- Gadolinium contrast highlights tumors and inflammation

PRE-PROCEDURE NURSING

- **CRITICAL** Screen for **metal implants** — THE safety question
- **ABSOLUTE** contraindications: **pacemaker, ICD, cochlear implant, aneurysm clips, metal shrapnel in eye**
- Remove ALL metal: jewelry, hairpins, watches, hearing aids, dentures, medication patches (metal backing)
- Assess for **claustrophobia** — may need sedation or open MRI
- If gadolinium: check **GFR / creatinine** — avoid if renal disease
- Credit cards stay outside — the magnet will wipe them

- Ligament, tendon, and joint injuries

DURING & POST-PROCEDURE

- Warn patient: loud **banging/knocking noise** is normal — offer earplugs
- Must lie **completely still** — movement blurs images
- Procedure lasts 30–90 minutes
- Communicate via intercom/squeeze ball
- Post: no activity restrictions unless sedated
- Monitor gadolinium recipients for allergic reaction (rare)

MRI Safety — Never-Events

-  NEVER bring ferromagnetic objects into the MRI room — oxygen tanks become projectiles
-  Pacemaker in magnetic field → device malfunction, patient death
-  Nephrogenic systemic fibrosis (NSF) — rare but fatal gadolinium complication in renal failure
-  Tattoos with metallic ink may cause burning sensation

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Lumbar Puncture (LP / Spinal Tap)

Needle into subarachnoid space at L3–L4 or L4–L5 to sample CSF

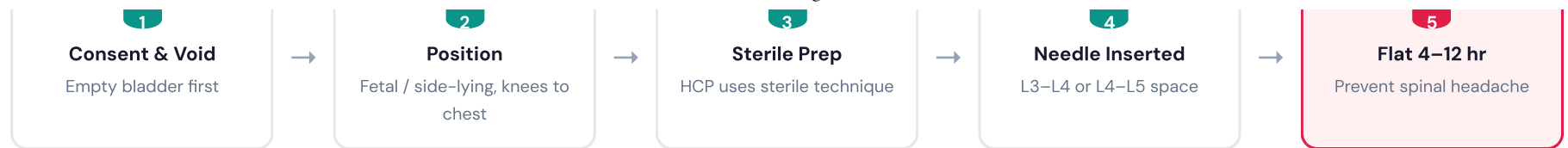


Lumbar Puncture

Diagnostic & therapeutic · CSF pressure, glucose, protein, culture, cells

PROCEDURE FLOW — IN ORDER





WHY L3–L4 OR L4–L5?

- Spinal cord ends at L1–L2 in adults
- Below that: only nerve roots (cauda equina) floating in CSF
- Safely avoids spinal cord injury
- Landmark: iliac crest $\approx$ L4

PRE-PROCEDURE NURSING

- Obtain **signed consent**
- Have patient **void** immediately before
- Baseline vital signs & neuro check
- Rule out increased ICP — **papilledema is a contraindication**
- Gather sterile LP tray; label 3–4 numbered tubes

POSITION OPTIONS

- **Lateral recumbent "fetal"** — side-lying, knees to chest, chin to chest (opens vertebral spaces)
- **Upright** — sitting, leaning forward over a table
- Hold still throughout; nurse often supports the patient

POST-PROCEDURE NURSING

- **Lie flat 4–12 hours** — prevents CSF leak / spinal headache
- **Increase fluids** to replace CSF (2–3 L / 24 hr)
- Monitor insertion site for leakage, bleeding, hematoma
- Assess movement & sensation in lower extremities
- Report **severe positional headache**, fever, neck stiffness, numbness
- Send labeled tubes to lab promptly

ABSOLUTE CONTRAINDICATION — Increased ICP

-  If ICP is elevated, sudden CSF withdrawal can cause **brainstem herniation and death**
-  Signs of $\uparrow$ ICP: papilledema, decreased LOC, vomiting, Cushing's triad ($\uparrow$ BP, $\downarrow$ HR, irregular respirations)
-  CT scan is done first to rule out $\uparrow$ ICP / mass effect before any LP
-  Other contraindications: bleeding disorders, anticoagulants, infection at puncture site

Normal CSF Findings

Parameter	Normal	Abnormal Finding Suggests
Appearance	Clear, colorless	Cloudy = infection · Bloody/xanthochromic = subarachnoid hemorrhage
Opening pressure	70–180 mm H ₂ O	High = ↑ICP, meningitis · Low = CSF leak
Glucose	50–80 mg/dL ($\frac{2}{3}$ of serum)	LOW = bacterial meningitis
Protein	15–45 mg/dL	HIGH = bacterial meningitis, MS, tumor
WBC	0–5 cells/mm ³	Elevated = infection / inflammation

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Glasgow Coma Scale (GCS)

Objective measure of LOC · Score range 3 (deepest coma) to 15 (fully alert)



Glasgow Coma Scale

Assesses 3 domains · Eye opening · Verbal response · Motor response

Scoring: Eye + Verbal + Motor

Always report the total AND the breakdown (e.g., "GCS 10 — E3 V3 M4"). Trending is more important than a single number.



Eye Opening

Max 4

Spontaneous	4
To voice / speech	3
To pain	2
No response	1



Verbal Response

Max 5

Oriented	5
Confused conversation	4
Inappropriate words	3
Incomprehensible sounds	2



Motor Response

Max 6

Obeys commands	6
Localizes pain	5
Withdraws from pain	4
Flexion (decorticate)	3

No response

1

Extension (decerebrate)

2

No response (flaccid)

1

Score Interpretation

15

Fully Alert & Oriented

13–14

Mild Impairment

9–12

Moderate

≤8

Severe / Coma — Intubate

🚑 GCS ≤ 8 = Intubate

- 🚑 " Less than 8 — intubate " — patient cannot protect their airway
- 🚑 Decorticate posturing (flexion, M3) → cortical damage
- 🚑 Decerebrate posturing (extension, M2) → brainstem damage (worse prognosis)
- 🚑 A drop of 2+ points between assessments = notify HCP immediately
- 🚑 GCS is limited in intubated patients (verbal unscored → mark as "T")

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NCJMM — Clinical Judgment Framework

Apply the Next Generation NCLEX Clinical Judgment Measurement Model

Thinking Like a Nurse

Use this model for every neuro scenario on the exam.

STEP 1 · RECOGNIZE CUES

Recognize

STEP 2 · ANALYZE CUES

Analyze

STEP 3 · PRIORITIZE HYPOTHESES
& ACTIONS

Prioritize

STEP 4 · EVALUATE OUTCOMES

Evaluate

Headache + stiff neck + fever → think meningitis → LP. Sudden "worst headache of life" → CT for SAH. Declining GCS → call rapid response.

Papilledema + vomiting + bradycardia = ↑ ICP — LP is CONTRAINDICATED. Metformin + IV contrast = lactic acidosis risk. Pacemaker + MRI = lethal.

Airway first (GCS ≤8 → intubate). Rule out bleed (CT) before giving tPA. Signs of herniation → STOP planned LP, notify HCP, elevate HOB 30°.

Post-LP: headache relieved while flat? Fluids tolerated? Post-contrast: urine output ≥ 30 mL/hr? GCS trend improving or declining? Adjust plan.

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NCLEX Test Traps ⚠

What students miss — and how the exam tests it

⚠ TRAP #1

Forgetting to rule out ↑ ICP before an LP

Students jump to meningitis answers without the priority step. **Always check for ↑ ICP signs (papilledema, decreased LOC, vomiting) before an LP is done** — otherwise herniation and death can occur.

⚠ TRAP #2

Missing the metformin–contrast interaction

If a diabetic patient is getting a CT **with contrast**, metformin must be held 48 hours before AND after the scan to prevent lactic acidosis. Students often choose "NPO" but forget metformin.

⚠ TRAP #3

Confusing CT vs MRI contrast allergies

CT contrast = **iodine-based** (ask about shellfish/iodine allergy). MRI contrast = **gadolinium** (renal-sensitive, NSF risk). They are NOT interchangeable.

⚠ TRAP #4

Saying "Semi-Fowler's" after LP

WRONG. Patient must lie **FLAT** (supine) for 4–12 hours to prevent CSF leak and spinal headache. Elevating the head worsens the leak.

⚠️ TRAP #5

Overlooking metal in the MRI room

It's not just about the patient — oxygen tanks, IV poles, wheelchairs, and even credit cards must stay out. The exam loves a "what should the nurse do before MRI" question. The answer: **remove all metal and screen for implants**.

⚠️ TRAP #6

Reporting GCS as one number

A total of "10" means little without breakdown. E3 V3 M4 tells you where the deficit is. Also: if the total **drops 2 or more points**, notify the HCP immediately — this is priority.

⚠️ TRAP #7

Forgetting "less than 8 → intubate"

GCS ≤ 8 means the patient cannot protect the airway. **Airway is always first (ABCs)** — don't get distracted by the neuro score itself.

9

Patient Education

Teach-back points for each test

CT Scan Teaching

- ✓ "You may feel a warm flush or metallic taste — this is normal"
- ✓ "Hold still while the table moves through the scanner"
- ✓ "Drink plenty of water for 24 hours afterward"
- ✓ "Tell us if you've had an iodine or shellfish reaction"
- ✓ "Do not take metformin for 48 hours after contrast"

MRI Teaching

- ✓ "The machine will make loud banging noises — we'll give you earplugs"
- ✓ "Remove ALL metal — jewelry, watches, hearing aids, bobby pins"
- ✓ "You must lie completely still for up to 90 minutes"
- ✓ "Use the squeeze ball if you need to reach us"
- ✓ "Tell us about any metal in your body — even old shrapnel"

Lumbar Puncture Teaching

- ✓ "You'll curl into a tight ball — this opens the spaces in your back"

GCS / Neuro Checks Teaching (for family)

- ✓ "We wake the patient to check their awareness every few hours"

- ✓ "You'll feel pressure; tell us about any sharp pain or tingling"
- ✓ "Stay flat in bed for several hours after"
- ✓ "Drink extra fluids to replace the CSF we removed"
- ✓ "Call if you get a severe headache, stiff neck, or numb legs"

- ✓ "This is not meant to be painful — we're tracking changes"
- ✓ "Tell us if you notice your loved one more confused or sleepy than before"
- ✓ "Any new weakness, slurred speech, or severe headache — call the nurse immediately"

10

Memory Boosters

Mnemonics, patterns, and associations that stick

💡 CT vs MRI — Which One?

C = Crisis / M = Mapping

CT = **C**risis (fast, ER, trauma, bleed)

MRI = **M**apping soft tissue (tumors, MS, spinal cord)

"Bleeding? Get a CT. Lesion? Get an MRI."

💡 GCS Maximum Values

4 - 5 - 6 = 15

4 points for Eye opening

5 points for Verbal response

6 points for Motor response

Max = 15 · Minimum ≠ 0, it's **3** (patient always gets 1 in each)

💡 "Less Than 8 — Intubate"

< 8 = Late

GCS below 8 = cannot protect airway

Airway is ALWAYS the priority

Memorize this phrase verbatim — high-yield NCLEX answer

💡 LP Contraindication — "ICP = NO"

I.C.P.

Increased intracranial pressure

Coagulation disorders / anticoagulants

Pus or infection at puncture site

Check for papilledema first — CT before LP!

💡 Posturing — Dec-O vs Dec-E

Cor — In · Cer — Out

Decorticate = arms flex **in** toward the **CORE** (cortex)

Decerebrate = arms extend **out** (brainstem) — **worse**

Motor score: Decorticate = 3 · Decerebrate = 2 · Flaccid = 1

💡 Post-LP Care — F.L.A.T.

F·L·A·T

Fluids — push 2–3 L to replace CSF

Lie flat for 4–12 hours

Assess headache, numbness, leakage

Tubes to lab — labeled, numbered

💡 MRI Metal Screen — "S.P.A.C.E."

S·P·A·C·E

Shrapnel / metal in the eye

Pacemaker / ICD

Aneurysm clips

Cochlear implant

Everything else metal — removed or screened

💡 Contrast Allergy Clue — "IODINE"

Shellfish = CT flag

CT contrast = **IODINE**-based (ask about shellfish)

MRI contrast = **Gadolinium** (kidney concern, not allergy)

Metallic taste in CT = normal, NOT allergy

NGN NCLEX 2026 Study Series · Neuro Diagnostics

Aligned with the Next Generation NCLEX Clinical Judgment Measurement Model (NCJMM)

Quick-review infographic · For educational use