

DIANE'S NGN NCLEX 2026 VISUAL STUDY LIBRARY

Contusion: *Coup & Contrecoup* Brain Injury

A focal traumatic brain injury where bruising occurs at **both** the site of impact (coup) **and** the opposite side of the brain (contrecoup) — a high-yield NGN concept tested under Recognize Cues, Prioritize Hypotheses, and Take Action.

NEUROLOGICAL

TRAUMA / TBI

HIGH ACUITY 🚑

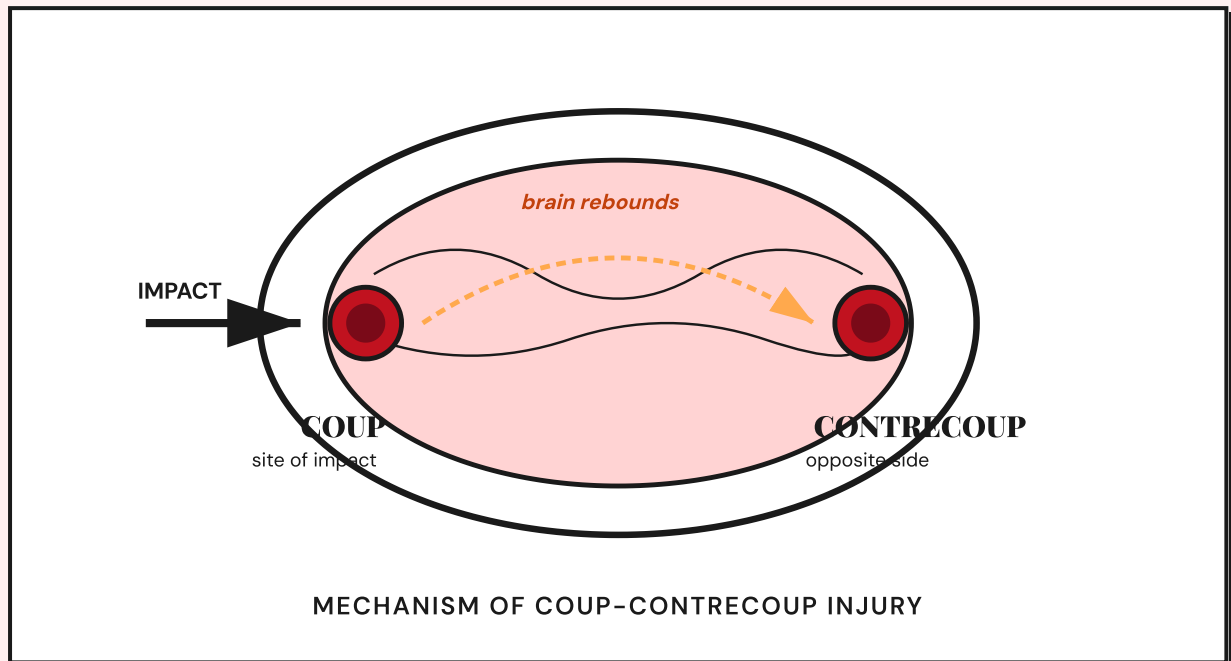
PRIORITY RANK: AIRWAY FIRST

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1 Definition & Overview

- A **cerebral contusion** is a **bruise of brain tissue** — actual bleeding and microvascular injury within the brain parenchyma, typically beneath the impact site.
- **Coup injury** = damage **directly under the point of impact** ("coup" = French for "blow").
- **Contrecoup injury** = damage on the **opposite side** of the brain, caused when the brain rebounds inside the skull and strikes the opposing bony surface.
- Together, **coup-contrecoup** is a **focal TBI** classically seen in **acceleration-deceleration trauma** (motor vehicle crash, fall, assault, sports impact, shaken-infant injury).
- **Why it matters:** Contusions can rapidly progress to **cerebral edema, increased ICP, midline shift, and herniation** — making serial neuro checks the single most important nursing action.

2 Pathophysiology — The Brain Bounces Twice



STEP-BY-STEP MECHANISM

- 1 **External force** strikes the head (acceleration phase) → skull stops abruptly but brain keeps moving inside the cranial vault.
- ↓
- 2 Brain **collides with the inner skull at the impact site** → **COUP contusion** (bruising of cortex + small vessel rupture).
- ↓
- 3 Brain **recoils** and slams into the **opposite bony surface** (often along ridges of frontal/temporal lobes) → **CONTRECOUP contusion**.
- ↓
- 4 **Inflammatory cascade** → cerebral edema → **↑ ICP** → cerebral perfusion pressure (CPP) falls → hypoxic-ischemic secondary injury.
- ↓
- 5 If untreated: **midline shift** → **brainstem herniation** → **death**. This is why serial neuro assessment is non-negotiable.



Monro-Kellie Doctrine

The skull is a fixed box containing brain (80%), blood (10%), and CSF (10%). If one increases (edema/hemorrhage), another must

decrease — or ICP rises. Normal ICP =

5–15 mm Hg

; treat >

20 mm Hg

.

3

Common Mechanisms of Injury



MVA

Motor vehicle crashes — the **#1 cause**. Sudden deceleration when forehead strikes windshield/steering wheel.



Falls

Most common in **older adults > 65** and **young children**. Backward fall → occipital coup + frontal contrecoup.



Assault

Blunt-force trauma, gunshot, "shaken-baby" mechanism in infants.



Sports

Football, boxing, soccer headers, cycling, skiing — repetitive concussion increases risk of **chronic traumatic encephalopathy (CTE)**.



Blast

Military explosions — pressure wave causes both coup and contrecoup pattern.



Abusive Head Trauma

Shaken infant — coup-contrecoup + retinal hemorrhages. **Mandatory reporting.**

4 Signs & Symptoms

EARLY (First Minutes–Hours)

- **Brief LOC** (loss of consciousness) — seconds to minutes
- **Headache** (steady, worsening)
- **Confusion, disorientation**
- **Amnesia** (retrograde or anterograde)
- **Nausea / vomiting**
- **Dizziness, blurred vision**
- **Pupil changes** — unequal (anisocoria), sluggish
- **Focal deficits** — weakness, slurred speech, facial droop
- **Restlessness, agitation, irritability**

LATE (Worsening / ↑ ICP)

- **Decreasing LOC** — drop of ≥ 2 points on GCS = emergency
- **Fixed, dilated "blown" pupil** (unilateral first)
- **Posturing**: decorticate (flexion to core) or decerebrate (extension)
- **Cushing's Triad**  — **↑ BP** (widening pulse pressure), **↓ HR** (bradycardia), **irregular respirations**
- **Projectile vomiting** without nausea
- **Seizures**
- **Coma** (GCS $\leq 8 \rightarrow$ intubate)
- **CSF leak**: Battle's sign (mastoid bruising), raccoon eyes, otorrhea/rhinorrhea

Cushing's Triad = Late, Pre-Terminal Sign

The classic combo of

HTN + bradycardia + abnormal respirations

means herniation is imminent. Do

NOT

wait for this — act on the *earliest* sign: a change in LOC.



Glasgow Coma Scale (GCS) Quick Reference

13–15

= Mild TBI |

9–12

= Moderate TBI |

≤ 8

= Severe — *"less than 8, intubate."*

5 Priority Nursing Interventions (ABC Framework)

A — AIRWAY

- **Maintain a patent airway** — jaw-thrust (not head-tilt) if c-spine not cleared
- **Suction only when needed**; limit to **≤ 10 seconds** — suctioning ↑ ICP
- **Prepare to intubate** if GCS ≤ 8 or airway compromised

B — BREATHING

- **Monitor SpO₂ ≥ 95%** — hypoxia is the #1 cause of secondary brain injury
- Maintain **PaCO₂ 35–38 mm Hg** (normocapnia); avoid hyperventilation unless herniation imminent
- Auscultate lungs; assess respiratory pattern (Cheyne–Stokes, apneustic = brainstem involvement)

C — CIRCULATION & CEREBRAL PERFUSION

- **Maintain SBP > 90 mm Hg** (or MAP 80–90) — hypotension doubles mortality
- Goal **CPP 60–70 mm Hg** (CPP = MAP – ICP)
- Two large-bore IVs; avoid hypotonic fluids (D5W, ½ NS) — they worsen edema
- Use **0.9% NS or LR** for volume resuscitation

ICP & NEURO

- **Serial neuro checks q15min–q1hr** — pupils, GCS, motor, sensory, cranial nerves. **Earliest change = LOC.**
- **HOB at 30°**, head/neck in **midline neutral alignment** (no flexion, rotation, or hip flexion > 90°) → promotes jugular venous drainage
- **Cluster care** with rest periods — multiple stimuli at once ↑ ICP
- Maintain a **quiet, dim environment**; minimize noise and bright lights
- Avoid Valsalva — give **stool softeners**, no rectal stimulation, no coughing
- **Seizure precautions**: padded rails, suction at bedside, IV access
- **Strict I&O**; monitor for **diabetes insipidus** or **SIADH** (pituitary/hypothalamic injury)
- Maintain **normothermia** (fever ↑ cerebral metabolism & ICP)
- **Glucose 140–180 mg/dL** — hyper/hypoglycemia both worsen outcomes

SAFETY

- C-spine precautions until cleared by imaging
- Fall & aspiration precautions if confused

- DVT prophylaxis (SCDs first; pharm only after bleeding stable)

6 Pharmacology

DRUG / CLASS	MECHANISM	KEY NURSING CONSIDERATIONS
Mannitol (<i>osmotic diuretic</i>)	Pulls fluid out of brain into vasculature → ↓ ICP	Use in-line filter ; monitor serum osmolality (goal < 320 mOsm/kg), I&O, K ⁺ , BP. Watch for rebound ICP & pulmonary edema.
3% Hypertonic Saline	Draws fluid from brain tissue via osmotic gradient → ↓ ICP	Central line preferred. Monitor serum Na ⁺ (goal 145–155); avoid rapid correction → central pontine myelinolysis.
Levetiracetam (Keppra) & Phenytoin (Dilantin)	Anti-seizure prophylaxis x 7 days post-TBI	Phenytoin: therapeutic 10–20 mcg/mL ; flush IV with NS only (precipitates in dextrose). Monitor for gingival hyperplasia.
Propofol (Diprivan)	Sedation → ↓ cerebral metabolic demand & ICP	Titrate to LOC; monitor BP (hypotension), triglycerides, lipase/amylase (the "-ase" enzymes). Has propofol infusion syndrome risk.
Fentanyl / Morphine (<i>use cautiously</i>)	Analgesia / sedation	Short-acting agents preferred so neuro checks remain reliable. Morphine may mask pupil response & LOC.
Acetaminophen	Antipyretic — fever control	Fever ↑ cerebral metabolism; treat T > 38°C aggressively.
Dexmedetomidine (Precedex)	α ₂ -agonist sedation that preserves arousability	Allows reliable neuro exam; watch for bradycardia and hypotension.
Stool Softeners (docusate)	Prevent Valsalva → prevent ICP spikes	Daily; avoid enemas and digital disimpaction.
PPI / H₂ blocker	Prevent stress ulcer (Cushing ulcer) in TBI	Routine in severe TBI; monitor stool for occult blood.

Drugs to AVOID

No

hypotonic IV fluids (D5W, ½ NS — worsen edema).

No

opioids that obscure neuro exam unless mechanically ventilated.

No

aspirin/NSAIDs/anticoagulants until bleeding ruled out.

No

steroids — they do

not

improve TBI outcomes and increase mortality (per CRASH trial).

7 NCLEX Test Traps ⚠️

- 1** ❌ **WRONG:** "Position the client flat or in Trendelenburg to improve perfusion."
 ✅ **RIGHT:** HOB 30°, head midline. Flat position **INCREASES** ICP — gravity is your friend for venous drainage.
- 2** ❌ **WRONG:** "Hyperventilate the client to lower CO₂."
 ✅ **RIGHT:** Maintain normocapnia (PaCO₂ 35–38). Aggressive hyperventilation causes cerebral vasoconstriction → ischemia. Only use briefly if herniation is imminent.
- 3** ❌ **WRONG:** "Give the headache patient morphine and check back in an hour."
 ✅ **RIGHT:** Opioids mask the neuro exam (pupils, LOC). Use cautiously and short-acting agents; reassess LOC frequently.
- 4** ❌ **WRONG:** Waiting for Cushing's triad to call the provider.
 ✅ **RIGHT:** Earliest sign of ↑ ICP = change in LOC. Cushing's triad is a **LATE**, pre-herniation finding — by then it may be too late.
- 5** ❌ **WRONG:** Suctioning every 2 hours routinely.
 ✅ **RIGHT:** Suction only when indicated, ≤10 seconds, hyperoxygenate before. Suctioning spikes ICP.
- 6** ❌ **WRONG:** Packing a nose/ear with clear fluid drainage.
 ✅ **RIGHT:** Clear drainage may be CSF (basilar skull fracture). Test for glucose / halo sign; do **NOT** pack (risk of meningitis & ↑ ICP).
- 7** ❌ **WRONG:** Choosing D5W or ½ NS for the IV fluid.
 ✅ **RIGHT:** 0.9% NS or LR only. Hypotonic fluids cross into brain cells and **WORSEN** cerebral edema.

8

✗ **WRONG: Giving aspirin or NSAIDs for headache.**

✓ **RIGHT: Acetaminophen only. ASA/NSAIDs ↑ bleeding risk in the already-bruised brain.**

9

✗ **WRONG: Confusing coup with contrecoup ("they're the same").**

✓ **RIGHT: Coup = SAME side as impact. Contrecoup = OPPOSITE side. Both occur in the same injury.**

10

✗ **WRONG: Hip-flexing the client when repositioning.**

✓ **RIGHT: Avoid hip flexion > 90° and neck flexion/rotation — both impair jugular drainage and ↑ ICP.**

8 Patient & Family Education



DISCHARGE TEACHING (MILD TBI)

- **Rest, rest, rest** — cognitive and physical rest for 24–48 hrs, then gradual return to activity
- **No driving** until cleared
- **No alcohol** or sedating medications — they mask symptoms and slow healing
- **Acetaminophen only** for headache — no aspirin, ibuprofen, or naproxen for 48 hrs
- Wake the client **every 2–4 hours** the first night to assess alertness (if instructed by HCP)
- Avoid contact sports until medically cleared — second-impact syndrome is fatal
- Resume school/work **gradually**; reduce screen time if symptoms recur



RETURN TO ER IMMEDIATELY IF ANY OF THESE OCCUR:

● Neurologic Red Flags

- Worsening or severe headache
- Repeated vomiting
- Confusion, agitation, drowsiness
- Difficulty waking
- Slurred speech, weakness on one side
- Unequal pupil size
- Seizure activity
- Clear fluid from nose or ear
- Vision changes / double vision



Future Prevention

- Always wear **seat belts** and properly install car seats
- Wear **helmets** for cycling, skiing, contact sports
- Remove fall hazards at home (rugs, cords, dim lighting)
- Install grab bars; use non-slip mats
- Address vision & balance issues in older adults
- Never shake an infant — educate caregivers
- Limit alcohol; avoid driving impaired

9 Memory Mnemonics & Pattern Tips

C-U-S-H-I-N-G

Late Signs of ↑ ICP (Cushing's Triad & Friends)

- C** Consciousness ↓ (LOC drop)
- U** Unequal pupils (blown pupil)
- S** Systolic BP ↑ (widening pulse pressure)
- H** Heart rate ↓ (bradycardia)
- I** Irregular respirations
- N** Nausea / projectile vomiting
- G** GCS drops ≥ 2 points → emergency

H-E-A-D

Priority Nursing Care for TBI

- H** HOB 30°, head midline neutral
- E** Evaluate neuro q15min–q1hr (LOC first!)
- A** Avoid Valsalva, suctioning > 10 sec, hypotonic fluids
- D** Dim, quiet environment + cluster care

COUP vs CONTRECOUP

"Coup hits the spot, Contrecoup is across the lot."

Coup = Contact site. Contre = opposite (think "counter").

"Less than 8, Intubate"

If **GCS $\leq$ 8**, the airway is unsafe → prepare for intubation. Memorize this number.

"M.O.M. lowers ICP"

Mannitol | **O**xygen (adequate) | **M**idline head, HOB 30°

"BAT signs"

Basilar skull fracture clues:

Battle's sign (mastoid bruise) | **A**nteorbital raccoon eyes | **T**elltale CSF leak (halo sign)

10 NCJMM Clinical Judgment Scenario

 **Scenario:** A 22-year-old male is admitted to the ED after a high-speed MVA in which he struck the back of his head against the headrest, then his forehead against the steering wheel. On arrival, GCS = 14, pupils equal and reactive, BP 128/76, HR 88, RR 18, SpO₂ 97% on 2 L NC. Two hours later, the nurse notes the client is harder to arouse and his right pupil is 5 mm and sluggish while the left is 3 mm and brisk. BP is now 162/72, HR 54, respirations irregular.

1 RECOGNIZE CUES

Relevant findings: Mechanism = acceleration-deceleration (coup-contrecoup likely involving occipital + frontal lobes). **Worsening LOC** (harder to arouse), **anisocoria with sluggish right pupil, widening pulse pressure (162/72), bradycardia (HR 54), irregular respirations** — classic **Cushing's triad**.

2 ANALYZE CUES

Findings are consistent with **rapidly rising intracranial pressure** due to expanding cerebral contusion / edema. The unilateral blown pupil suggests **uncal (transtentorial) herniation** compressing CN III on the right. Cushing's triad indicates **brainstem compression** — this is a pre-terminal emergency.

3 PRIORITIZE HYPOTHESES

#1 priority: Increased ICP with impending herniation (life-threatening, must intervene NOW).

#2: Compromised airway with declining LOC (GCS approaching ≤ 8).

#3: Inadequate cerebral perfusion.

Lower priority: pain, anxiety, family communication (important but not immediate).

4

GENERATE SOLUTIONS

- Notify provider / activate rapid response immediately
- Prepare for emergent intubation (GCS trending ≤ 8)
- Position HOB 30°, head midline neutral
- Administer ordered osmotic therapy (mannitol or 3% hypertonic saline)
- Prepare client for STAT non-contrast head CT
- Anticipate ICP monitor placement (ventriculostomy) and possible neurosurgical decompression
- Maintain $\text{SpO}_2 \geq 95\%$, normocapnia, SBP > 90

5

TAKE ACTION

Nurse **calls rapid response**, raises HOB to 30° with head midline, applies 100% O_2 via non-rebreather, ensures two large-bore IVs with **0.9% NS** running, draws labs (CBC, BMP, coags, type & screen), and administers **mannitol 1 g/kg IV via in-line filter** per order. Anesthesia and neurosurgery are paged. Family is updated. Suction equipment and intubation supplies are placed at the bedside.

6

EVALUATE OUTCOMES

Desired outcomes (within 30–60 min): Pupil size and reactivity improve or stabilize. GCS stops declining or improves. BP returns toward baseline; HR rises out of bradycardia; respirations regular. Serum osmolality 300–320 mOsm/kg. CT identifies and quantifies the contusion / edema. If pupil remains fixed and dilated or GCS worsens → escalate to **emergent craniotomy / decompressive surgery**. Continue serial neuro checks q15min until stable.