Neuro: ICP and Stroke

ICP, herniation, EVD care, osmotics, GCS, stroke and seizures

ICP, CPP AND THE ICP WAVEFORM

Thresholds: Brain Trauma Foundation (severe TBI). Many non-TBI protocols treat ICP above 20.

MEASURE	VALUE
Normal ICP (adult)	Up to about 15 mm Hg
Treat ICP (severe TBI)	Above 22 mm Hg
CPP	MAP – ICP
CPP target (TBI)	60–70 mm Hg
SBP floor (TBI)	≥100 at age 50–69; ≥110 at 15–49 or >70

Normal ICP waveform: P1 (percussion) > P2 (tidal) > P3 (dicrotic).

EXAM TIP Exams test CPP math (MAP 75, ICP 25: CPP 50, too low) and P2 above P1 (poor compliance).

RISING ICP AND HERNIATION

- Most sensitive sign: change in LOC (restless, confused, drowsy)
- Headache, vomiting, new pupil asymmetry
- Uncal herniation: same-side dilated pupil, opposite-side weakness
- Posturing: flexion (decorticate); extension (decerebrate) is worse
- Cushing triad: rising SBP with wide pulse pressure, bradycardia, irregular breathing

SAFETY Cushing triad is late: act on a new dilated pupil or a sudden GCS drop.

Prevention: HOB ≥30°, head midline; no neck or hip flexion or tight ETT ties; brief suctioning; control pain, fever and seizures; SpO2 above 94%; avoid low sodium. Hyperventilation (PaCO2 32–35): brief bridge only.

EVD CARE AND OSMOTIC THERAPY

- Level at the tragus (foramen of Monro); drain height set in cm H2O above it
- Re-level after any position or bed-height change
- Clamp for moves per protocol; re-level, then unclamp
- Read ICP with the drain briefly clamped
- Closed sterile system; never flush unless ordered
- Report: new cloudy or bright-red CSF; no drainage plus a damped waveform; sudden high output

SAFETY Raising the head without re-leveling an open drain overdrains CSF; a forgotten clamp lets ICP climb.

Exam ranges; follow your institution's or agency's protocols. Classic exam rule: hold mannitol if osmolality exceeds 320.

AGENT	TYPICAL ADULT DOSE	WATCH
Mannitol	0.25–1 g/kg IV bolus	Filter; diuresis, low BP, kidneys, osmolality
3% saline	2.5–5 mL/kg bolus or infusion	Favored in TBI, ICH; sodium every 4–6 h, keep <160
23.4% saline	30 mL over 10–20 min	Central line only

GCS AND NIHSS

Glasgow Coma Scale © University of Glasgow. Total 3–15.

SCORE	EYE	VERBAL	MOTOR
6	–	–	Obeys commands
5	–	Oriented	Localizes
4	Spontaneous	Confused	Normal flexion (withdraws)
3	To sound	Words	Abnormal flexion
2	To pressure (pain)	Sounds	Extension
1	None	None	None

- Score the best response; report parts (E2 V3 M4 = 9)
- NT (not testable) if a part cannot be assessed, such as verbal when intubated
- GCS 3–8 = severe; airway protection usually needed
- NIHSS: 15 items scored 0–42, higher is worse

ACUTE ISCHEMIC STROKE

Time starts at last known well (LKW), not when found. Check glucose (treat below 60) and get a non-contrast CT or MRI before any lytic.

2026 AHA/ASA guideline. Follow your institution's or agency's protocols.

THERAPY	WINDOW	KEY DETAILS
Tenecteplase	0–4.5 h	0.25 mg/kg IV push, max 25 mg
Alteplase	0–4.5 h	0.9 mg/kg (max 90): 10% bolus, rest over 1 h
Lytic, extended	4.5–9 h or wake-up	Perfusion mismatch, or MRI DWI–FLAIR mismatch (wake-up)
Thrombectomy	0–6 h; selected 6–24 h	ICA/M1: NIHSS ≥6. Basilar: NIHSS ≥10, to 24 h

SITUATION	BP GOAL
Before a lytic	Below 185/110
Lytic or thrombectomy, first 24 h	Below 180/105
No reperfusion, ≥220/120	Lower about 15% at first
No reperfusion, <220/120	No routine lowering for 48–72 h

SAFETY After a lytic: neuro checks and BP every 15 min for 2 h, every 30 min for 6 h, then hourly to 24 h. New headache, vomiting, hypertension or worse exam: stop alteplase, emergency CT. No antithrombotics until 24-h imaging; delay NG tubes, urinary catheters and arterial lines.

HEMORRHAGIC STROKE (ICH)

- Mild to moderate ICH, SBP 150–220: target 140 (keep 130–150); below 130 may harm
- Start within 2 h, reach target within 1 h, avoid swings
- Warfarin, INR 2 or more: 4F-PCC (not FFP) plus IV vitamin K
- Dabigatran: idarucizumab. Factor Xa inhibitors: 4F-PCC (older answer: andexanet, off US market 2025)
- Heparin: protamine
- Antiplatelet ICH without surgery: no platelet transfusion
- No steroids for ICP; no seizure prophylaxis

STATUS EPILEPTICUS

Seizure lasting 5 min or more, or repeated seizures without recovery between. Benzodiazepines are often underdosed.

Exam study doses; follow your institution's or agency's protocols.

ACCESS	FIRST-LINE BENZODIAZEPINE (ADULT)
IV	Lorazepam 0.1 mg/kg, max 4 mg/dose; repeat once in 3–5 min
No IV	Midazolam 10 mg IM
IV alternative	Diazepam 0.15 mg/kg, max 10 mg

Check glucose and protect the airway without delaying the benzodiazepine. Still seizing: levetiracetam, fosphenytoin or valproate.

Sources (24) are listed with links at icubasics.com/sheets/neuro-icp-stroke.html. For education and exam preparation only. Not medical advice; follow current guidelines and your institution's protocols. ICU Basics is an independent study aid not affiliated with any certifying body.