

Increased ICP (pressure in brain)

A plain-English guide for you and your family

WHAT IS HAPPENING

Your brain sits inside your skull in a closed box. Inside that box are three things: brain tissue, blood flowing through vessels, and clear fluid called cerebrospinal fluid (CSF) that cushions everything. Normally the pressure stays steady because these three parts balance each other. Blood flows in at just the right pressure to feed every part of the brain, and the CSF drains smoothly so it does not build up. But if something takes up extra space — like bleeding, a tumor, swelling from injury or stroke, or fluid that cannot drain — pressure inside the skull climbs. At first the body squeezes out some CSF and blood to make room, buying a little time. But once that safety margin runs out, pressure shoots up fast. Now the brain starts getting squeezed. The most dangerous squeeze happens at the brainstem, the control center at the bottom of the brain that runs your breathing, heart rate, blood pressure, and wake-sleep cycle. When pressure pushes the brainstem toward the hole at the bottom of the skull, you see a pattern: blood pressure climbs high (the body trying to force blood past the squeeze), heart rate drops (a reflex to protect blood vessels), breathing becomes jerky and irregular, and one or both pupils get big and stop shrinking in bright light (a nerve is pinched). If pressure keeps rising, parts of the brain can herniate — meaning they squeeze out through openings in the skull — and that can stop breathing or heartbeat in minutes. The goal is to catch rising pressure early, lower it fast with medicine or surgery, and protect the brain before it herniates.

What you might feel

- Headache that gets worse when lying down or in the morning
- Throwing up without feeling sick to the stomach first (projectile vomiting)
- Blurry vision or brief moments when vision goes dark (visual obscurations)
- Feeling confused, sleepy, or hard to wake up
- One pupil becomes larger than the other or stops shrinking in bright light
- Seizures
- Cushing triad: high blood pressure, slow heart rate, and irregular breathing
- Stiff neck or being forced into an arched-back position (opisthotonus)

Call the doctor right away if...

- Confusion, extreme sleepiness, or impossible to wake up
- One pupil much larger than the other or not reacting to light
- Sudden seizure
- Cushing triad: very high blood pressure, slow pulse, and weird breathing pattern
- Sudden severe headache described as 'the worst of my life'

What the care team will do

- Position the head of bed at 30 degrees and keep the patient's head and neck in straight midline alignment without any rotation or flexion
- Perform neurological assessments every 1 hour using Glasgow Coma Scale (a 15-point scoring system measuring eye opening, verbal response, and motor movement) and pupil checks with a penlight
- Maintain continuous ICP monitoring via the external ventricular drain (EVD) or intraparenchymal bolt (a pressure probe inserted into brain tissue), keeping ICP below 22 mmHg and cerebral blood flow (perfusion) pressure (CPP) above 60 mmHg
- Administer hypertonic saline 3% continuous infusion or give 23.4% saline 30 mL bolus over 5 minutes through a central line as ordered, checking serum sodium (blood salt level) every 4 to 6 hours and keeping it between 145 and 155 mEq/L
- Provide adequate sedation with propofol infusion (typical 20 to 50 mcg/kg/min) and analgesia with fentanyl boluses (25 to 100 mcg IV every 1 to 2 hours) to keep the patient calm and comfortable
- Maintain mechanical ventilation with PaCO₂ (carbon dioxide level in arterial blood) at 30 to 35 mmHg if hyperventilation is ordered, monitoring with continuous end-tidal CO₂ and arterial blood gases every 4 hours
- Drain cerebrospinal fluid in 2 to 3 mL increments through the external ventricular drain when ICP rises above 20 mmHg, recording output color and amount hourly
- Avoid any unnecessary stimulation including suctioning, bathing, or repositioning during the same time period, and pre-medicate with lidocaine 1.5 mg/kg IV and extra sedation before required procedures

Medicines you may be given — and why

Hypertonic saline (3% or 23.4%)

Creates a salt gradient that pulls extra water out of swollen brain tissue and into the bloodstream, where the kidneys can flush it out. Think of it like sprinkling salt on a wet sponge—the salt draws the water toward it.

Mannitol

Works like hypertonic saline but uses a sugar molecule instead of salt. Mannitol stays in the blood vessels and pulls water out of brain tissue, then the kidneys flush it all out as urine within 30 to 60 minutes.

Sedatives (propofol, midazolam, or dexmedetomidine)

Slow down the brain's electrical firing and reduce how much oxygen and glucose the brain demands. When the brain works less hard, it makes less waste heat and swelling, and blood vessels can shrink a bit—all of which lowers pressure inside the skull. Think of it like dimming the lights in a busy factory so it uses less power and gives off less heat.

Pain control (fentanyl, morphine, or other opioids)

Block pain signals in the spinal cord and brain so the patient does NOT thrash, strain, or tense up—all of which would spike pressure inside the skull. Pain and stress also trigger the release of adrenaline and cortisol, which raise blood pressure and brain blood flow, pushing pressure even higher. Opioids stop that cascade.

Short-term hyperventilation (lowering PaCO₂ to 30-35 mmHg)

Breathing the patient faster blows off carbon dioxide (CO₂). Low CO₂ makes brain blood vessels squeeze tight (vasoconstriction), which shrinks the volume of blood inside the skull and drops pressure fast—within seconds. Think of it like letting air out of a balloon to make it smaller.

Positioning (head of bed elevated 30°, neck midline)

Gravity helps blood and spinal fluid drain out of the brain through the jugular veins (the big veins in the neck). Keeping the neck straight prevents kinking or squashing those veins. This lowers the total volume inside the skull and drops pressure gently. Think of it like tilting a bottle so liquid flows out more easily.

Where this information comes from

- Neurocritical Care Society
- Brain Trauma Foundation ICP guidelines

- AAN (American Academy of Neurology)
- NEJM clinical review on intracranial hypertension

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