

Neurocognitive Disorders

Neurocognitive disorders: when the brain loses its ability to remember, plan, or think clearly—because cells die, connections break, or chemistry goes wrong.

THE ONE-LINE TRUTH

In neurocognitive disorders, the team that spots early memory loss, asks one good screen question, and checks for reversible causes outperforms the team that assumes it's just old age.

The chain — how it unfolds

1. Protein clumps or blood-flow loss kill the first wave of neurons — why: In Alzheimer disease, amyloid- β plaques stack up outside cells like sticky garbage and tau tangles twist inside, choking the cell until it dies; in vascular dementia, a clot or burst vessel starves a brain patch of oxygen (ischemia) and cells die within minutes—either way, the hippocampus and cortex start to thin.
2. Dying cells dump glutamate and calcium, exciting neighbors to death — why: Ruptured neurons spill glutamate (the brain's go-go messenger) into the space between cells; too much glutamate forces calcium flood-gates open in nearby neurons, and calcium overload is like revving an engine until it seizes—the cell burns out and dies, spreading the damage in a wave (excitotoxicity).
3. Inflammation roars as the brain's cleanup crew goes rogue — why: Microglia (the brain's resident immune cells, like tiny janitors) swarm to eat dead cells and plaques, but they get stuck in an angry on-mode, spraying inflammatory chemicals (cytokines like IL-1 and TNF- α) that poison healthy bystanders, widening the kill zone.
4. Neurotransmitter factories shut down, and circuits go silent — why: The nucleus basalis stops making acetylcholine, the substantia nigra stops making dopamine, and the raphe nuclei stop making serotonin—without these chemical couriers, the cortex, hippocampus, and basal ganglia lose their signals, so memory, movement, and mood all falter.
5. Brain volume shrinks and cerebrospinal fluid fills the empty space — why: As cortex and hippocampus waste away, the ventricles (fluid-filled caves inside the brain) balloon to fill the gap—visible on CT or MRI as widened dark spaces and shrunken folds—marking permanent, irreversible loss.

6. Behavior and personality shift as frontal and temporal lobes fail — why: The orbitofrontal cortex (underside of the front brain that reads social cues and taps the brakes on impulses) and anterior temporal lobes (that recognize faces and empathy) die off, so the person becomes disinhibited (says cruel things, shoplifts, eats trash), apathetic (sits all day, no interest), or paranoid (accuses family of theft) because the circuits that made them 'them' are gone.
7. Late cascade: breathing and swallowing centers falter, infections and starvation threaten — why: When degeneration reaches the brainstem (the stalk controlling automatic survival functions), swallowing becomes uncoordinated (dysphagia) so food goes into the lungs causing aspiration pneumonia (lung infection from inhaled food or spit), and eventually the medulla (the brainstem's bottom that runs heartbeat and breath) fails, leading to death from respiratory arrest or infection.
8. The final common path is immobility, total dependence, and multi-organ decline — why: Bedbound and mute, the person cannot shift weight so pressure sores (bedsores) open and infection (sepsis) spreads through the blood; muscles waste (sarcopenia), joints freeze (contractures), kidneys and heart weaken under the load, and the body shuts down system by system.

Spot it — what you see, and why

- Memory loss that disrupts daily life: The hippocampus (the brain's memory keeper, tucked deep in the middle of the brain) and the nearby areas that store and retrieve memories shrink or get damaged, so new information can't be filed away or old facts can't be pulled back up when you need them.
- Trouble planning or solving problems: The prefrontal cortex (the front of the brain that organizes your thoughts and plans your next steps) loses cells and connections, so tasks that need multiple steps—like following a recipe or balancing a checkbook—become confusing and slow.
- Confusion about time or place: Damage to the parietal lobes (the parts of the brain on the top and back that map where you are in space and time) and the hippocampus makes it hard to remember today's date, where you are right now, or how you got there.
- Difficulty understanding visual images or judging distance: The occipital lobes (the back of the brain that process what you see) and the parietal lobes that make sense of space get damaged, so reading, recognizing faces, or judging how far away a car is becomes hard—even though the eyes themselves still work fine.
- Problems with words in speaking or writing: The left temporal and frontal lobes (where the brain stores word meanings and builds sentences) lose neurons, so finding the right word, following a conversation, or calling things by their correct name becomes a struggle.

- Misplacing things and losing the ability to retrace steps: The hippocampus and prefrontal cortex can't hold onto the memory of where you put your keys or glasses a few minutes ago, and the reasoning circuits that would let you work backward to find them don't fire reliably anymore.

Red flags — act now

- Sudden, rapid confusion or change in alertness over hours to days—may signal delirium from infection, stroke, or medication toxicity
- New trouble walking, severe headache, or one-sided weakness—may mean a stroke or bleeding in the brain
- Weight loss, not eating or drinking, or signs of neglect or abuse—the person may no longer be safe at home
- Thoughts of harming themselves or others, severe agitation, or hallucinations that are frightening—needs urgent psychiatric and medical evaluation

Treat it — in this order

1. Check airway, breathing, circulation (ABCs); give oxygen to keep $\text{SpO}_2 \geq 94\%$; place on cardiac monitor → The brain needs constant oxygen and glucose. Low oxygen (Hypoxia) (low oxygen) or low blood pressure (hypotension) (low blood pressure) kills brain cells within minutes. Oxygen and monitoring prevent secondary brain injury while you find the cause.
2. Stat fingerstick glucose; if $< 60 \text{ mg/dL}$ give IV dextrose 25 g (one amp D50), then recheck in 15 minutes → Glucose is the brain's only fuel. Low blood sugar (Hypoglycemia) (low blood sugar) causes confusion, seizures, and coma within minutes. Dextrose reverses it instantly if given in time.
3. If $\text{GCS} \leq 8$, focal neurologic deficit, or signs of increased ICP: elevate head of bed 30° , avoid neck flexion, give osmotic agent (mannitol 1 g/kg IV or 3% hypertonic saline 250 mL IV over 30 min), keep systolic BP 100–160 mmHg, aim PaCO_2 35–40 mmHg if intubated → Elevating the head helps venous blood drain out of the skull. Mannitol and hypertonic saline pull water out of swollen brain tissue (osmosis—water follows salt). This lowers pressure inside the skull and prevents the brainstem from getting squeezed (herniation), which stops breathing and causes death.

4. If seizure witnessed or suspected: IV levetiracetam 1,500 mg load (or fosphenytoin 20 mg PE/kg if levetiracetam unavailable), protect airway, give oxygen, place on continuous EEG if available → Levetiracetam and fosphenytoin raise the threshold for neurons (brain cells) to fire. This stops the seizure cascade—repeated firing burns through oxygen and glucose, kills cells, and can lead to status epilepticus (a seizure that will not stop) (seizure lasting > 5 minutes or back-to-back seizures), which is deadly.
5. If fever (> 38°C or 100.4°F) and concern for meningitis or encephalitis: blood cultures × 2, then empiric IV antibiotics (ceftriaxone 2 g + vancomycin 15–20 mg/kg, add acyclovir 10 mg/kg if encephalitis possible) within 1 hour, then lumbar puncture after CT clears increased pressure → Bacterial meningitis kills within hours by inflaming the brain's protective layers and cutting off blood flow. Empiric antibiotics (given before culture results) cover the most common bacteria (*Streptococcus pneumoniae*, *Neisseria meningitidis*, *Listeria*). Acyclovir stops herpes simplex virus from destroying the temporal lobes (memory and language centers).

Your top priorities at the bedside

1. Assess and document Glasgow Coma Scale score every 1 to 2 hours, notifying provider immediately if score drops 2 or more points — why: Declining GCS means worsening brain function from swelling, bleeding, or herniation (brain squeezing through skull); early detection allows intervention before respiratory arrest
2. Check blood glucose with fingerstick immediately on arrival and repeat every 4 hours if abnormal — why: Low blood sugar (Hypoglycemia) below 60 causes confusion identical to stroke but reverses in minutes with glucose; missing this delays real treatment and risks permanent brain damage from prolonged low sugar
3. Position head of bed at 30 degrees and keep head midline, avoiding neck flexion or rotation — why: Elevation and midline alignment promote venous drainage (blood flow out of brain) and reduce intracranial pressure (ICP); neck twisting kinks jugular veins and traps blood inside the skull