

Status Epilepticus

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THE STORY IN ONE SENTENCE

A seizure that lasts more than 5 minutes is status epilepticus (a seizure that will not stop) — a brain emergency that can kill cells if it is not stopped fast.

“Status epilepticus (a seizure that will not stop) is a seizure that won't stop on its own. Your brain needs help right away or cells start dying.”

Normal anatomy — the body's job

The brain has billions of nerve cells (neurons) that talk to each other using tiny electric signals. Two main chemicals keep the signals balanced: glutamate (which turns neurons on, like a gas pedal) and GABA (which quiets neurons down, like a brake pedal). Normally, these two stay in balance so brain activity stays smooth and controlled. A seizure that starts on its own usually stops within 1 to 2 minutes because the brain's GABA brakes kick in and shut the extra firing down.

BODY'S JOB

The brain's job is to keep nerve signals firing in organized patterns — not too fast, not too slow. Glutamate speeds things up when the brain needs to think, move, or react. GABA slows things down to prevent runaway firing. This balance lets you think clearly, move smoothly, and stay alert without your brain going haywire. When a seizure starts, the brain is supposed to notice the extra firing and turn on the GABA brakes to stop it quickly.

1. Billions of neurons send electric signals to each other in organized patterns.
2. Glutamate (the gas pedal) turns neurons on when the brain needs action.
3. GABA (the brake pedal) quiets neurons down to keep firing under control.
4. These two chemicals stay balanced, so brain activity stays smooth.
5. If a seizure starts, the GABA brakes usually kick in within 1 to 2 minutes and stop it.
6. The person wakes up, and the brain goes back to normal balanced firing.

What breaks

In status epilepticus (a seizure that will not stop), the seizure lasts longer than 5 minutes and the brain's GABA brakes start to fail, so the runaway firing does not stop on its own and becomes harder to stop even with medicine.

CLINICAL TERM

Status epilepticus (a seizure that will not stop) is defined as continuous seizure activity lasting more than 5 minutes, or recurrent seizures without return to baseline consciousness between episodes. The core problem is that as the seizure continues, GABA-A receptors on the neuron surface get pulled inside the cell (internalized) and glutamate NMDA receptors move to the surface, so the brake signal fades and the gas signal gets stronger. This makes the seizure self-sustaining and progressively resistant to benzodiazepines and other GABA-enhancing drugs. Common triggers include antiepileptic drug withdrawal or noncompliance, alcohol withdrawal, acute stroke, traumatic brain injury, central nervous system infection (meningitis or encephalitis), metabolic derangements (hypoglycemia, low sodium (hyponatremia), low calcium (hypocalcemia), severe waste buildup in the blood (uremia)), drug toxicity, and anoxic brain injury.

How the body compensates

At first, the body tries to keep up with the seizure's huge demand for fuel and oxygen — the heart races, blood pressure climbs, and the lungs breathe fast. For the first 20 to 30 minutes, vital signs may look okay or even high. But this cannot last. After about 30 minutes, the body's backup systems start to fail: blood pressure drops, the heart struggles, breathing gets weak, and brain cells begin to die from running out of fuel. The danger is that early on, the patient may look stable while the clock is ticking toward permanent brain damage.

1. {'what': 'Heart rate and blood pressure go up', 'why': 'The heart pumps harder and faster to deliver oxygen and fuel to muscles and brain cells that are working at top speed.'}
2. {'what': 'Breathing gets fast and deep', 'why': 'The lungs try to blow off the carbon dioxide and acid waste building up from all the muscle work.'}
3. {'what': 'Blood sugar spikes, then drops', 'why': 'The body dumps stored sugar into the blood to fuel the seizure, but after a while the stores run out and blood sugar falls dangerously low.'}
4. {'what': 'Body temperature climbs', 'why': 'All the nonstop muscle squeezing makes heat faster than the body can cool down, so temperature can hit 104°F (40°C) or higher.'}
5. {'what': 'Vital signs start to crash after 30 minutes', 'why': 'The body runs out of backup fuel, the heart gets tired, blood pressure falls, and the brain and other organs start getting damaged from lack of oxygen and too much acid.'}

6. {'what': 'The window to prevent permanent damage closes fast', 'why': 'After 30 minutes of continuous seizure, brain cells begin to die even if blood flow and oxygen are normal — the nonstop firing itself kills them. Every extra minute increases the chance of lasting brain injury or death.'}

Domino effect

1. Neurons fire all at once without stopping. — The seizure starts when something triggers runaway firing (like missing seizure pills, low blood sugar, or a stroke). Normally the GABA brakes would stop it in a minute or two, but in status epilepticus (a seizure that will not stop) the firing keeps going.
2. GABA receptors disappear from the neuron surface. — After about 5 to 10 minutes of nonstop firing, the GABA-A receptors (the brake pedals) get pulled inside the cell and tucked away, so the brain's natural off-switch stops working.
3. Glutamate receptors move to the surface. — At the same time, glutamate NMDA receptors (the gas pedals) move to the outside of neurons, so the turn-on signal gets even stronger and locks the seizure in place.
4. The body works at top speed — muscles squeeze hard, the heart races, and waste piles up. — All that firing makes muscles contract over and over without rest, burning fuel and oxygen very fast and dumping acid waste (lactate) into the blood, so the blood gets too acidic (lactic too much acid in the blood (acidosis)).
5. Body temperature climbs and muscles start breaking down. — The nonstop muscle work makes so much heat that the body cannot cool down, and muscles that work too hard without rest start to tear apart (rhabdomyolysis), spilling a protein called myoglobin into the blood that can clog and damage the kidneys.
6. Seizure medicines stop working as well. — Benzodiazepines (like lorazepam or diazepam) work by boosting GABA, but if the GABA receptors are already gone from the cell surface, the medicine has nothing to grab onto — so it does not work as well the longer you wait.
7. After 30 minutes, brain cells start to die. — Even if oxygen and blood flow stay normal, neurons that fire nonstop for 30 minutes or more run out of energy inside the cell and start to die — this is called excitotoxic injury, and it causes permanent brain damage.
8. The person can choke, stop breathing, or have the heart stop. — If the seizure is not stopped, the body's compensations fail: blood pressure drops, the heart gets unstable and can stop (from too much acid in the blood (acidosis), low oxygen, or high potassium leaking from broken muscle cells), and the airway can get blocked by the tongue or by vomit, cutting off oxygen completely.

Symptoms · what the patient feels, and why

- **Shaking that won't stop for more than 5 minutes:** The brain's nerve cells are firing out of control in a runaway electrical storm, causing muscles all over the body to jerk and tighten over and over without the usual shut-off signal.
- **Multiple seizures one after another with no time to wake up in between:** The brain doesn't get a chance to reset between electrical storms, so the person stays trapped in a repeating cycle of seizure activity without regaining normal awareness.
- **Not waking up or responding after a seizure that seemed to stop:** The electrical storm may still be firing silently inside the brain (called non-convulsive status epilepticus (a seizure that will not stop)) even though the visible shaking has stopped, keeping the person deeply unconscious.
- **Fast breathing or pauses in breathing:** The brainstem (the lower part of the brain that controls automatic breathing) gets overwhelmed by the seizure's electrical chaos, causing the breathing rhythm to speed up, slow down, or stop briefly.
- **Blue lips or fingertips:** Breathing becomes so inefficient during the seizure that oxygen levels in the blood drop, turning skin and nails a dusky blue color (called bluish skin (cyanosis)).
- **Fever or high body temperature:** The non-stop muscle contractions generate heat like a car engine running at full throttle, and the brain's temperature control center (the hypothalamus) can't cool the body down fast enough.
- **Confusion or strange behavior that lasts a long time:** The frontal lobes (the thinking and decision-making parts of the brain) and the hippocampus (the memory center) are still misfiring or recovering from the electrical overload, scrambling thoughts and actions.
- **Foaming or drooling from the mouth:** The person can't swallow normally during the seizure because the muscles in the throat are either locked tight or jerking, so saliva builds up and spills out, sometimes mixed with air bubbles that look like foam.

Focused exam

- **Seizure activity lasting longer than 5 minutes, or multiple seizures without waking between them:** A normal seizure stops in 1 to 2 minutes when the brain's off-switch (GABA, the main calming signal) kicks in. If it keeps going past 5 minutes, or one seizure runs into another without the person waking, the off-switch is broken or too tired to work. That is status epilepticus (a seizure that will not stop).

- Rhythmic jerking of arms and legs (generalized convulsive), or subtle twitching of face or eyes, or no movement at all but the person stays unconscious (nonconvulsive): Status epilepticus (a seizure that will not stop) can show up as big shaking (convulsive) or almost no movement (nonconvulsive). The quiet kind is easy to miss because the body looks calm but the brain is still firing without an off-switch. Both types damage the brain if they last.
- Unresponsive or does not follow commands, even after visible seizure stops: After status epilepticus (a seizure that will not stop) starts, the brain gets so tired from nonstop firing that the person cannot wake up. The wake-up circuits in the cortex (the thinking outer layer of the brain) are exhausted. This tells you the brain has been seizing long enough to shut down normal thinking.
- Temperature rising (often above 38.5°C or 101°F), skin hot and sweaty, muscles stiff: Nonstop muscle activity from seizures burns fuel so fast it creates heat, like an engine running wide open. High temperature means the whole body is overheating and brain cells are at risk of cooking. Hyperthermia (body too hot) makes brain damage happen faster.
- Fast, shallow breathing or pauses in breathing; bitten tongue or inner cheek; foamy saliva at the mouth: Status epilepticus (a seizure that will not stop) makes chest and jaw muscles clench, so breathing becomes hard. The person may bite their tongue during the seizure. Poor breathing causes carbon dioxide to build up and oxygen to drop, which makes the blood acidic and the brain swell.
- Blood pressure elevated, heart rate fast (often above 120), sometimes irregular heart rhythm: The body floods with adrenaline (the main stress hormone) during status epilepticus (a seizure that will not stop), which makes the heart race and blood pressure shoot up. This is the sympathetic nervous system (the body's gas pedal) stuck on. High heart rate and pressure mean the stress response is maxed out.

Diagnostics · every test answers a question

- Fingerstick blood glucose (point-of-care glucose) → Is low blood sugar (hypoglycemia) (blood sugar too low) causing or worsening the seizure?
- Serum electrolytes (sodium, calcium, magnesium) → Is an electrolyte imbalance making brain cells fire out of control?
- Serum anti-epileptic drug (AED) levels (e.g. phenytoin, valproate, carbamazepine) → Did the person miss their seizure medicine, causing breakthrough seizures?
- Arterial or venous blood gas (ABG or VBG) → Is the blood becoming too acidic from nonstop muscle activity and poor breathing?
- Complete blood count (CBC) and metabolic panel (CMP) including creatinine and liver enzymes → Is there infection, kidney failure, or liver failure that could trigger or worsen seizures?

- Toxicology screen (urine and serum) including alcohol level → Is drug or alcohol withdrawal, overdose, or poisoning causing the seizure?
- Head CT (computed tomography) without contrast, or brain MRI if time allows → Is there bleeding, stroke, tumor, or brain swelling causing the seizure?
- Electroencephalogram (EEG, brain wave test) → Is the brain still seizing even though the body stopped shaking (nonconvulsive status epilepticus (a seizure that will not stop))?

Treatment logic

- Check fingerstick glucose immediately; if < 60 mg/dL, give 25 grams of IV dextrose (D50W, one amp) or 1 mg glucagon IM if no IV → Low blood sugar (hypoglycemia) shuts down the brain's off-switch because brain cells run on glucose. Raising blood sugar lets GABA (the brain's main calming signal) work again, which can stop the seizure within minutes. This is the fastest fix.
- Establish IV access and give lorazepam 4 mg IV over 2 minutes (or diazepam 10 mg IV, or midazolam 10 mg IM if no IV) within the first 5 to 20 minutes → Benzodiazepines (benzos) boost GABA, the brain's off-signal, so the nonstop firing stops. They cross into the brain fast and stop seizures in 60 to 80 percent of cases. Lorazepam lasts longer than diazepam. Midazolam works in the muscle if you cannot get an IV.
- Secure the airway, give high-flow oxygen, position the person on their side, suction secretions if needed, and prepare for intubation if they cannot protect their airway → Status epilepticus (a seizure that will not stop) makes muscles clench, so breathing becomes shallow and oxygen drops. Nonstop muscle activity burns oxygen fast, creating lactic acid and making blood acidic (acidosis). Keeping oxygen flowing prevents brain swelling and brain cell death from low oxygen (hypoxia).
- If seizure continues after benzos (refractory status epilepticus (a seizure that will not stop), after 20 minutes), give a second-line anti-seizure medicine: levetiracetam 60 mg/kg IV (max 4500 mg), OR fosphenytoin 20 mg PE/kg IV (max 1500 mg PE), OR valproate 40 mg/kg IV (max 3000 mg) → These drugs work more slowly than benzos but last longer. Levetiracetam blocks calcium channels on brain cells so they cannot keep firing. Fosphenytoin blocks sodium channels so the on-signal (glutamate) cannot spread. Valproate boosts GABA and blocks sodium. All three reset how brain cells fire so the off-signal can catch up.
- If still seizing after 40 to 60 minutes (established refractory status epilepticus (a seizure that will not stop)), start continuous IV anesthetic: midazolam infusion (0.2 mg/kg bolus, then 0.1–2 mg/kg/hr), OR propofol (1–2 mg/kg bolus, then 20–200 mcg/kg/min), OR pentobarbital (5–15 mg/kg load, then 0.5–5 mg/kg/hr). Requires ICU, intubation, and continuous EEG monitoring. → These anesthetics put the whole brain to sleep (burst suppression on EEG) so the nonstop firing stops. They are the last step when all other medicines fail. They give the brain time to rest and reset.

- Cool the body with ice packs to groin, armpits, and neck; give cool IV saline; use a cooling blanket if temperature rises above 39°C (102.2°F) → Nonstop muscle shaking creates heat (hyperthermia), which speeds up brain cell death. Cooling slows down chemical reactions in the brain and buys time before permanent damage happens. Every degree you lower temperature helps protect the brain.
- Identify and treat the underlying cause: restart or load anti-seizure medicine if levels are low, give thiamine 500 mg IV and treat alcohol withdrawal if the person drinks daily, start antibiotics and acyclovir if meningitis or encephalitis is suspected, reverse toxins or poisons, correct electrolytes, image the brain to find stroke or bleed → The seizure is the body's alarm that something broke the brain's off-switch. Fixing that broken thing (low medicine level, infection, withdrawal, stroke, toxin) is the only way to truly stop the seizure and prevent it from coming back. Medicines only hold the door open while you fix the real problem.

Medications

Lorazepam (Ativan) · Benzodiazepine

Lorazepam boosts the power of GABA, the brain's main calming signal. GABA acts like a brake pedal on nerve cells—it tells them to slow down and stop firing. In status epilepticus (a seizure that will not stop), neurons are stuck firing over and over like a stuck car alarm. Lorazepam makes GABA's brake stronger so the alarm finally shuts off.

1. Lorazepam crosses from the blood into the brain within seconds.
2. It finds GABA-A receptors—tiny gates on nerve cells that open when GABA lands on them.
3. When the gate opens, chloride ions (tiny charged particles) rush into the nerve cell.
4. Chloride makes the inside of the cell more negative, like draining a battery.
5. A drained cell cannot fire easily, so the seizure wave stops spreading.

SAFETY WATCH

Can slow breathing, especially if given too fast or with other sedatives—watch oxygen levels and be ready to help the patient breathe. · Can lower blood pressure—check it regularly. · Works for only a few hours, so a longer-acting seizure medicine must be started next. · In older adults or people with lung disease, use a smaller dose and watch closely.

Midazolam (Versed) · Benzodiazepine

Midazolam works exactly like lorazepam—it turns up the volume on GABA, the brain's brake signal. The big advantage is that midazolam can be given as a shot into the muscle

(intramuscular) if an IV line is not yet in place. This makes it faster to use in an emergency when every second counts.

1. Midazolam is injected into the muscle (usually the thigh) or given into a vein.
2. It reaches the brain in under two minutes.
3. It binds to GABA-A receptors and helps GABA open chloride channels wider.
4. Chloride floods into nerve cells, making them too negative to fire.
5. The seizure wave loses power and stops.

SAFETY WATCH

Can slow or stop breathing—have oxygen and a bag-mask ready. · Can drop blood pressure quickly. · Lasts only one to two hours, so a maintenance seizure drug must follow. · When given into muscle, it may take a minute or two longer to work than IV, but it is still faster than waiting for an IV line.

Diazepam (Valium, rectal gel Diastat) · Benzodiazepine

Diazepam is another GABA booster. Its special feature is that it can be given rectally (into the bottom) as a gel when there is no IV and no one trained to give a muscle shot. A family member or school nurse can give it, buying time until paramedics arrive.

1. Diazepam gel is squeezed into the rectum, where it is absorbed through the rectal lining into the bloodstream.
2. It reaches the brain in two to five minutes.
3. It latches onto GABA-A receptors and makes them more sensitive to GABA.
4. Chloride ions flow into nerve cells, silencing the overactive firing.
5. The seizure slows and often stops within a few minutes.

SAFETY WATCH

Can depress breathing, especially in young children or if combined with other sedatives. · Can cause drowsiness lasting several hours. · Rectal absorption is slower and less predictable than IV, so if seizures continue after ten minutes, advanced care is needed. · Do not give more than two doses at home—call 911 if the first dose does not work.

Fosphenytoin (Cerebyx) · Sodium-channel blocker (prodrug of phenytoin)

Fosphenytoin blocks sodium channels on nerve cells. Sodium channels are like tiny doors that swing open to let a wave of electricity race down a nerve. When too many doors keep swinging

open too fast, you get a seizure. Fosphenytoin jams the doors in the closed position so the wave cannot keep going.

1. Fosphenytoin is given into a vein; the body quickly converts it into phenytoin, the active form.
2. Phenytoin finds voltage-gated sodium channels on nerve-cell membranes.
3. It binds to channels that are stuck in the open or rapidly cycling state.
4. This keeps the channels closed, blocking the sodium rush that would trigger the next spike.
5. Without sodium spikes, the seizure wave cannot spread to neighboring cells.

SAFETY WATCH

Can cause dangerous heart-rhythm changes if pushed in too fast—give no faster than 150 mg PE (phenytoin equivalent) per minute and monitor the heart. · Can drop blood pressure—check it every few minutes during infusion. · Watch for severe skin reactions (rare but serious) days to weeks later. · Does not work well if the patient is already on phenytoin and has a therapeutic level. · Interacts with many other drugs—review the medication list.

Levetiracetam (Keppra) · SV2A modulator (synaptic-vesicle protein blocker)

Levetiracetam targets a protein called SV2A that sits on tiny bubbles (vesicles) inside nerve terminals. These bubbles are packed with neurotransmitters—chemical messengers. When a nerve fires, the bubbles fuse to the cell wall and dump their cargo, passing the signal to the next cell. Levetiracetam slows this dumping process, so overexcited nerves cannot keep shouting to their neighbors as easily.

1. Levetiracetam is infused into a vein and reaches the brain within minutes.
2. It binds to the SV2A protein on synaptic vesicles inside nerve endings.
3. This makes it harder for vesicles to release their neurotransmitter load.
4. With less neurotransmitter spilling out, the next nerve cell gets a weaker signal.
5. The seizure wave loses strength and fizzles out.

SAFETY WATCH

Generally well tolerated with few immediate side effects. · Can cause agitation, mood changes, or irritability in some people, especially over days to weeks. · Does not require blood-level monitoring or dose adjustment for heart or blood-pressure problems. · Safe to use even if liver or kidney function is mildly reduced (adjust dose in severe kidney disease). · No major drug interactions, making it easier to combine with other seizure medicines.

Valproate sodium (Depacon IV) · Multi-mechanism antiepileptic (enhances GABA, blocks sodium and calcium channels)

Valproate works on several fronts at once. It boosts GABA (the calming signal), blocks sodium channels (stopping the wave), and also blocks certain calcium channels (reducing neurotransmitter release). Think of it as turning up the brakes, jamming the gas pedal, and cutting fuel lines all at the same time.

1. Valproate is infused into a vein and quickly enters the brain.
2. It increases the amount of GABA by blocking the enzyme that breaks GABA down and by boosting the enzyme that makes it.
3. It binds to sodium channels in their inactive state, keeping them from reopening rapidly.
4. It also blocks T-type calcium channels, which are important in certain seizure types.
5. All three actions together suppress abnormal firing and stop the seizure.

SAFETY WATCH

Can harm a developing baby—do NOT use in women of childbearing age unless no other option exists; it causes birth defects and developmental problems. · Can damage the liver, especially in young children or people with metabolic disorders—monitor liver tests. · Can lower platelet count (the blood cells that stop bleeding)—check a complete blood count. · Can cause severe inflammation of the pancreas (pancreatitis)—watch for sudden belly pain. · Can raise ammonia levels, leading to confusion—measure ammonia if mental status worsens.

Propofol (Diprivan) · GABA-A agonist and general anesthetic

Propofol is a powerful anesthetic that forces GABA receptors wide open, flooding nerve cells with chloride and shutting down nearly all electrical activity. It is used when seizures have not stopped after 40 minutes (refractory status epilepticus (a seizure that will not stop)) and the brain needs to be put into a controlled sleep to break the cycle.

1. Propofol is given as a continuous IV drip, often starting with a quick loading dose.
2. It binds to GABA-A receptors and holds the chloride channel open much longer than natural GABA would.
3. Nerve cells become deeply hyperpolarized (their batteries drained far below normal).
4. Seizure activity stops, and brain waves flatten into a pattern called burst suppression, which doctors monitor with continuous EEG (brain-wave recording).
5. The dose is carefully adjusted to keep the brain quiet but not completely silent.

SAFETY WATCH

Stops breathing—patient must be on a ventilator (breathing machine) in an intensive-care unit. · Drops blood pressure dramatically—IV fluids and pressure-support drugs are often needed. · Propofol infusion syndrome: a rare, life-threatening condition with muscle breakdown, heart failure, and kidney damage—risk rises with high doses or infusions longer than 48 hours; watch creatine kinase, lactate, and triglycerides. · Turns urine green (harmless but startling). · Requires continuous EEG and close ICU monitoring.

Midazolam continuous infusion · Benzodiazepine (GABA-A enhancer)

When a single shot of midazolam is not enough, a continuous drip keeps GABA receptors supercharged around the clock. This is one step below full anesthesia—enough to silence seizures but sometimes light enough that the patient can still breathe on their own (though often a ventilator is still used for safety).

1. Midazolam is started with a loading dose, then continued as a steady drip.
2. It continuously enhances GABA's ability to open chloride channels.
3. Chloride keeps nerve cells too negative to fire.
4. Seizures stop; EEG often shows a pattern of suppressed activity.
5. The dose is adjusted based on EEG and clinical response.

SAFETY WATCH

Depresses breathing—most patients need a ventilator. · Can cause very low blood pressure—IV fluids and vasopressors may be needed. · Tolerance develops quickly; doses may need to climb every day. · Withdrawal seizures can occur if stopped suddenly—must taper slowly. · Requires ICU monitoring with continuous EEG.

Ketamine · NMDA-receptor antagonist

Ketamine blocks NMDA receptors, which are a different kind of gate on nerve cells that lets in calcium and keeps seizures revving. Unlike GABA drugs that boost the brake, ketamine cuts off one of the gas pedals. It is often used when GABA-based drugs (benzodiazepines, propofol) are losing their grip because the brain has started to resist them.

1. Ketamine is given as an IV infusion.
2. It plugs the NMDA receptor channel, preventing glutamate (the brain's main excitatory messenger) from opening it.
3. Without calcium influx through NMDA channels, nerve cells cannot sustain the high-energy firing needed for a seizure.
4. Seizure activity breaks apart.

5. Ketamine also has some direct neuroprotective effects, though these are still being studied.

SAFETY WATCH

Can raise blood pressure and heart rate—monitor closely, especially in patients with heart disease. · Can cause vivid hallucinations or agitation when waking up—usually not an issue in heavily sedated ICU patients. · May increase pressure inside the skull—use cautiously if brain swelling is suspected. · Generally preserves breathing better than propofol, but most patients are still intubated for airway protection. · Requires continuous EEG to guide dosing.

Pentobarbital · Barbiturate (GABA-A agonist and anesthetic)

Pentobarbital is one of the most powerful brain-wave suppressors available. It opens GABA-A chloride channels even wider than benzodiazepines and also blocks certain excitatory receptors. It drives the brain into burst suppression or even electrical silence, used only when every other treatment has failed (super-refractory status epilepticus (a seizure that will not stop)).

1. Pentobarbital is loaded rapidly, then given as a continuous drip.
2. It prolongs the opening of GABA-A chloride channels, hyperpolarizing nerve cells to near shutdown.
3. It also directly blocks AMPA receptors (another excitatory gate).
4. EEG shows burst suppression: brief bursts of activity separated by flat lines.
5. Seizures stop completely; the brain is in a controlled coma.

SAFETY WATCH

Profound drops in blood pressure—requires multiple vasopressor drugs (medications that squeeze blood vessels to raise pressure) and close ICU monitoring. · Stops breathing—patient must be on a ventilator. · Suppresses the immune system—raises infection risk. · Very long half-life (stays in the body for days)—takes a long time to wake up after stopping. · Risk of a stalled gut (ileus) (bowel stops moving), skin breakdown from immobility, and deep-vein blood clots. · Continuous EEG and invasive blood-pressure monitoring are mandatory.

Thiamine (Vitamin B1) · Vitamin supplement

Thiamine is not a seizure drug, but it is given immediately in the emergency room if there is any chance the patient has alcoholism or malnutrition. Thiamine is a key helper molecule (cofactor) that brain cells need to burn glucose for energy. Without it, brain cells starve and

can be permanently damaged. Giving thiamine before or with IV glucose prevents a catastrophic condition called Wernicke encephalopathy.

1. Thiamine is given as a quick IV or intramuscular injection.
2. It enters cells and is converted into thiamine pyrophosphate, the active form.
3. Thiamine pyrophosphate allows enzymes in the mitochondria (the cell's power plants) to process glucose and make ATP (energy).
4. Brain cells regain their energy supply and can function normally.
5. This prevents acute brain damage and supports recovery.

SAFETY WATCH

Extremely safe; serious reactions are very rare. · Must be given BEFORE glucose in malnourished patients—giving sugar first without thiamine can trigger or worsen Wernicke encephalopathy. · Allergic reactions (flushing, itching) are uncommon but possible. · No dose adjustment needed for kidney or liver disease.

Dextrose (IV glucose) · Sugar (energy substrate)

Dextrose is simply sugar water given into a vein. The brain runs entirely on glucose—it has no backup fuel. If blood sugar drops too low (hypoglycemia), brain cells cannot fire properly, and seizures can result. Giving IV dextrose instantly restores fuel and can stop a hypoglycemic seizure within seconds.

1. A finger-stick or lab test shows blood sugar is low.
2. Dextrose (usually 25 grams as a 50% solution, or a gentler 10% solution in children) is pushed into a vein.
3. Glucose floods the bloodstream and crosses into the brain within moments.
4. Neurons take up glucose and restart their energy-making machinery.
5. Normal electrical activity resumes; the seizure stops.

SAFETY WATCH

Check blood sugar first—never assume low blood sugar (hypoglycemia) without a measurement. · Can cause tissue damage if the IV leaks into surrounding tissue (concentrated sugar is irritating)—make sure the IV is running well. · In a malnourished patient, give thiamine FIRST to prevent Wernicke encephalopathy. · After giving dextrose, check blood sugar again to make sure it stays up—sometimes a continuous glucose drip is needed.

Red flags

- Seizure lasting longer than 5 minutes without stopping
- Not breathing well or turning blue
- Not waking up between seizures or after the shaking stops
- First-ever seizure in someone who has never had one before
- Seizure in a pregnant woman, which could signal eclampsia (a dangerous pregnancy complication)

Nursing priorities

1. Check blood sugar with a fingerstick glucometer right now. — The brain needs glucose (sugar) to work. Low blood sugar causes seizure-like shaking and confusion but fixes in 2 minutes with IV dextrose, so you must rule this out first before giving seizure medicine.
2. Protect the airway by turning the patient on their side and suctioning if needed. — During a seizure the tongue and throat muscles relax, so spit and vomit can block the airway (breathing tube) or go into the lungs causing aspiration pneumonia (lung infection from inhaling stomach contents).
3. Give oxygen by nasal cannula or mask to keep oxygen saturation above 94 percent. — Seizures make the brain fire nonstop which uses huge amounts of oxygen, and the person stops breathing deeply during the seizure so oxygen levels drop and brain cells start to die.
4. Start an IV line with normal saline running and give lorazepam 4 mg IV push over 2 minutes. — Lorazepam (a benzodiazepine that calms brain electrical activity) stops 60 to 80 percent of status epilepticus (a seizure that will not stop) if given in the first 20 minutes. The longer the seizure goes, the harder it is to stop and the more brain damage happens.
5. Monitor heart rate, blood pressure, breathing rate, and oxygen on the cardiac monitor continuously. — Status epilepticus (a seizure that will not stop) raises blood pressure and heart rate dangerously high from stress hormones, and seizure medicines like lorazepam can slow breathing and lower blood pressure causing the patient to crash.
6. Prepare second-line seizure medicine if shaking continues past 20 minutes: levetiracetam 60 mg per kilogram IV or fosphenytoin 20 mg per kilogram PE IV. — After 20 minutes the seizure becomes refractory (does not respond to first medicine), so you need a different drug that works on other brain pathways to stop the electrical storm before permanent brain injury occurs.
7. Check the patient's temperature and apply cooling measures like ice packs to the groin, armpits, and neck if temperature is above 101 degrees. — Seizure activity makes muscles contract over and over which creates heat. High fever (hyperthermia) above 104 degrees cooks brain proteins and causes lasting brain damage even after the seizure stops.

8. Call for help and prepare for possible intubation if the seizure does not stop or the patient cannot protect their airway after medicine. — If seizures continue despite two medicines the patient needs ICU care with a breathing tube (endotracheal intubation) and continuous EEG monitoring because the brain may still be seizing even when the body stops shaking.

Sources

- Neurocritical Care Society 2012 Guidelines
- American Epilepsy Society
- AAN (American Academy of Neurology) 2016 Practice Guideline

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