

Seizure Disorder

A plain-English guide for you and your family

WHAT IS HAPPENING

Your brain is made of billions of nerve cells that talk to each other using tiny electrical pulses—normally those pulses fire in an organized rhythm, like instruments in an orchestra staying in time. A seizure happens when a group of nerve cells suddenly fires too fast and too much all at once, like one section of the orchestra playing loud and off-beat. If the wild firing stays in one spot, it is called a focal seizure; you might stay awake and notice one arm jerking or a strange smell, or you might zone out and do odd things like lip-smacking without knowing it. If the wild firing spreads across both sides of the brain at the same time, it is called a generalized seizure; you lose awareness right away and might shake all over (tonic-clonic), stare and freeze (absence), or have sudden muscle jerks (myoclonic). The cause can be an old scar in the brain from a stroke or head injury, a tumor, a blood vessel tangle, a genetic change in how the nerve cells are wired, or a chemical imbalance like low blood sugar or low sodium. One seizure does not always mean epilepsy—doctors call it epilepsy only if you have had two or more unprovoked seizures or one seizure plus a high chance of more. Treatment depends on the seizure type: focal seizures respond to medicines like levetiracetam, lamotrigine, or carbamazepine; generalized seizures need medicines like valproate, levetiracetam, or lamotrigine. Safety is just as important—no driving until seizure-free for the time your state law requires (often 3-12 months), no swimming alone, no heights without rails, and a helper who knows how to roll you onto your side and call 911 if a seizure lasts longer than five minutes. Most people live full lives on the right medicine, but the team watches for rare dangers like SUDEP (sudden unexpected death in epilepsy, often from a breathing or heart pause during sleep), status epilepticus (a seizure that will not stop) (a seizure that will not stop and can hurt the brain), and serious drug rashes like Stevens-Johnson syndrome.

What you might feel

- Sudden jerking movements that the person cannot control
- Staring spell with no response when you talk to them
- Confusion or sleepiness right after the event
- Loss of bladder or bowel control during the event

- Tongue biting on the side during the event
- Feeling a strange smell, taste, or rising feeling in the belly right before
- Seizure lasts longer than 5 minutes or a second one starts before the person wakes up
- First seizure ever in an adult, especially over age 25

Call the doctor right away if...

- Seizure lasts longer than 5 minutes or repeats without the person waking up in between (status epilepticus—a medical emergency that can kill brain cells)
- New seizure in an adult, especially over age 25 (raises worry for tumor, stroke, or infection)
- Fever, stiff neck, or severe headache with the seizure (may be meningitis or encephalitis—brain infection)
- Sudden weakness or numbness on one side after the seizure clears (could be a stroke instead of or along with the seizure)
- Person is pregnant (seizures can harm the baby, and eclampsia—dangerously high blood pressure in pregnancy—can cause seizures and needs immediate treatment)

What the care team will do

- Place the patient on continuous pulse oximetry and position them on their side if they have altered mental status or are still in the in the groggy phase after a seizure (postictal) period
- Establish IV access and check fingerstick glucose immediately if the patient is still seizing or has not returned to baseline mental status within 10 minutes
- Protect the patient from injury by padding bedrails, removing hard objects from the bedside, and staying within arm's reach during the first 24 hours after a witnessed seizure
- Document exact seizure duration, body parts involved, eye movements, and responsiveness level every 2 minutes during the event using the hospital seizure flowsheet
- Hold all oral intake and keep the patient NPO until they can follow 3-step commands and swallow water without coughing
- Teach the patient and family seizure precautions including no driving, no swimming alone, no climbing ladders, and showering instead of bathing until seizure-free for the time required by state law
- Review the exact dosing schedule and emphasize taking lamotrigine at the same times every day, never doubling a dose if one is missed, and reporting any new rash within 24 hours
- Schedule the 2-week follow-up appointment before discharge and confirm the patient knows to call the clinic if seizures increase, if they have more than 3 seizures in one week, or if side effects like dizziness prevent walking safely

Medicines you may be given — and why

Levetiracetam (Keppra)

Levetiracetam calms overexcited neurons (brain cells that send signals) by attaching to a protein called SV2A on the storage bubbles that hold neurotransmitters (the chemical messengers neurons use to talk to each other). When the drug locks onto SV2A, it slows down the release of excitatory signals—like turning down the volume on neurons that are firing too fast—so the electrical storm of a seizure is less likely to start or spread.

Lamotrigine (Lamictal)

Lamotrigine blocks voltage-gated sodium channels—tiny gates on the surface of neurons that swing open to let sodium ions rush in and trigger an electrical spike. By holding these gates partly closed, lamotrigine keeps neurons from firing rapid bursts of signals. This dampens the runaway electrical activity that causes a seizure, especially in the cortex (the brain's outer layer where most seizures start).

Valproate (valproic acid, Depakote)

Valproate works through several pathways at once. It blocks voltage-gated sodium channels (like lamotrigine does), slowing rapid neuron firing. It also blocks T-type calcium channels in the thalamus (the brain's relay station), which stops the rhythmic 3-Hz spike-and-wave pattern of absence seizures. Finally, it boosts GABA—the brain's main calming neurotransmitter—by blocking the enzyme that breaks GABA down and by helping convert glutamate (an excitatory signal) into GABA. Together, these actions quiet overexcited neurons and prevent seizures from starting.

Lacosamide (Vimpat)

Lacosamide enhances slow inactivation of voltage-gated sodium channels. Unlike other sodium-channel blockers that act on fast inactivation, lacosamide works on a slower, longer-lasting closed state of the channel. By keeping sodium channels shut for a longer stretch after they fire, lacosamide makes it harder for neurons to fire repetitively—like giving the 'off' switch a longer hold. This is especially effective at stopping the rapid, rhythmic bursts that characterize focal seizures.

Carbamazepine (Tegretol)

Carbamazepine blocks voltage-gated sodium channels on neurons, just like lamotrigine. By holding these channels in an inactive state, it prevents neurons from firing rapid, repetitive bursts of electrical signals. This is effective for focal seizures and generalized tonic-clonic seizures, which involve sustained high-frequency firing. However, carbamazepine can worsen

absence and myoclonic seizures—types driven by different electrical rhythms—so it should NOT be used for those.

Phenytoin (Dilantin)

Phenytoin blocks voltage-gated sodium channels on neurons, preventing the rapid, repetitive firing that drives seizures. It works by keeping sodium channels in an inactive state after they fire, so the neuron cannot immediately fire again. This is especially effective for stopping focal seizures and generalized tonic-clonic seizures. Phenytoin is also one of the standard drugs for status epilepticus (a seizure that will not stop) (a prolonged, life-threatening seizure) because it works quickly when given intravenously.

Ethosuximide (Zarontin)

Ethosuximide blocks T-type calcium channels in the thalamus—the brain's deep relay station that coordinates rhythmic electrical activity. In absence seizures, neurons in the thalamus fire in a synchronized 3-Hz (three-per-second) spike-and-wave pattern, briefly disconnecting the cortex from awareness. By blocking the T-type calcium channels, ethosuximide breaks this abnormal rhythm and prevents the brief lapses in consciousness that define absence seizures. It does NOT work for other seizure types.

Topiramate (Topamax)

Topiramate works through several pathways. It blocks voltage-gated sodium channels (like lamotrigine and carbamazepine), preventing rapid neuron firing. It also boosts GABA—the brain's main calming signal—by acting on GABA-A receptors, and it blocks AMPA/kainate receptors for glutamate (the brain's main excitatory signal), further reducing overactivity. Finally, it weakly blocks carbonic anhydrase (an enzyme), which may help by shifting brain pH. Together, these actions quiet overexcited neurons and prevent seizures.

Oxcarbazepine (Trileptal)

Oxcarbazepine is closely related to carbamazepine and works the same way: it blocks voltage-gated sodium channels on neurons, preventing the rapid, repetitive firing that drives focal seizures and generalized tonic-clonic seizures. It is often chosen over carbamazepine because it has fewer drug interactions and a lower risk of serious skin reactions, though it still should NOT be used for absence or myoclonic seizures.

Clobazam (Onfi)

Clobazam is a benzodiazepine that boosts the effect of GABA—the brain's main calming neurotransmitter. It binds to GABA-A receptors (the brake pedal on neurons) and makes them more sensitive to GABA, so each GABA molecule opens the chloride channel wider and longer. More chloride flowing into the neuron makes it harder to fire, which quiets overexcited

neurons and prevents seizures. Clobazam is used as an add-on (adjunctive) medication, not usually as the only drug.

Where this information comes from

- American Epilepsy Society
- American Academy of Neurology (AAN) seizure guidelines
- International League Against Epilepsy (ILAE)
- CDC Epilepsy Program

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