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Neurology

SPEAKING OF HEALTH | TUESDAY, NOVEMBER 8, 2022

## How to help someone having a seizure



Although quite common, seizures are not something people typically are used to seeing in person. Many people don't know how to react when observing somebody having a seizure.

Fundamentally, seizures result from abnormal electrical discharges in a small region or broadly distributed throughout the brain, almost like an abnormal surge of electrical activity. This activity's clinical manifestation depends on which part of the brain is involved.

There are multiple types of seizures. The most common is a grand mal seizure, which features violent muscle contractions and loss of consciousness. Other types of seizures are less apparent and may include lip smacking, staring, loss of awareness, unusual finger motions, or repetitive chewing or swallowing.

### **These simple interventions can significantly reduce the possibility of injury from a seizure:**

#### **Ensure safety:**

- Gently lower the person to the ground.
- Turn the person on the side to keep the mouth and airway open.
- Move away any easily mobile objects that the person could strike or fall on them.
- Do not try to restrain the person in any way, as this can cause more injury. It is essential to keep in mind your safety as well. Often, violent convulsions or falls lead to injuries in people trying to assist.
- Do not put any objects in the person's mouth, as this may lead to oral injury or injury to you.
- Remain calm and by the person's side until the seizure has stopped.

Most seizures are self-limiting and will stop on their own. After the seizure has stopped, provide reassurance that the

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**Seek medical attention:**

- Record what time the seizure started and how long it lasted. Relay this information to a medical first responder or the person after the episode stops.
- Look for a medical bracelet on their arms, as many people with epilepsy have one as part of their rescue plan. The bracelet should state whom you can contact in an emergency and if the person is carrying medication that can stop the seizure.
- Call 911 if it's the first time your loved one has had a seizure.

Seizures can be frightening, but remembering these tips will help you provide the right care for your loved one. More detailed information and resources about seizure first aid can be found through the [Epilepsy Foundation](#).

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# Seizures

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A seizure is a sudden, uncontrolled burst of electrical activity in the brain. It can cause changes in behavior, movements, feelings and levels of consciousness. Having two or more seizures at least 24 hours apart that don't have a known cause is considered to be epilepsy.

There are many types of seizures, and they have a range of symptoms and severity. Seizure types vary by where they begin in the brain and how far they spread. Most seizures last from 30 seconds to two minutes. A seizure that lasts longer than five minutes is a medical emergency.

Seizures can happen after a stroke or a head injury. They also may be caused by an infection such as meningitis or another illness. Many times, though, the cause is unknown.

Most seizures can be controlled with medicine. However, managing seizures can affect your daily life. You can work with your health care professional to balance seizure control and medicine side effects.

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## Symptoms

Symptoms vary based on the type of seizure. They also can range from mild to severe. Seizure symptoms may include:

- Temporary confusion.
- A staring spell.
- Jerking movements of the arms and legs that can't be controlled.
- Loss of consciousness or awareness.
- Cognitive or emotional changes. They may include fear, anxiety or a feeling that you've already lived this moment, known as déjà vu.

A classification system distinguishes the different types of seizures. Health care professionals typically classify seizures as focal or generalized. Seizures are classified based on how and where the brain activity causing the seizure began. If health care professionals don't know how the seizures began, they may classify the seizures as unknown onset.

## Focal seizures

Focal seizures result from electrical activity in one area of the brain. This type of seizure can occur with or without loss of consciousness:

- **Focal seizures with impaired awareness.** These seizures involve a change or loss of consciousness or awareness that feels like being in a dream. People having these types of seizures may seem awake but they stare into space

and don't respond to their environment. They may perform repetitive movements such as hand rubbing, mouth movements, repeating certain words or walking in circles. They may not remember the seizure or even know that it occurred.

- **Focal seizures without impaired awareness.** These seizures may alter emotions. They also may change the way things look, smell, feel, taste or sound. But the seizures don't cause a loss of consciousness.

During these types of seizures, people may suddenly feel angry, joyful or sad. Some people have nausea or unusual feelings that are hard to describe. These seizures may result in trouble speaking and involuntary jerking of a body part such as an arm or a leg. They also may cause sudden sensory symptoms such as tingling, dizziness and seeing flashing lights.

Symptoms of focal seizures may be confused with other conditions of the brain or nervous system. They include migraine, narcolepsy or mental illness.

## Generalized seizures

Seizures that appear to involve all areas of the brain from the time they start are called generalized seizures. Different types of generalized seizures include:

- **Absence seizures.** Absence seizures, formerly known as petit mal seizures, often occur in children. Absence seizures typically cause a person to stare into space or make subtle body movements such as eye blinking or lip smacking. They usually last for 5 to 10 seconds. These seizures may happen up to hundreds of times a day. They may occur in clusters and can cause a brief loss of awareness.
- **Tonic seizures.** Tonic seizures cause stiffening of the muscles. These seizures usually affect muscles in the back, arms and legs. People who experience these seizures may lose consciousness and fall to the ground.
- **Atonic seizures.** Atonic seizures, also known as drop seizures, cause a loss of muscle control. People having this type of seizure may suddenly fall down or drop their head.

- **Clonic seizures.** Clonic seizures are associated with repeated jerking muscle movements. These seizures usually affect the neck, face and arms on both sides of the body.
- **Myoclonic seizures.** Myoclonic seizures usually appear as sudden brief jerks or twitches of the arms and legs. There is often no loss of consciousness.
- **Tonic-clonic seizures.** Tonic-clonic seizures, previously known as grand mal seizures, are the most dramatic type of epileptic seizure. They can cause a sudden loss of consciousness, body stiffening and shaking. They sometimes cause people to lose control of their bladder or to bite their tongue. They may last for several minutes. Tonic-clonic seizures also may start as focal seizures that then spread to involve most or all of the brain.

## Seizure stages

Seizures can have a beginning phase, middle phase and end phase.

- **Prodrome.** This is the earliest warning that a seizure may occur, but it is not part of the seizure itself. During the prodrome, people may have a hard-to-describe sense that a seizure may happen. They also may have changes in behavior. This can happen in the hours or even days before a seizure.

The prodrome stage may include an aura. The aura is the first symptom of a seizure. Symptoms during the aura may include the feeling that a person or place is familiar, known as déjà vu, or a feeling that a person or place is not familiar. Or people may simply feel strange, feel fear or panic, or even have pleasant feelings. Symptoms also may include smells, sounds, tastes, blurred vision or racing thoughts. The prodrome may include a headache, numbness or tingling, nausea, or dizziness.

Many people with seizures have a prodrome or aura as part of their experience, but some people do not.

- **Ictal.** The middle part of a seizure is called the ictal phase. The ictal phase spans the time from the first symptom to the end of the seizure. Symptoms of the ictal phase depend on the type of seizure.

- **Postictal.** This is the period after a seizure during recovery. The postictal stage can last minutes or hours. Some people recover quickly while others take hours. The length of the postictal stage depends on the type of seizure and what part of the brain was affected.

During this phase, people may be slow to respond, have trouble with memory, and have trouble talking or writing. They may feel sleepy, confused, dizzy, sad, scared, anxious or frustrated. They also may have nausea, a headache, weakness, feel thirsty or have a loss of bladder control.

## When to see a doctor

Seek immediate medical help if you have a seizure or if you see someone have a seizure and any of the following occurs:

- The seizure lasts more than five minutes.
- The person isn't breathing after the seizure stops.
- A second seizure follows immediately.
- The seizure is accompanied by a high fever.
- The seizure is accompanied by heat exhaustion.
- The person who had the seizure is pregnant.
- The person who had the seizure has diabetes.
- The seizure resulted in an injury.

If you experience a seizure for the first time, seek medical advice.

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## Causes

Nerve cells in the brain, known as neurons, create, send and receive electrical impulses. This allows the cells to communicate. Anything that disrupts the communication pathways can lead to a seizure. Some types of seizures may be caused by genetic changes.

The most common cause of seizures is epilepsy. But not every person who has a seizure has epilepsy. Sometimes seizures may be caused or triggered by:

- A high fever. When this happens, the seizure is known as a febrile seizure.
- An infection of the brain. This may include meningitis or encephalitis.

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- Severe general illness, including a severe infection of COVID-19.
  - Lack of sleep.
  - Low blood sodium. This can happen with medicine that makes you urinate.
  - Certain medicines that treat pain, depression or help people stop smoking. They can make it easier for seizures to happen.
  - A new, active brain injury, such as head trauma. It can cause bleeding in an area of the brain or a new stroke.
  - The use of legal or illegal drugs that may be sold on the streets, such as amphetamines or cocaine.
  - Alcohol misuse, including during times of withdrawal or extreme intoxication.
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## Complications

Having a seizure can sometimes lead to complications that are dangerous for you or others. You might be at risk of:

- **Falling.** If you fall during a seizure, you can injure your head or break a bone.
- **Drowning.** If you have a seizure while swimming or bathing, you're at risk of accidental drowning.
- **Car accidents.** A seizure that causes loss of awareness or the inability to control a vehicle while conscious can be dangerous.
- **Pregnancy complications.** Seizures during pregnancy pose dangers to people who are pregnant and their babies. And certain anti-seizure medicines increase the risk of birth defects. If you have epilepsy and plan to become pregnant, work with your health care professional. Your care professional can adjust your medicines and monitor your pregnancy as needed.

- **Mental health issues.** People with seizures are more likely to have depression, anxiety or other emotional health issues. Dealing with the condition and the side effects of anti-seizure medicines can cause these issues.
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# Absence seizure

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## Overview

Absence seizures involve brief, sudden lapses of consciousness. They're more common in children than in adults.

A person having an absence seizure may stare blankly into space for a few seconds. Then the person typically returns quickly to being alert. This type of seizure usually doesn't lead to physical injury. But injury can result during the period when the person loses consciousness. This is particularly true if someone is driving a car or riding a bike when the seizure happens.

Absence seizures usually can be controlled with anti-seizure medicines. Some children who have them also develop other seizures, such as generalized tonic-clonic seizures or myoclonic seizures. Many children outgrow absence seizures in their teens.

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# Symptoms

A simple absence seizure causes a vacant stare, which may be mistaken for a brief lapse in attention. The seizure lasts about 10 seconds, though it may last as long as 30 seconds. There's no confusion, headache or drowsiness after the seizure.

Symptoms of absence seizures include:

- A sudden stop in activity without falling.
- Lip smacking.
- Eyelid flutters.
- Chewing motions.
- Finger rubbing.
- Small movements of both hands.

Afterward, there's usually no memory of the incident. But if the seizure is longer, the person may be aware of missed time. Some people have many episodes daily. When it happens, it can interfere with school or daily activities.

A child may have absence seizures for some time before an adult notices them. This is because the seizures are so brief. A decline in a child's learning ability may be the first sign of the seizure disorder. Teachers may say the child has trouble paying attention or that a child is often daydreaming.

## When to see a doctor

Contact your child's pediatrician:

- If you're concerned that your child may be having seizures.
- If your child has epilepsy but develops symptoms of a new type of seizure.
- If the seizures continue to occur despite taking anti-seizure medicine.

Contact 911 or emergency services in your area:

- If you observe prolonged automatic behaviors lasting minutes to hours. This may include activities such as eating or moving without awareness. It also might include prolonged confusion. These are possible symptoms of a condition called status epilepticus.
- After any seizure lasting more than five minutes.

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## Causes

Absence seizures usually have a genetic cause.

In general, seizures occur as a result of a burst of electrical impulses from nerve cells in the brain, called neurons. Neurons typically send electrical and chemical signals across the synapses that connect them.

In people who have seizures, the brain's usual electrical activity is altered. During an absence seizure, these electrical signals repeat themselves over and over in a three-second pattern.

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People who have seizures also may have altered levels of the chemical messengers that help the nerve cells communicate with one another. These chemical messengers are called neurotransmitters.

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## Risk factors

Certain factors are common to children who have absence seizures, including:

- **Age.** Absence seizures are more common in children between the ages of 4 and 14.
  - **Sex.** Absence seizures are more common in females.
  - **Family members who have seizures.** Nearly a quarter of children with absence seizures have a close relative who has seizures.
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## Complications

While most children outgrow absence seizures, some:

- Must take anti-seizure medicines throughout life.
- Eventually have full convulsions, such as generalized tonic-clonic seizures.

Other complications can include:

- Learning problems.
- Behavior problems.
- Social isolation.
- Injury during the seizure.

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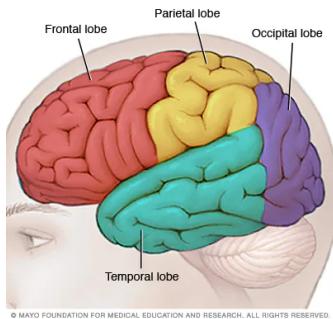
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# Frontal lobe seizures

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## Overview

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Frontal lobe seizures are a common form of epilepsy. Epilepsy is a brain disorder in which clusters of brain cells send a burst of electrical signals. This causes movements that can't be controlled, known as seizures. Frontal lobe seizures begin in the front of the brain, the area known as the frontal lobe.

The frontal lobe is large and has important functions. For this reason, frontal lobe seizures can produce symptoms that are unusual and may appear to be related to a mental illness. The seizures also can be mistaken for a sleep disorder because they often occur during sleep. Frontal lobe seizures also are known as frontal lobe epilepsy.



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Changes in brain tissue, infection, injury, stroke, tumors or other conditions can cause frontal lobe seizures.

Medicines can help control the seizures. Surgery or electrical stimulation might be options if medicines don't reduce or stop the seizures.

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## Symptoms

Frontal lobe seizures often last less than 30 seconds. Sometimes recovery is immediate.

Symptoms of frontal lobe seizures might include:

- Head and eye movement to one side.
- Not responding to others or having trouble speaking.
- Explosive screams, including profanities or laughter.
- Body posturing. A common posture is extending one arm while the other flexes, as if the person is posing like a fencer.
- Repetitive movements. These may include rocking, bicycle pedaling or pelvic thrusting.

## When to see a doctor

See a health care professional if you're having symptoms of a seizure. Call 911 or emergency medical help if you see someone having a seizure that lasts longer than five minutes.

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## Causes

Frontal lobe seizures can be caused by tumors, stroke, infection or traumatic injuries in the brain's frontal lobes.

Frontal lobe seizures also are associated with a rare inherited disorder called autosomal dominant nocturnal frontal lobe epilepsy. This form of epilepsy causes brief seizures during sleep. If one of your parents has this form of epilepsy, you have a 50% chance of inheriting the disorder.

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For about half of people who have frontal lobe epilepsy, the cause is not known.

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## Risk factors

Risk factors of frontal lobe seizures include:

- Family history of seizures or brain disorders.
  - Head trauma.
  - Brain infection.
  - Brain tumors.
  - Blood vessels or brain tissues that form in an irregular way.
  - Stroke.
- 

## Complications

Frontal lobe seizures can cause complications that may include:

- **Seizures that last dangerously long.** Frontal lobe seizures tend to occur in clusters. For this reason, they might provoke a condition in which seizure activity lasts much longer than usual, known as status epilepticus. If these seizures continue, they can cause permanent brain damage or death.

Seizures that last longer than five minutes are medical emergencies. Call 911 or get medical help right away if you witness someone having a seizure for longer than five minutes.

- **Injury.** The motions that occur during frontal lobe seizures sometimes result in injury to the person having the seizure. Seizures also can result in accidents and drowning if they occur in certain situations, such as while driving or swimming.

- **Sudden unexplained death in epilepsy (SUDEP).** People who have seizures have a greater risk than the average person of dying suddenly. The reasons for this are not known. Possible factors include heart or breathing problems, perhaps related to genetic changes. Controlling seizures as well as possible with medicines appears to be the best way to prevent SUDEP.
  - **Depression and anxiety.** Both are common in people with epilepsy. Children also have a higher risk of developing attention-deficit/hyperactivity disorder (ADHD).
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## Overview

Temporal lobe seizures begin in the temporal lobes of the brain. These areas process emotions and are important for short-term memory. Symptoms of a temporal lobe seizure may be related to these functions. Some people have odd feelings during the seizure, such as joy, déjà vu or fear.

Temporal lobe seizures are sometimes called focal seizures with impaired awareness. Some people remain aware of what's happening during the seizure. But if the seizure is more intense, the person might look awake but won't respond to what's around them. The person's lips and hands may make motions over and over.

The cause of temporal lobe seizures is often not known. But it may stem from a scar in the temporal lobe. Temporal lobe seizures are treated with medicine. For some people who don't respond to medicine, surgery may be an option.

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## Symptoms

An unusual sensation known as an aura may happen before a temporal lobe seizure. An aura acts as a warning. Not everyone who has temporal lobe seizures has auras. And not everyone who has auras remembers them.

The aura is the first part of a focal seizure before a loss of consciousness.

Examples of auras include:

- A sudden sense of fear or joy.
- A feeling that what's happening has happened before, known as déjà vu.
- A sudden or strange odor or taste.
- A rising sensation in the belly similar to being on a roller coaster.

Sometimes temporal lobe seizures impair your ability to respond to others. This type of temporal lobe seizure usually lasts 30 seconds to 2 minutes.

Symptoms of a temporal lobe seizure include:

- Not being aware of the people and things around you.
- Staring.
- Lip smacking.
- Repeated swallowing or chewing.
- Finger movements, such as picking motions.

After a temporal lobe seizure, you may have:

- A period of confusion and trouble speaking.
- Inability to recall what occurred during the seizure.
- Not being aware of having had a seizure.
- Extreme sleepiness.

In extreme cases, what starts as a temporal lobe seizure evolves into a generalized tonic-clonic seizure. This type of seizure causes shaking, known as convulsions, and loss of consciousness. It also is called a grand mal seizure.

## **When to see a doctor**

Call 911 or your local emergency number if any of the following occurs:

- The seizure lasts more than five minutes.
- Breathing or consciousness doesn't return after the seizure stops.
- A second seizure follows immediately.
- Recovery isn't complete after the seizure is over.
- Recovery is slower than usual after the seizure is over.
- You have a high fever.
- You're experiencing heat exhaustion.
- You're pregnant.
- You have diabetes.
- You've injured yourself during the seizure.

If you experience a seizure for the first time, see a health care provider.

### **Seek medical advice if:**

- You think you or your child has had a seizure.

- The number of seizures increases without explanation. Or the seizures become more intense.
- New seizure symptoms appear.

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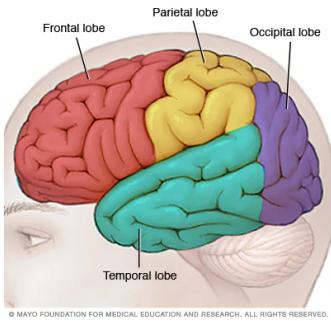
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Often, the cause of temporal lobe seizures is not known. But they can be a result of a number of factors, including:

- Traumatic brain injury.
- Infections such as encephalitis or meningitis. Or a history of such infections.
- A process that causes scarring in a part of the temporal lobe called the hippocampus. This is known as gliosis.
- Blood vessel malformations in the brain.
- Stroke.
- Brain tumors.
- Genetic syndromes.

During waking and sleeping, your brain cells produce varying electrical activity. If there's a burst of electrical activity in many brain cells, a seizure may occur.

If this happens in just one area of the brain, the result is a focal seizure. A temporal lobe seizure is a focal seizure that originates in one of the temporal lobes.

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## Complications

Over time, repeated temporal lobe seizures can cause the part of the brain that's responsible for learning and memory to shrink. This area of the brain is called

the hippocampus. The loss of brain cells in the hippocampus may cause memory problems.

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# Tonic-clonic (grand mal) seizure

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## Overview

A tonic-clonic seizure, previously known as a grand mal seizure, causes a loss of consciousness and violent muscle contractions. It's the type of seizure most people picture when they think about seizures.

During a seizure, there's a burst of electrical activity in the brain that causes changes in behavior and movements. Seizures can be focal, meaning the burst of electrical activity happens in one area of the brain. Or seizures can be generalized, in which they result in electrical activity in all areas of the brain. Tonic-clonic seizures may begin as focal seizures in a small area of the brain and spread to become generalized seizures that involve the whole brain.

Focal and generalized seizures have different symptoms. People who have generalized seizures usually lose consciousness. But people who have focal seizures may or may not lose consciousness. In tonic-clonic seizures, the muscles become stiff, causing the person to fall. Then the muscles alternately flex and relax.

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Usually, a tonic-clonic seizure is caused by epilepsy. But sometimes this type of seizure can be triggered by other health problems. Very low blood sugar, a high fever or a stroke can cause a tonic-clonic seizure.

Many people who have a tonic-clonic seizure never have another one and don't need treatment. But someone who has recurrent seizures may need treatment with daily anti-seizure medicines to control and prevent future tonic-clonic seizures.

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# Symptoms

Tonic-clonic seizures have two stages:

- **Tonic phase.** Loss of consciousness occurs. The muscles suddenly contract and cause the person to fall down. This phase tends to last about 10 to 20 seconds.
- **Clonic phase.** The muscles go into rhythmic contractions. They alternately flex and relax. Convulsions usually last 1 to 2 minutes or less.

The following symptoms occur in some but not all people with tonic-clonic seizures:

- **A scream.** Some people may cry out at the beginning of a seizure.
- **Loss of bowel and bladder control.** This may happen during or following a seizure.
- **Not responding after convulsions.** The person may not become conscious for several minutes after convulsions have ended.

- **Confusion.** The person often is disoriented after a tonic-clonic seizure. This is referred to as postictal confusion.
- **Fatigue.** Sleepiness is common after a tonic-clonic seizure.
- **Bad headache.** Headaches may occur after a tonic-clonic seizure.

## When to see a doctor

Call 911 or emergency medical help if:

- The seizure lasts more than five minutes.
- Breathing or consciousness doesn't return after the seizure stops.
- A second seizure follows immediately.
- You have a high fever.
- You're experiencing heat exhaustion.
- You're pregnant.
- You have diabetes.
- You've injured yourself during the seizure.

If you experience a seizure for the first time, see a healthcare professional.

Also see a healthcare professional if you or your child:

- Experience an increasing number of seizures for no apparent reason.
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## Causes

The brain's nerve cells typically communicate by sending electrical and chemical signals across the synapses that connect the cells. Tonic-clonic seizures occur when there's a surge of electrical activity over the surface of the brain. Many nerve cells fire at once, much faster than usual. Exactly what causes the changes to occur often is not known.

However, tonic-clonic seizures are sometimes caused by underlying health problems, such as:

### Injury or infection

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- Traumatic head injuries.
- Infections, such as encephalitis or meningitis. Or a history of such infections.
- Injury due to a previous lack of oxygen.
- Stroke.

## Congenital or developmental factors

- Blood vessels that don't form properly in the brain.
- Genetic syndromes.
- Brain tumors.

## Metabolic issues

- Very low blood levels of glucose, sodium, calcium or magnesium.

## Withdrawal syndromes

- Using or withdrawing from drugs, including alcohol.

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## Risk factors

Risk factors for tonic-clonic seizures include:

- A family history of seizure disorders.
- Any injury to the brain from trauma, a stroke, previous infection and other causes.
- Sleep deprivation.
- Medical problems that affect electrolyte balance.

- Illicit drug use.
  - Heavy alcohol use.
- 

## Complications

Having a seizure at certain times can be dangerous for you or others. You might be at risk of:

- **Falling.** If you fall during a seizure, you can injure your head or break a bone.
  - **Drowning.** If you have a seizure while swimming or bathing, you're at risk of accidental drowning.
  - **Car accidents.** A seizure that causes either loss of awareness or control can be dangerous if you're driving a car or operating other equipment.
  - **Pregnancy complications.** Seizures during pregnancy pose dangers to both mother and baby. And certain anti-seizure medicines increase the risk of birth defects. If you have epilepsy and plan to become pregnant, talk with a healthcare professional. Your medicines may need to be adjusted. A healthcare professional likely will monitor your pregnancy.
  - **Emotional health issues.** People with seizures are more likely to have depression and anxiety. Emotional health issues may be a result of dealing with the condition itself or as a result of medicine side effects.
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## Overview

### Explaining epilepsy

Listen to specialist Lily Wong-Kisiel, M.D., walk through the epilepsy basics.

What is epilepsy? A Mayo Clinic expert explains



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Epilepsy — also known as a seizure disorder — is a brain condition that causes recurring seizures. There are many types of epilepsy. In some people, the cause can be identified. In others, the cause is not known.

Epilepsy is common. It's estimated that 1.2% of people in the United States have active epilepsy, according to the Centers for Disease Control and Prevention. Epilepsy affects people of all genders, races, ethnic backgrounds and ages.

Seizure symptoms can vary widely. Some people may lose awareness during a seizure while others don't. Some people stare blankly for a few seconds during a seizure. Others may repeatedly twitch their arms or legs, movements known as convulsions.

Having a single seizure doesn't mean you have epilepsy. Epilepsy is diagnosed if you've had at least two unprovoked seizures at least 24 hours apart.

Unprovoked seizures don't have a clear cause.

Treatment with medicines or sometimes surgery can control seizures for most people with epilepsy. Some people require lifelong treatment. For others, seizures go away. Some children with epilepsy may outgrow the condition with age.

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## Symptoms

Seizure symptoms vary depending on the type of seizure. Because epilepsy is caused by certain activity in the brain, seizures can affect any brain process. Seizure symptoms may include:

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- Temporary confusion.
- A staring spell.
- Stiff muscles.
- Uncontrollable jerking movements of the arms and legs.
- Loss of consciousness.
- Psychological symptoms such as fear, anxiety or déjà vu.

Sometimes people with epilepsy may have changes in their behavior. They also may have symptoms of psychosis.

Most people with epilepsy tend to have the same type of seizure each time. Symptoms are usually similar from episode to episode.

## Warning signs of seizures

Some people with focal seizures have warning signs in the moments before a seizure begins. These warning signs are known as aura.

Warning signs might include a feeling in the stomach. Or they might include emotions such as fear. Some people might feel déjà vu. Auras also might be a taste or a smell. They might even be visual, such as a steady or flashing light, a color, or a shape. Some people may experience dizziness and loss of balance. And some people may see things that aren't there, known as hallucinations.

Seizures are classified as either focal or generalized, based on how and where the brain activity causing the seizure begins.

When seizures appear to result from activity in just one area of the brain, they're called focal seizures. These seizures fall into two categories:

- **Focal seizures without loss of consciousness.** Once called simple partial seizures, these seizures don't cause a loss of awareness, also known as consciousness. They may alter emotions or change the way things look,

smell, feel, taste or sound. Some people experience déjà vu. This type of seizure also may result in involuntary jerking of a body part, such as an arm or a leg. And focal seizures may cause sensory symptoms such as tingling, dizziness and flashing lights.

- **Focal seizures with impaired awareness.** Once called complex partial seizures, these seizures involve a change or loss of consciousness. This type of seizure may seem like being in a dream. During a focal seizure with impaired awareness, people may stare into space and not respond in typical ways to the environment. They also may perform repetitive movements, such as hand rubbing, chewing, swallowing or walking in circles.

Symptoms of focal seizures may be confused with other neurological conditions, such as migraine, narcolepsy or mental illness. A thorough exam and testing are needed to tell if symptoms are the result of epilepsy or another condition.

Focal seizures may come from any lobe of the brain. Some types of focal seizures include:

- **Temporal lobe seizures.** Temporal lobe seizures begin in the areas of the brain called the temporal lobes. The temporal lobes process emotions and play a role in short-term memory. People who have these seizures often experience an aura. The aura may include sudden emotion such as fear or joy. It also may be a sudden taste or smell. Or an aura may be a feeling of déjà vu, or a rising sensation in the stomach. During the seizure, people may lose awareness of their surroundings. They also may stare into space, smack their lips, swallow or chew repeatedly, or have movements of their fingers.
- **Frontal lobe seizures.** Frontal lobe seizures begin in the front of the brain. This is the part of the brain that controls movement. Frontal lobe seizures cause people to move their heads and eyes to one side. They won't respond when spoken to and may scream or laugh. They might extend one arm and flex the other arm. They also might make repetitive movements such as rocking or bicycle pedaling.

- **Occipital lobe seizures.** These seizures begin in the area of the brain called the occipital lobe. This lobe affects vision and how people see. People who have this type of seizure may have hallucinations. Or they may lose some or all of their vision during the seizure. These seizures also might cause eye blinking or make the eyes move.

## Generalized seizures

Seizures that appear to involve all areas of the brain are called generalized seizures. Generalized seizures include:

- **Absence seizures.** Absence seizures, previously known as petit mal seizures, typically occur in children. Symptoms include staring into space with or without subtle body movements. Movements may include eye blinking or lip smacking and only last 5 to 10 seconds. These seizures may occur in clusters, happening as often as 100 times a day, and cause a brief loss of awareness.
- **Tonic seizures.** Tonic seizures cause stiff muscles and may affect consciousness. These seizures usually affect muscles in the back, arms and legs and may cause the person to fall to the ground.
- **Atonic seizures.** Atonic seizures, also known as drop seizures, cause a loss of muscle control. Since this most often affects the legs, it often causes sudden falls to the ground.
- **Clonic seizures.** Clonic seizures are associated with repeated or rhythmic jerking muscle movements. These seizures usually affect the neck, face and arms.
- **Myoclonic seizures.** Myoclonic seizures usually appear as sudden brief jerks or twitches and usually affect the upper body, arms and legs.
- **Tonic-clonic seizures.** Tonic-clonic seizures, previously known as grand mal seizures, are the most dramatic type of epileptic seizure. They can cause a

sudden loss of consciousness and body stiffening, twitching and shaking. They sometimes cause loss of bladder control or biting of the tongue.

## When to see a doctor

Seek immediate medical help if any of the following occurs with a seizure:

- The seizure lasts more than five minutes.
- Breathing or consciousness doesn't return after the seizure stops.
- A second seizure follows immediately.
- You have a high fever.
- You're pregnant.
- You have diabetes.
- You've injured yourself during the seizure.
- You continue to have seizures even though you've been taking anti-seizure medicine.

If you have a seizure for the first time, seek medical advice.

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## Causes

Epilepsy has no identifiable cause in about half the people with the condition. In the other half, the condition may be traced to various factors, including:

- **Genetic influence.** Some types of epilepsy run in families. In these instances, it's likely that there's a genetic influence. Researchers have linked some types of epilepsy to specific genes. But some people have genetic epilepsy that isn't hereditary. Genetic changes can occur in a child without being passed down from a parent.

For most people, genes are only part of the cause of epilepsy. Certain genes may make a person more sensitive to environmental conditions that trigger seizures.

- **Head trauma.** Head trauma as a result of a car accident or other traumatic injury can cause epilepsy.
- **Factors in the brain.** Brain tumors can cause epilepsy. Epilepsy also may be caused by the way blood vessels form in the brain. People with blood vessel conditions such as arteriovenous malformations and cavernous malformations can have seizures. And in adults older than age 35, stroke is a leading cause of epilepsy.

- **Infections.** Meningitis, HIV, viral encephalitis and some parasitic infections can cause epilepsy.
- **Injury before birth.** Before they're born, babies are sensitive to brain damage that could be caused by several factors. They might include an infection in the mother, poor nutrition or not enough oxygen. This brain damage can result in epilepsy or cerebral palsy.
- **Developmental conditions.** Epilepsy can sometimes occur with developmental conditions. People with autism are more likely to have epilepsy than are people without autism. Research also has found that people with epilepsy are more likely to have attention-deficit/hyperactivity disorder (ADHD) and other developmental conditions. Having both conditions may be related to genes.

## Seizure triggers

Seizures can be triggered by things in the environment. Seizure triggers don't cause epilepsy, but they may trigger seizures in people who have epilepsy. Most people with epilepsy don't have reliable triggers that always cause a seizure. However, they often can identify factors that make it easier to have a seizure. Possible seizure triggers include:

- Alcohol.
- Flashing lights.
- Illicit drug use.
- Skipping doses of antiseizure medicines or taking more than prescribed.
- Lack of sleep.
- Hormone changes during the menstrual cycle.
- Stress.
- Dehydration.
- Skipped meals.

- Illness.
- 

## Risk factors

Certain factors may increase your risk of epilepsy:

- **Age.** The onset of epilepsy is most common in children and older adults, but the condition can occur at any age.
- **Family history.** If you have a family history of epilepsy, you may be at an increased risk of seizures.
- **Head injuries.** Head injuries are responsible for some cases of epilepsy. You can reduce your risk by wearing a seat belt while riding in a car. Also wear a helmet while bicycling, skiing, riding a motorcycle or doing any activities with a high risk of head injury.
- **Stroke and other vascular diseases.** Stroke and other blood vessel diseases can cause brain damage. Brain damage may trigger seizures and epilepsy. You can take steps to reduce your risk of these diseases. Limit alcohol, don't smoke, eat a healthy diet and exercise regularly.
- **Dementia.** Dementia can increase the risk of epilepsy in older adults.
- **Brain infections.** Infections such as meningitis, which causes inflammation in the brain or spinal cord, can increase your risk.
- **Seizures in childhood.** High fevers in childhood can sometimes be associated with seizures. Children who have seizures due to high fevers generally won't develop epilepsy. The risk of epilepsy increases if a child has a long fever-associated seizure, another nervous system condition or a family history of epilepsy.

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## Complications

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Having a seizure at certain times can be dangerous to yourself or others.

- **Falling.** If you fall during a seizure, you can injure your head or break a bone.
- **Drowning.** People with epilepsy are 13 to 19 times more likely to drown while swimming or bathing than people without epilepsy. The risk is higher because you might have a seizure while in the water.
- **Car accidents.** A seizure that causes either loss of awareness or control can be dangerous if you're driving a car or operating other equipment.

Many states have driver's license restrictions related to a driver's ability to control seizures. In these states, there is a minimum amount of time that a driver must be seizure-free before being cleared to drive. The amount of time may range from months to years.

- **Trouble with sleep.** People who have epilepsy may have trouble falling asleep or staying asleep, known as insomnia.
- **Pregnancy complications.** Seizures during pregnancy pose dangers to both mother and baby. Also, certain anti-seizure medicines increase the risk of birth defects. If you have epilepsy and you're considering becoming pregnant, get medical help as you plan your pregnancy.

Most women with epilepsy can become pregnant and have healthy babies. You need to be carefully monitored throughout pregnancy. Your medicines may need to be adjusted. It's very important that you work with your healthcare team to plan your pregnancy.

- **Memory loss.** People with some types of epilepsy have trouble with memory.

## Emotional health issues

People with epilepsy are more likely to have mental health conditions. They may be a result of dealing with the condition itself as well as medicine side effects. But even people with well-controlled epilepsy are at increased risk. Emotional health problems that may affect people with epilepsy include:

- Depression.
- Anxiety.
- Suicidal thoughts and behaviors.

Other life-threatening complications of epilepsy are not common but may happen. These include:

- **Status epilepticus.** This condition occurs if you're in a state of continuous seizure activity lasting more than five minutes. Or it may occur if you have seizures without regaining full consciousness in between them. People with status epilepticus have an increased risk of permanent brain damage and death.
- **Sudden unexpected death in epilepsy (SUDEP).** People with epilepsy also have a small risk of sudden unexpected death. The cause is unknown, but some research shows that it may occur due to heart or respiratory conditions.

People with frequent tonic-clonic seizures or people whose seizures aren't controlled by medicines may be at higher risk of SUDEP. Overall, about 1% of people with epilepsy die of SUDEP. It's most common in those with severe epilepsy that doesn't respond to treatment.

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## Diagnosis

### Epilepsy FAQs

Pediatric neurologist Lily Wong-Kisiel, M.D., answers the most frequently asked questions about epilepsy.

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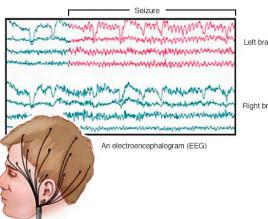
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## Diagnosing your condition



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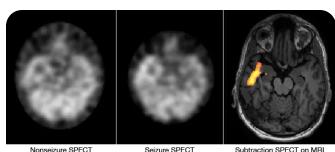
### EEG brain activity

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### CT scanner

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### Pinpointing seizure location

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To diagnose epilepsy, your healthcare professional reviews your symptoms and medical history. You may have several tests to diagnose epilepsy and to detect the cause of seizures. They may include:

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- **A neurological exam.** This exam tests your behavior, movements, mental function and other areas. The exam helps diagnose epilepsy and determine the type of epilepsy you may have.
- **Blood tests.** A blood sample can detect signs of infections, genetic conditions or other conditions that may be associated with seizures.
- **Genetic testing.** In some people with epilepsy, genetic testing may give more information about the condition and how to treat it. Genetic testing is most often performed in children but also may be helpful in some adults with epilepsy.

You also may have brain imaging tests and scans that detect brain changes:

- **Electroencephalogram (EEG).** This is the most common test used to diagnose epilepsy. In this test, small metal discs called electrodes are attached to your scalp with an adhesive or cap. The electrodes record the electrical activity of your brain.

If you have epilepsy, it's common to have changes in the pattern of brain waves. These changes occur even when you're not having a seizure. Your healthcare professional may monitor you on video during an EEG to detect and record any seizures. This may be done while you're awake or asleep. Recording the seizures may help determine what kind of seizures you're having or rule out other conditions.

The test may be done in a healthcare professional's office or the hospital. Or you may have an ambulatory EEG. The EEG records seizure activity over the course of a few days at home.

You may get instructions to do something that can cause seizures, such as getting little sleep prior to the test.

- **High-density EEG.** In a variation of an EEG test, you may have a high-density EEG. For this test, electrodes are placed closer together compared with a conventional EEG. High-density EEG may help more precisely determine which areas of your brain are affected by seizures.

- **Computerized tomography (CT) scan.** A CT scan uses X-rays to obtain cross-sectional images of your brain. CT scans can detect tumors, bleeding or cysts in the brain that might be causing epilepsy.
- **Magnetic resonance imaging (MRI).** An MRI uses powerful magnets and radio waves to create a detailed view of the brain. Like a CT scan, an MRI looks at the structure of the brain to detect what may be causing seizures. But an MRI provides a more detailed look at the brain than a CT scan.
- **Functional MRI (fMRI).** A functional MRI measures the changes in blood flow that occur when specific parts of the brain are working. This test may be used before surgery to identify the exact locations of critical functions, such as speech and movement. This allows surgeons to avoid those areas while operating.
- **Positron emission tomography (PET).** PET scans use a small amount of low-dose radioactive material. The material is injected into a vein to help visualize metabolic activity of the brain and detect changes. Areas of the brain with low metabolism may indicate places where seizures occur.
- **Single-photon emission computerized tomography (SPECT).** This type of test is used if MRI and EEG didn't pinpoint the location in the brain where the seizures start.

A SPECT test uses a small amount of low-dose radioactive material. The material is injected into a vein to create a detailed, 3D map of blood flow during seizures. Areas of higher than typical blood flow may indicate areas where seizures occur.

Another type of SPECT test called subtraction ictal SPECT coregistered to MRI (SISCOM) may provide even more-detailed results. The test overlaps the SPECT results with brain MRI results.

- **Neuropsychological tests.** These tests assess thinking, memory and speech skills. The test results help determine which areas of the brain are affected by seizures.

Along with your test results, a combination of other techniques may be used to help pinpoint where in the brain seizures start:

- **Statistical parametric mapping (SPM).** SPM looks at the areas of the brain with increased blood flow during seizures. It's compared to the same areas of the brains of people who don't have seizures. This provides information about where seizures begin.
- **Electrical source imaging (ESI).** ESI is a technique that takes EEG data and projects it onto an MRI of the brain. This is done to show areas where seizures are occurring. This technique provides more-precise detail than does EEG alone.
- **Magnetoencephalography (MEG).** MEG measures the magnetic fields produced by brain activity. This helps find the potential areas where seizures start. MEG can be more accurate than EEG because the skull and tissue surrounding the brain interfere less with magnetic fields. MEG and MRI together provide images that show areas of the brain both affected by seizures and not affected by seizures.

Diagnosis of your seizure type and where seizures begin gives you the best chance for finding an effective treatment.

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# Treatment

Treatment can help people diagnosed with epilepsy have fewer seizures or even completely stop having seizures. Possible treatments include:

- Medicines.
- Surgery.
- Therapies that stimulate the brain using a device.
- A ketogenic diet.

## Medication

Most people with epilepsy can become seizure-free by taking one anti-seizure medicine, which is also called an anti-epileptic medicine. Others may be able to decrease the number and intensity of their seizures by taking more than one medicine.

Many children with epilepsy who aren't having epilepsy symptoms can eventually stop taking medicines and live a seizure-free life. Many adults can stop taking medicines after two or more years without seizures. Your healthcare team can advise you about the appropriate time to stop taking medicines.

Finding the right medicine and dosage can be complex. Your provider may consider your condition, how often you have seizures, your age and other factors when choosing which medicine to prescribe. Your provider also may review any other medicines you may be taking to ensure the anti-seizure medicines won't interact with them.

You may first take a single medicine at a low dose. Then your healthcare professional may increase the dosage gradually until your seizures are well

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controlled.

There are more than 20 different types of anti-seizure medicines available. The medicines that you take depend on the type of seizures you have, your age and other health conditions.

Anti-seizure medicines may have some side effects. Mild side effects include:

- Fatigue.
- Dizziness.
- Weight gain.
- Loss of bone density.
- Skin rashes.
- Loss of coordination.
- Speech problems.
- Memory and thinking problems.

More-serious but rare side effects include:

- Depression.
- Suicidal thoughts and behaviors.
- Severe rash.
- Inflammation of certain organs, such as the liver.

For the best seizure control possible with medicine, follow these steps:

- Take medicines exactly as prescribed.
- Always call your healthcare professional before switching to a generic version of your medicine or taking other medicines. This includes medicines you get with or without a prescription and herbal remedies.

- Never stop taking your medicine without talking to your healthcare professional.
- Tell your healthcare professional immediately if you notice new or increased feelings of depression or suicidal thoughts. Also contact your healthcare professional right away if you have changes in your mood or behaviors.
- Tell your healthcare professional if you have migraines. You may need an anti-seizure medicine that can prevent your migraines and treat epilepsy.

At least half the people newly diagnosed with epilepsy become seizure-free with their first medicine. If anti-seizure medicines don't provide good results, you may be able to have surgery or other therapies. You'll likely have regular follow-up appointments with your healthcare professional to check on your condition and medicines.

## Surgery



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### Epilepsy surgery

When medicines do not provide enough control of seizures, epilepsy surgery may be an option. With epilepsy surgery, a surgeon removes the area of your

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brain that's causing seizures.

Surgery usually is done when tests show that:

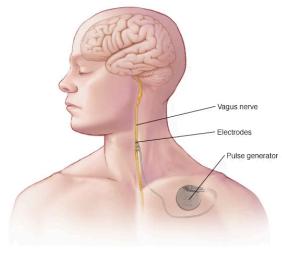
- Your seizures start in a small, well-defined area of your brain.
- The surgery wouldn't affect vital functions such as speech, language, movement, vision or hearing.

For some types of epilepsy, minimally invasive approaches such as MRI-guided stereotactic laser ablation may help symptoms. These treatments may be used when open surgery is too risky. This procedure involves using a thermal laser probe directed at the area in the brain causing seizures. It destroys tissue in an effort to better control the seizures.

You may continue to take medicine to help prevent seizures after successful surgery. However, you may be able to take fewer medicines and reduce your doses.

In a small number of people, surgery for epilepsy can cause complications. Complications may include a permanent change in thinking abilities. Talk to your surgical team members about their experience, success rates and complication rates with the procedure you're considering.

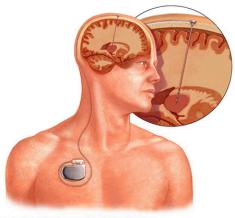
## Therapies



**Vagus nerve stimulation**

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**Deep brain stimulation**

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**MRI of deep brain stimulation**

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Apart from medicines and surgery, these potential therapies offer an alternative for treating epilepsy:

- **Vagus nerve stimulation.** Vagus nerve stimulation may be an option when medicines haven't worked well enough to control seizures and surgery isn't possible. A device called a vagus nerve stimulator is implanted underneath the skin of the chest, similar to a heart pacemaker. Wires from the stimulator are connected to the vagus nerve in the neck.

The battery-powered device sends bursts of electrical energy through the vagus nerve and to the brain. It's not clear how this inhibits seizures, but the device can usually reduce seizures by 20% to 40%.

Most people still need to take anti-seizure medicine. But some people may be able to lower their medicine dose. Vagus nerve stimulation side effects may include throat pain, hoarse voice, shortness of breath or coughing.

- **Deep brain stimulation.** In deep brain stimulation, surgeons implant electrodes into a specific part of the brain, typically the thalamus. The electrodes are connected to a generator implanted in the chest. The generator regularly sends electrical pulses to the brain at timed intervals and may reduce seizures. Deep brain stimulation is often used for people whose seizures don't get better with medicine.
- **Responsive neurostimulation.** These implantable, pacemaker-like devices can help reduce how often seizures occur. The devices analyze brain activity patterns to detect seizures as they start. They deliver electrical stimulation to stop the seizure. Research shows that this therapy has few side effects and can provide long-term seizure relief.

## Ketogenic diet

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Some children and adults with epilepsy reduce their seizures by following a diet high in fats and low in carbohydrates. This may be an option when medicines aren't helping to control epilepsy.

In this diet, called a ketogenic diet, the body breaks down fats instead of carbohydrates for energy. After a few years, some children may be able to stop the ketogenic diet and remain seizure-free. It's important for this to be done under close supervision of healthcare professionals.

Experts don't fully know how a ketogenic diet works to reduce seizures. But researchers think that the diet creates chemical changes that suppress seizures. The diet also alters the actions of brain cells to reduce seizures.

Get medical advice if you or your child is considering a ketogenic diet. It's important to make sure that your child gets enough nutrients when following the diet.

Side effects of a ketogenic diet may include dehydration, constipation and slowed growth from not getting enough nutrition. Side effects also may include a buildup of uric acid in the blood, which can cause kidney stones. These side effects are not common if the diet is properly and medically supervised.

Following a ketogenic diet can be hard. Low-glycemic index and modified Atkins diets offer less restrictive alternatives that may still provide some help for seizure control.

## Potential future treatments

Researchers are studying many potential new treatments for epilepsy, including:

- **Continuous stimulation of the seizure onset zone, known as subthreshold stimulation.** Subthreshold stimulation is continuous stimulation to an area of the brain below a level that's physically noticeable. This type of therapy appears to improve seizure outcomes and quality of life for some people

with seizures. Subthreshold stimulation helps stop a seizure before it happens.

This treatment may work in people who have seizures that start in an area of the brain called the eloquent area. This area can't be removed because it would affect speech and movements. Or it might help people with seizure types that may not improve with responsive neurostimulation.

- **Minimally invasive surgery.** New minimally invasive surgical techniques, such as MRI-guided focused ultrasound, show promise for treating seizures. These surgeries have fewer risks than traditional open-brain surgery for epilepsy.
- **Transcranial magnetic stimulation (TMS).** TMS applies focused magnetic fields on areas of the brain where seizures occur to treat seizures without the need for surgery. It may be used for patients whose seizures occur close to the surface of the brain and can't be treated with surgery.
- **Transcranial direct current stimulation (tDCS).** This technique provides electrical stimulation through the scalp to the brain to reduce seizures over time. This treatment may be provided at home.

#### Pacemaker for epilepsy

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## Lifestyle and home remedies

Understanding your condition can help you take better control of it:

- **Take your medicine correctly.** Don't adjust your dosage before talking to a member of your healthcare team. If you feel that your medicine should be changed, talk with your healthcare professional.
- **Get enough sleep.** Lack of sleep can trigger seizures. Be sure to get adequate rest every night.
- **Wear a medical alert bracelet.** This will help emergency staff know how to treat you correctly.
- **Exercise.** Exercising may help keep you physically healthy and reduce depression. Make sure to drink enough water, and rest if you get tired during exercise.

In addition, make healthy life choices. Manage stress, limit alcohol and don't smoke cigarettes.

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## Coping and support

Not being able to control seizures can lead to depression. But you can live an active, full life with epilepsy. To help cope:



- **Educate yourself and your friends and family** about epilepsy so that they understand the condition.
- **Try to ignore negative reactions from people.** It helps to learn about epilepsy so that you know the facts as opposed to misconceptions about the disease. And try to keep your sense of humor.
- **Live as independently as possible.** Continue to work, if possible. If you can't drive because of your seizures, investigate public transportation options near you. If you are not cleared to drive, you might consider moving to a city with good public transportation options.
- **Find a healthcare professional you like** and with whom you feel comfortable.
- **Try not to worry** about having a seizure.
- **Find an epilepsy support group** to meet people who understand what you're going through.

If you can't work outside of the home because of your seizures, you might consider working from home. And there are other ways to feel connected to people.

Let people you work and live with know how to handle a seizure. This can help if they are with you when you have one. You may offer them suggestions such as:

- Carefully roll the person onto one side to prevent choking.
- Place something soft under the person's head.
- Loosen tight neckwear.
- Don't place fingers or anything else in the person's mouth. People with epilepsy will not "swallow" their tongues during a seizure — it's physically impossible.
- Don't try to restrain someone having a seizure.
- If the person is moving, clear away dangerous objects.

- If immediate medical help is needed, stay with the person until medical staff arrive.
  - Observe the person closely so that you can provide details on what happened.
  - Time the seizures.
  - Be calm during the seizures.
- 

## Preparing for your appointment

You may start by seeing your healthcare professional. However, when you call to set up an appointment, you may be referred immediately to a specialist. This specialist may be a doctor trained in brain and nervous system conditions, known as a neurologist. Or you may be referred to a neurologist trained in epilepsy, known as an epileptologist.

Appointments can be brief and there's often a lot to talk about. It's a good idea to be well prepared. Here's information to help you get ready for your appointment, and what to expect.

### What you can do

- **Keep a detailed seizure calendar.** Each time a seizure occurs, write down the time, the type of seizure and how long it lasted. Also make note of any circumstances surrounding the seizure. They might include missed medicines, lack of sleep, increased stress, menstruation or other events that might trigger seizure activity.

Seek input from people who may observe your seizures, including family, friends and co-workers. It allows you to record information you may not know.

- **Be aware of any pre-appointment restrictions.** At the time you make the appointment, ask if there's anything you need to do in advance, such as

restrict your diet.

- **Write down key personal information**, including any major stresses or recent life changes.
- **Make a list of all medicines**, vitamins or supplements that you're taking.
- **Take a family member or friend along**. Sometimes it can be difficult to remember all the information provided to you during an appointment. Someone who comes with you may remember something that you missed or forgot.

You may not be aware of everything that happens when you're having a seizure. Someone else who has seen your seizures may be able to answer questions during your appointment.

- **Write down questions to ask** your healthcare professional. Preparing a list of questions helps you make the most of your appointment time.

For epilepsy, some basic questions include:

- What is likely causing my seizures?
- What kinds of tests do I need?
- Is my epilepsy likely temporary or long-lasting?
- What treatment do you recommend?
- What are the alternatives to the primary treatment that you're suggesting?
- How can I make sure that I don't hurt myself if I have another seizure?
- I have these other health conditions. How can I best manage them together?
- Are there any restrictions that I need to follow?
- Should I see a specialist? What will that cost, and will my insurance cover it?
- Is there a generic alternative to the medicine you're prescribing?

- Are there any brochures or other printed material that I can take home with me? What websites do you recommend?

In addition to the questions that you've prepared, don't hesitate to ask questions during your appointment at any time that you don't understand something.

## **What to expect from your doctor**

Your healthcare professional is likely to ask you a number of questions, such as:

- When did you first begin experiencing seizures?
- Do your seizures seem to be triggered by certain events or conditions?
- Do you have similar sensations just before the onset of a seizure?
- Have your seizures occurred often or occasionally?
- What symptoms do you have when you experience a seizure?
- What, if anything, seems to improve your seizures?
- What, if anything, appears to worsen your seizures?

## **What you can do in the meantime**

Certain conditions and activities can trigger seizures, so it may be helpful if you:

- Don't drink large amounts of alcohol.
- Don't use nicotine.
- Get enough sleep.
- Reduce stress.

Also, it's important to keep a log of your seizures before your appointment.

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# Febrile seizure

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## Overview

A febrile seizure is a convulsion in a child that's caused by a fever. The fever is often from an infection. Febrile seizures occur in young, healthy children who have normal development and haven't had any neurological symptoms before.

It can be frightening when your child has a febrile seizure. Fortunately, febrile seizures are usually harmless, only last a few minutes, and typically don't indicate a serious health problem.

You can help by keeping your child safe during a febrile seizure and by offering comfort afterward. Call your doctor to have your child evaluated as soon as possible after a febrile seizure.

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# Symptoms

Usually, a child having a febrile seizure shakes all over and loses consciousness. Sometimes, the child may get very stiff or twitch in just one area of the body.

A child having a febrile seizure may:

- Have a fever higher than 100.4 F (38.0 C)
- Lose consciousness
- Shake or jerk the arms and legs

Febrile seizures are classified as simple or complex:

- **Simple febrile seizures.** This most common type lasts from a few seconds to 15 minutes. Simple febrile seizures do not recur within a 24-hour period and

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are not specific to one part of the body.

- **Complex febrile seizures.** This type lasts longer than 15 minutes, occurs more than once within 24 hours or is confined to one side of your child's body.

Febrile seizures most often occur within 24 hours of the onset of a fever and can be the first sign that a child is ill.

## When to see a doctor

See your child's doctor as soon as possible after your child's first febrile seizure, even if it lasts only a few seconds. Call an ambulance to take your child to the emergency room if the seizure lasts longer than five minutes or is accompanied by:

- Vomiting
- A stiff neck
- Breathing problems
- Extreme sleepiness

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## Causes

Usually, a higher than normal body temperature causes febrile seizures. Even a low-grade fever can trigger a febrile seizure.

### Infection

The fevers that trigger febrile seizures are usually caused by a viral infection, and less commonly by a bacterial infection. The flu (influenza) virus and the virus that causes roseola, which often are accompanied by high fevers, appear to be most frequently associated with febrile seizures.

### Post-vaccination seizures

The risk of febrile seizures may increase after some childhood vaccinations. These include the diphtheria, tetanus and pertussis vaccine and the measles-mumps-rubella vaccine. A child can develop a low-grade fever after a vaccination. The fever, not the vaccine, causes the seizure.

## Risk factors

Factors that increase the risk of having a febrile seizure include:

- **Young age.** Most febrile seizures occur in children between 6 months and 5 years of age, with the greatest risk between 12 and 18 months of age.



- **Family history.** Some children inherit a family's tendency to have seizures with a fever. Additionally, researchers have linked several genes to a susceptibility to febrile seizures.
- 

## Complications

Most febrile seizures produce no lasting effects. Simple febrile seizures don't cause brain damage, intellectual disability or learning disabilities, and they don't mean your child has a more serious underlying disorder.

Febrile seizures are provoked seizures and don't indicate epilepsy. Epilepsy is a condition characterized by recurrent unprovoked seizures caused by abnormal electrical signals in the brain.

### Recurrent febrile seizures

The most common complication is the possibility of more febrile seizures. The risk of recurrence is higher if:

- Your child's first seizure resulted from a low-grade fever.
  - The febrile seizure was the first sign of illness.
  - An immediate family member has a history of febrile seizures.
  - Your child was younger than 18 months at the time of the first febrile seizure.
- 

## Prevention

Most febrile seizures occur in the first few hours of a fever, during the initial rise in body temperature.

### Giving your child medications

Giving your child infants' or children's acetaminophen (Tylenol, others) or ibuprofen (Advil, Motrin, others) at the beginning of a fever may make your child more comfortable, but it won't prevent a seizure.



Use caution when giving aspirin to children or teenagers. Though aspirin is approved for use in children older than age 3, children and teenagers recovering from chickenpox or flu-like symptoms should never take aspirin. This is because aspirin has been linked to Reye's syndrome, a rare but potentially life-threatening condition, in such children.

### Prescription prevention medications

Rarely, prescription anticonvulsant medications are used to try to prevent febrile seizures. However, these medications can have serious side effects that may outweigh any possible benefit.

Rectal diazepam (Diastat) or nasal midazolam might be prescribed to be used as needed for children who are prone to long febrile seizures. These medications are typically used to treat seizures that last longer than five minutes or if the child has more than one seizure within 24 hours. They are not typically used to prevent febrile seizures.

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