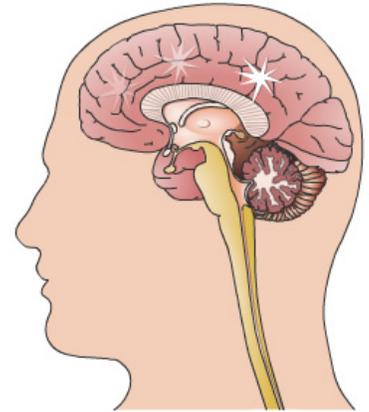


### **Introduction**

More than 2 million people in the United States are currently living with epilepsy. About 1 in 26 people in the U.S. will develop epilepsy at some time in their life.

During a seizure, a person has movements or feelings that he or she cannot control. The person may fall, cry out, lose consciousness, stare, twitch, or become confused. This is caused by abnormal electrical activity in the brain. About 1 in 10 people will have a seizure in their lifetime.

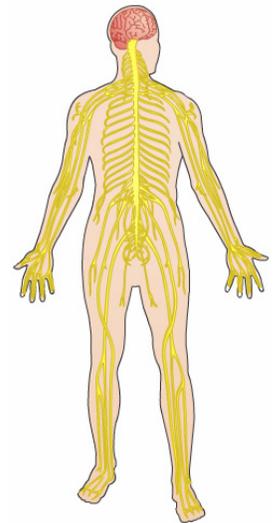
A person has epilepsy when he or she has seizures more than once. Sometimes people use the terms seizures or seizure disorder to indicate epilepsy. Epilepsy is the fourth most common neurological disorder. This reference summary explains its symptoms, causes, and treatment options. It also covers what to do when a seizure occurs, how to live with seizures, and how to prevent seizures.



### **What is a Seizure?**

Your brain is the control center of your body. It has millions of cells that constantly communicate through small electrical signals. It controls how you think, feel and move. Nerves that run through your body are made of small cells called neurons. These nerves allow your brain to communicate with your body.

Different parts of the brain control different things. One part of the brain controls your right arm. Another part will control your sight or your emotions. Seizures happen because of abnormal electrical activity in your brain. A seizure is like a storm in the brain where too many electrical signals are firing at the same time. This causes a change in how you move, think or feel.



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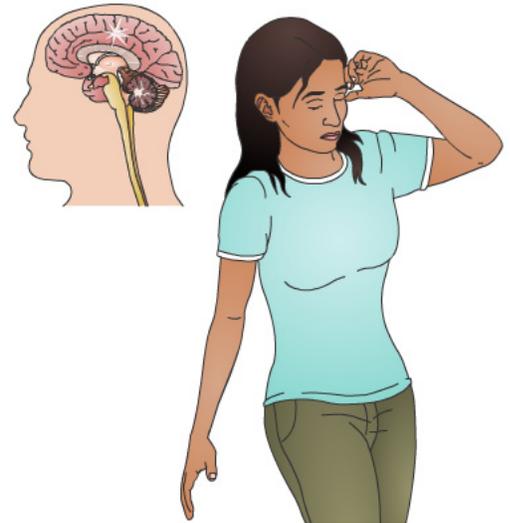
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There are many different types of seizures. The symptoms you experience during a seizure depend on where in the brain the seizure starts and how much of your brain is involved. For instance, if a part of your brain controlling a muscle is affected, the muscle may jerk uncontrollably or become completely still.

Some people may have only one seizure in their whole life. This is not epilepsy. Doctors say you have epilepsy when you have recurrent seizures. This means you have 2 or more seizures.

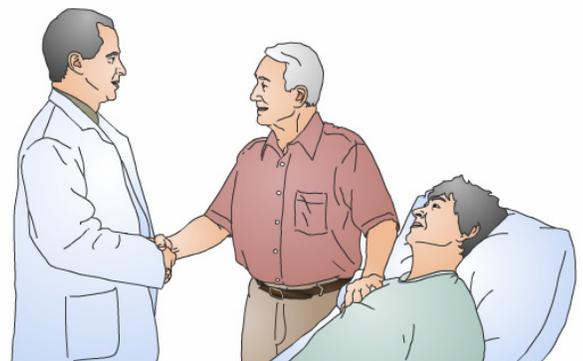
### Causes

In about 7 in 10 cases of epilepsy there is no known cause. The other 3 in 10 cases are linked to a disease, injury to the brain, or a brain abnormality. Babies are at special risk before birth and during the first few years of life. During this time, the brain grows a lot. Exposure to certain diseases, poor nutrition, or lack of oxygen can sometimes cause epilepsy.



The cells in your brain are like a complex web of wires. Defects in this wiring during the brain's early growth could lead to epilepsy. After a brain injury due to an accident or a stroke, your brain tries to repair itself by making new wiring. Scarring of the brain can also occur. If the new wiring is abnormal, it could cause seizures.

Diseases of the brain, such as hydrocephalus and meningitis, could cause epilepsy. Poisoning of the brain, such as lead and carbon monoxide poisoning, could lead to seizures and epilepsy. Older people sometimes develop diseases of the brain, such as brain tumors, strokes, dementia, infections, and bleeding. These types of diseases could lead to epilepsy. Some types of epilepsy tend to run in families, suggesting hereditary causes.



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## Types of Seizures

Seizures can be divided into two types. Generalized seizures involve uncontrolled electrical activity in your whole brain. Partial seizures, also called focal seizures, limit themselves to one part of the brain. Two common types of generalized seizures are:

- Absence seizures (also called petit mal)
- Tonic clonic seizures (also called grand mal)

Two common types of partial seizures are:

- Simple partial seizures
- Complex partial seizures

Generalized seizures that involve your whole brain may cause you to:

- Lose consciousness
- Fall
- Have muscle spasms
- Have jerking muscles all over the body or
- Stare into space, losing contact with reality for a few seconds.



If you have simple partial seizures, you may experience sudden feelings of joy or sadness or sudden sensations of smell, hearing, or vision. In this type of seizure, you remain fully aware and awake.

During a complex partial seizure you may display abnormal repetitive behaviors, such as blinking, moving in a circle, or moving an arm or leg without being able to control the movement. In this type of seizure, you can be confused and disoriented. Sometimes a child may have a seizure during an illness with a high fever. These are called febrile seizures. Most of the time, these seizures do not lead to epilepsy.

When you have a seizure, your brain shows abnormal electrical activity. This can be recorded by doctors on a special machine called an EEG (electroencephalogram). Most seizures last from a few seconds to a few minutes and stop naturally. Some people have seizure-like behavior without any abnormal electrical activity. These events are called non-epileptic seizures. They may occur due to psychological reasons, such as stress or anxiety.

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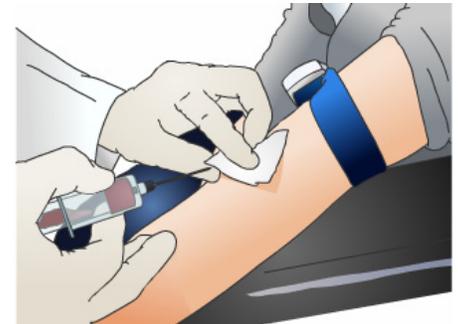
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Some people can tell when they are about to have a seizure because they have a specific feeling before the seizure starts; this is called an “aura”. One common aura is the smell of burnt rubber.

## Diagnosis

To understand if you have epilepsy, your doctor will first take your medical history, do a physical and neurological exam, and may do blood tests. They may also use a variety of other medical tests.

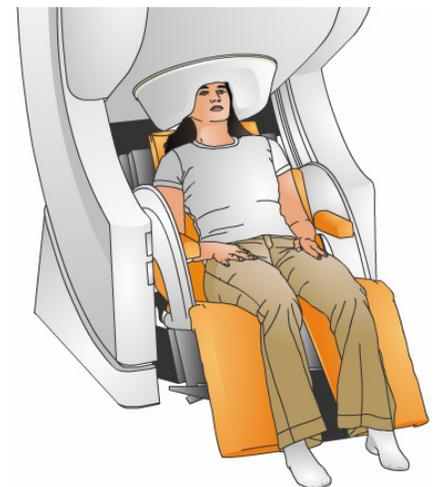
A test commonly used to diagnose epilepsy is called an electroencephalogram, or EEG. This test records your brain waves. In some cases of epilepsy, your doctor can tell if your brain has abnormal electrical activity connected with a seizure by reading your EEG. During an EEG, electrodes are placed on your scalp and brain waves are measured. The test is painless. The doctor may also want to do an EEG while you are sleeping.



Blood test

The doctor may also request a brain scan in order to see structures inside your brain. Examples of brain scans are MRI and CT scans. These allow the doctor to diagnose things like tumors, stroke, bleeding, brain malformations or cysts, which could be causing your epilepsy.

A doctor may use a magnetoencephalogram, or MEG. The purpose of this test is similar to an EEG, except that it measures magnetic signals in the brain instead of electrical signals. Because of this difference, it does not require electrodes and can detect signals from deeper areas of your brain than the EEG can.



MEG

## Treatment Options

More than 6 in 10 people with epilepsy have their seizures controlled with medication. After diagnosing the type of epilepsy you have, your doctor will recommend a medication to try. These drugs are called anticonvulsants or anti-seizure drugs. Doctors will also call these antiepileptic drugs, or AEDs for short.

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There are many different anti-seizure drugs available to control seizures. Your doctor will choose a drug based on the type of seizures you have, your test results, your age and any other medical conditions you may have. Your doctor will also choose a drug that will not interact with any medications you take.

Your doctor will adjust the dosage based on your weight and how you respond to the drug. Doctors usually start with a low dosage and increase it as needed based on seizure control and side effects.

Only a doctor can determine whether or not you can stop taking the medication. This will depend on the results of future EEG tests and for how long you have been free of seizures. Some people are able to stop taking medication. Others may need to stay on medication the rest of their life.

If a medication is stopped suddenly, you may have more seizures that are harder to treat and can be life threatening.

The side effects of anti-seizure drugs vary. Most side effects are relatively minor. Some common side effects include:

- Fatigue
- Weight gain or weight loss
- Dizziness
- Cognitive problems
- Balance problems
- Drowsiness



If your doctor recommends anti-seizure drug treatment, he or she will discuss the benefits and risks of it. Some people may be allergic to certain drugs. If you develop any kind of rash when taking one of these drugs, you should contact the doctor immediately.

In some cases of childhood epilepsy special diets that are rich in fat and low in sugar can help to reduce the number of seizures. One of these diets is called the ketogenic diet. These diet treatments should be done only under the supervision of a healthcare provider to make sure the child gets proper nutrition.

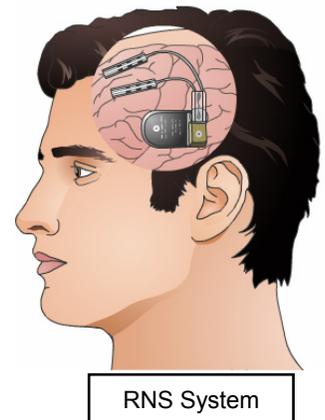


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When drug treatment fails to control seizures, brain surgery may be considered. Brain surgery for seizures tries to remove the part of the brain that is responsible for abnormal electrical signals; this is the part that causes the seizures. Only some people are good candidates for surgical treatment. A full evaluation is needed to decide if surgery is an option for someone with epilepsy.

Your doctor may recommend an implantable brain device called the RNS System. A surgeon inserts a neurostimulator device under the skull. One or 2 wires go from the device to an area in the brain. The device senses when you may be about to have a seizure and sends small electrical impulses to try and stop or lessen the seizure.



For some people with epilepsy a device called a vagus nerve stimulator, or VNS, may be suggested. A surgeon inserts the VNS electronic device under the skin in the upper left chest. A wire is connected from the device to the vagus nerve in the neck. Small electrical signals stimulate this nerve. This stimulation helps some people to have fewer seizures.

## Living with Epilepsy

When seizures are controlled, most people with epilepsy can participate in all life activities. However, people with seizures that are not well-controlled need to take precautions that may affect their daily living.

People with uncontrolled seizures may not be able to drive or operate hazardous machinery. Most states will not issue a driver's license to someone with epilepsy unless the person can document that he or she has been seizure-free for a certain period of time. The length of this period varies from state to state.

Jobs and hobbies may have to be limited to those that are not dangerous to the person in case he or she loses consciousness or attention for a few moments. Examples of jobs and hobbies that may need to be avoided are:

- Flying an airplane
- Motor racing
- Skydiving
- Mountain climbing



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Other activities and sports may be possible with supervision and/or safety gear, such as:

- Swimming
- Sailing
- Riding bicycles

A lot of activities and sports are safe for people with epilepsy such as jogging and volleyball. Careful consideration should be taken when choosing to participate in contact sports like football or hockey.

By law, people with epilepsy in the United States cannot be denied employment or access to any education or recreational activities because of their seizures. Most people with epilepsy have normal intelligence. Some are geniuses, such as Tchaikovsky, Nobel, and Napoleon.



The impact of uncontrolled or frequent seizures is often challenging for children and young adults. This can cause learning and memory issues. These children may need extra help and tutoring in school. Because some anti-seizure drugs can interfere with memory and concentration, children with epilepsy may need extra time to learn and complete their homework.

Women with a seizure disorder can get pregnant and safely deliver a healthy baby. If you are planning to get pregnant or become pregnant you should notify your doctor right away.



Your doctor may change your anti-seizure medication or adjust your dosage because some of these medications can increase the risk of birth defects. Most women are told to stay on the medication as prescribed by their doctor throughout the pregnancy. Some women will need special care and monitoring during their pregnancy.

If you have epilepsy, you should not drink alcoholic beverages or do illegal drugs. Doing so increases your chances of having a seizure and could be life-threatening.

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Although rare, it is possible for someone to die as a result of their epilepsy. Sometimes this is the result of a fall or accidental drowning. It may also happen when a person has a very long uncontrolled seizure. This is called status epilepticus.

The leading cause of epilepsy-related death is believed to be Sudden Unexpected Death in Epilepsy, also known as SUDEP. The greatest known risk factor for SUDEP is frequent seizures, especially generalized tonic-clonic (grand mal) seizures.

The best way to prevent SUDEP is to do everything you can to have as few seizures as possible.

## Seizure First Aid

Seizures can last from just a few seconds up to a few minutes. Most seizures stop on their own and are not emergencies. However, in rare cases seizures can last 30 minutes or more, requiring urgent medical attention. If you notice a person having a seizure, protect the person from harm until he or she regains awareness and control.

The following are some tips that can decrease the chances of injury during a seizure:

- Remain calm.
- Time the seizure if possible. A seizure lasting longer than 5 minutes is serious and requires a call to 911.
- Put something soft under their head to protect it from injury.
- Turn the person on one side to prevent the person from choking on vomit or saliva.



If the person is confused during a seizure and is moving around, remove anything from the area that may cause injury to the person or to others, such as a pan of boiling water or a hot iron.

During a seizure, do NOT do the following:

- Do not force anything into their mouth. It is not true that a person having a seizure will swallow their tongue.
- Do not give them water or medicine until the seizure is over.
- Do not try to stop the jerking movement.

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People with epilepsy can lead full, active lives and usually return to normal activity after a seizure. However, in some cases, a seizure becomes an emergency. You should call 911 if:

- The person is injured
- The seizure lasts more than 5 minutes or one seizure is followed by another seizure.
- The person does not regain consciousness after the seizure
- You believe this is the first seizure this person has had
- The person is pregnant or has diabetes
- The person has had a seizure in water

If the person stops breathing, call 911 and perform CPR.

Sometimes a person will have a seizure that lasts for longer than 5 minutes or have one seizure after another without regaining consciousness. This is called status epilepticus and is a medical emergency. If this happens you should call 911.



## Summary

Epilepsy is a disorder of the brain that affects millions of Americans. Seizures are signs of epilepsy but not all seizure-like symptoms are due to epilepsy. There are many types of seizures and epilepsies. It is important to see a doctor for the correct diagnosis and appropriate treatment.

Thanks to medical advances, we understand epilepsy much better than we did 50 years ago. Epilepsy is not a mental illness nor is it intellectual disability. Most cases of epilepsy can be controlled with medications, allowing the person to live a full and productive life.



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