

# Diagnosis of Seizures and Epilepsy

Page 1 of 5

**What are seizures?** events caused by uncontrollable, excessive electrical brain activity that results in a wide variety of symptoms called “manifestations” including:

- Stiffening of the body and or extremities
- Rhythmic jerking movements of the body and or extremities
- Visual or auditory (hearing) changes
- Behavioral changes (strange acting, repetitive activity or speech)
- Altered awareness (staring, not responding)
- Loss of consciousness
- Or a combination of some or all of these symptoms

**Seizure types:** basically there are two types of seizures: 1. Focal and 2. Generalized

**Focal seizures:** affect one part of the brain. Two types include:

1. **“Partial” Seizures in** which the patient retains consciousness and is completely aware. The person typically has rhythmic jerking of a limb
2. **“Complex Partial” Seizures** causes confusion or decreases the person’s ability to interact. Respond or recall the event.
3. Some partial seizures will progress into a generalized seizures (called a “secondary generalized” seizure)

**Generalized seizures** affect the whole brain and cause one of a combination of the following:

- Staring without response (such as “Absence” or “Petit Mal” seizures)
- Loss of consciousness
- Whole body stiffening (called a “Generalized Tonic” seizure)
- Whole body jerking (called a “Generalized Clonic” or “Grand-mal” seizure)
- Sudden drops (falls to the ground)

**Provoked seizures:** are caused by an event that is not considered epilepsys:

- Fever in kids 6 years of age and younger
- Fainting (also called syncope)
- Withdrawal from some medications or alcohol
- High blood pressure
- Medications
- Excessive sleep deprivation
- Brain injuries, strokes, hemorrhages, aneurysm ruptures
- Brain tumors

**Unprovoked seizures:** occur without known causes. A first unprovoked seizure is considered an isolated event. 2 unprovoked seizures is epilepsy.

# Diagnosis of Seizures and Epilepsy

Page 2 of 5

**How do seizures start?** Seizures may start:

- Suddenly without warning or
- With a warning (called an “aura”) of a variety of symptoms:
  - “a weird feeling” in the stomach that rises
  - Feeling of wind against the face
  - Visual changes in which objects get smaller or larger
  - Numbness, tingling or weakness of a limb

**How long do seizures last?** Most seizures are brief lasting seconds to 2-3 minutes:

- ~90% of seizures are less than 3 minutes long
- Seizures lasting 5 minutes are typically treated with an “abortive” medication (see below).
- Seizures longer than 30 minutes are a medical emergency called “status epilepticus”

**What causes seizures?** As indicated above, provoked seizures are due to an event known to promote seizures. However, some people who eventually are diagnosed with epilepsy may have had what was thought to be “provoked” seizures initially. The evaluation for seizures is important to rule out concerning causes (see above).

**Evaluating Seizures:** the most important test to be done is an EEG (electroencephalogram) which is painless and is like an EKG for the brain. The entire test typically takes an hour from start to finish (including cleaning the paste from hair). The electrodes smooth cup-shaped metal that are placed onto the scalp using a paste or gel that allows the machine to sense electrical activity made by the brain. No needles are involved. The test is painless. We do prefer the patient is sleep deprived the night before and the his/her is cleaned and without hair gel or hair spray for the test. Depending on the type of seizure, history and exam findings, other tests may be ordered:

- Routine EEG (as above)
- Prolonged EEG
- 24 hour Video-EEG (3-5 days, in the hospital or sometimes at home) intended on capturing a spell to help diagnose seizures and guide further evaluation and treatment
- Brain Imaging: CT, MRI
- Blood tests

# Diagnosis of Seizures and Epilepsy

Page 3 of 5

**Risk of seizures:** provoked seizures may not recur, depending on the cause and ability to eliminate the cause. First-time unprovoked seizures increases the risk of a second seizure but how high of a risk is difficult to say. Seizure recurrence risks increases with:

- Certain seizures types
- Long seizures
- Abnormalities on neurologic exam, EEG or brain scans (CT, MRI)
- History of neurologic injuries (stroke, hemorrhage, trauma)
- Neurologic problems (developmental delay, Mental Retardation, Autism).
- Some medical problems (Diabetes, Lupus)
- Pertinent family history of seizures

Those patients without above risks factors have the lowest risk of seizure recurrence.

**What is Epilepsy?** Epilepsy is simply defined as having **two or more recurrent, unprovoked seizures**. Epilepsy is a central nervous disorder that has many different causes. Some are acquired or from a known cause called “symptomatic” which includes (but not limited to) brain damage from prematurity, brain bleeds, brain injury, tumor and infections. Some are inherited (genetic syndromes). Some epilepsies are thought to be due to an underlying brain problem but cannot be proved with tests. This strong association between a condition and epilepsy is seen in Autism, developmental delay, mental retardation and some know genetic disorders. In other epilepsies, no cause or association can be determined despite performing many tests. These epilepsies typically occur in children who are normal developmentally, but not always.

**When to begin seizure medication?** Most specialists do not start medications (called “anti-epileptic drugs” or AEDs) after a first seizure for many reasons, The most significant reason is that a second seizure may never occur so starting medications may not be needed. The decision to start medications requires consideration of the risks and benefits of not treating against the risks and benefits of treating:

	<b>Benefits</b>	<b>Risks</b>
• <b>Not treating:</b>	may not be needed	a 2 <sup>nd</sup> seizure may occur and cause injury
• <b>Treating:</b>	may prevent seizures	medication side effects/adverse reactions

# Diagnosis of Seizures and Epilepsy

Page 4 of 5

**Can a seizure cause brain damage?** Seizures are primarily due to brain dysfunction. Sometimes this dysfunction is mild and reversible (like a seizure after passing out after donating blood). Sometimes this dysfunction is known to be present months or years before a seizure occurs (as in children with prematurity, a history of intra-ventricular hemorrhages, meningitis or brain trauma) and the seizures are called “symptomatic” epilepsy. In “symptomatic” epilepsy, the injury that causes the potential to have a seizure is “stable” and the seizure is a symptom of the longstanding injury. These seizures are generally not thought to cause more brain damage. However, there are rare occasions in which brain dysfunction (such as worsening development, worsening school performance, etc.) may occur with epilepsy. For example:

- **Severe epilepsy** with very frequent seizures (many a day): it is very difficult to determine if the neurologic problems are from the underlying cause of the epilepsy, the frequent seizures, the seizure treatment or a combination.
- **Status Epilepticus:** meaning very long seizures (30 minutes or longer) have the potential of causing damage to the brain (and body) due to chemical changes from excessive acid build up in the body and / or inadequate nutrients (glucose, oxygen).
- **Accidental events:** very rarely, a patient may have a very unfortunate event associated with a seizure that may cause injuries or can even be life threatening. For example, having a seizure may result in a fall, hitting her head on a hard surface causing a concussion or brain injury. A seizure during an unmonitored bath could result in drowning or near-drowning. A seizure while riding a horse, driving a vehicle, scuba or sky-diving could have disastrous consequences.

**Do we need to get oxygen for home use during a seizure?** Although a seizure may cause a patient’s lips or mouth to turn blue, this generally is brief and is not harmful. Rarely, the patient’s entire face (or body) turns bluish, which again is typically brief in duration. Because this “cyanosis” usually occurs with the initial stiff (or “tonic”) phase of a convulsion (GTC seizure), the breathing muscles are also “stiff” and breathing is not very effective. This phase typically lasts a very short duration (seconds). During this phase, oxygen would not be very helpful because the patient is not breathing deep enough to use the concentrated oxygen AND there is adequate oxygen in his/her blood circulating because the heart is still pumping. Mouth-to-mouth would also not be helpful because the patient’s chest muscles are stiff preventing the air to be forced in. Once the “tonic” stiff phase changes into the “clonic” jerking phase, the patient’s breathing will become deeper and rhythmic and cyanosis typically resolves. If not, the observer should call 911 and consider giving a seizure “abortive” medicine if available to stop the seizure.

# Diagnosis of Seizures and Epilepsy

Page 5 of 5

**Should I sleep with my child from now on? Should we use an audio/video monitor while she/he sleeps?** The risk of having a seizure in sleep depends on the child's epilepsy. Certainly, there is a risk for vomiting with aspiration (and developing pneumonia), falling out of bed (avoid top bunks), as well as suffocating (after the seizure falling asleep face down on a pillow however, such events are extremely rare). Sleep arrangements and monitoring are up to the individual family.

**What can happen from a seizure?** Most seizures are brief and stop on their own without incident or injury. Most problems occur with convulsive seizures during which patients may bite their tongues. Other patients may lose bladder (or bowel) control and wet their pants. Some may fall and get a bruise or even a laceration (that could need sutures). Less commonly patients break teeth or break bones or suffer a concussion. Some patients may vomit and are at risk of aspirating the vomit (goes into their lungs) and develops pneumonia. Any seizure that causes an altered awareness (complex partial, absence or convulsive seizures) can result in injury to the patient and/or others depending on the activity the patient is engaged in during the seizure (such as driving a car, taking a bath, climbing a ladder, etc.). On very RARE occasions, a person with epilepsy may die unexpectedly (often not from or during a seizure but in sleep). This is called **Sudden Unexpected Death in Epilepsy Patients (SUDEP)**. Little is known about SUDEP, although the risk is very low (driving in a car is far more dangerous) and treating epilepsy is the best protection from SUDEP.

## Remember:

- Most seizures are brief and stop on their own
- Most patients with epilepsy tolerate seizures well without significant problems
- Most patients will experience seizure-freedom on medications.
- Most patients will have no significant problems taking medications.
- It is important to practice seizure-precautions to avoid accidents (such as taking showers rather than baths)
- Keep a diary of seizure frequency, duration and medication side effects
- Follow your doctor's orders for dosing ("compliance," lab and other tests)
- Attend doctor visits as scheduled but call if you are unable to attend to reschedule

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