



Seizure & Status Epilepticus

Credits

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Seizures & Status Epilepticus Objectives

Upon completion of this self-study module, you should be able to:

- List the differential diagnosis of seizure
- Discuss the work-up and disposition of a new-onset, first-time seizure
- Discuss the work-up and disposition of patients presenting with recurrent seizures
- Describe appropriate management of status epilepticus

The complaint of seizures represents over 2.5 million visits per year (approx 1-2% of all ED visits). Epilepsy is estimated to affect about 6.6 per 1000 people, and 1% of the population will experience at least one seizure in their lifetime.

Status epilepticus is responsible for 50,000-150,000 visits per year to the ED and carries increased morbidity and mortality when present.

Seizures result from abnormal, excessive activity of the CNS and are categorized as either generalized, involving both hemispheres of the brain with loss of consciousness, or focal (partial), in which only one hemisphere is involved. Focal seizures are referred to as simple partial seizures when cognition is not impaired and as complex partial seizures when cognition is impaired. Focal seizures may generalize to involve both cerebral hemispheres, referred to as partial seizure with secondary generalization.

Classic Presentation

Classically, patients are brought to the ED after a witnessed seizure. Most seizures last 1-2 minutes, but duration can be highly variable. When the patient awakens, witnesses or EMS will report that they were confused for several minutes before they returned back to baseline (postictal state). Seizures may also be unwitnessed and a patient may present to the ED stating that they have been waking up confused or on the floor. Rarely, patients who have had seizures will present to the ED having been “found down” without a clear cause of their loss of consciousness.

While history will guide the physician in most cases of seizures, physical exam can provide some clues to make the diagnosis more likely. Common findings include postictal confusion that resolves while in the ED, evidence of tongue trauma from biting, and urinary or bowel incontinence. Minor head trauma may be present but does not help to distinguish between seizures and other etiologies. A focal neurologic deficit mimicking a stroke, referred to as Todd's paralysis, may also be present. However, this is a diagnosis of exclusion and the patient should undergo work-up for other causes of the paralysis. Patients may also have tachycardia, diaphoresis, tremulousness, and/or anxiety. These findings may suggest alcohol withdrawal, drug use, or hypoglycemia as possible causes of seizure.

Status epilepticus is present in any patient with a seizure of greater than 5 minutes duration, or 2 or more seizures in a row without a return to baseline. A prolonged postictal period may also indicate ongoing seizure activity. Physical exam may reveal a twitching/seizing limb, but absence of visible convulsions does not rule out ongoing seizure activity in the patient with a depressed mental status.

Differential Diagnosis

Seizures may occur either as a primary seizure disorder, generally referred to as epilepsy, or as a reaction to other underlying conditions. Patients with a primary seizure disorder are more prone to seize in the setting of:

- Medical noncompliance (most common cause of recurrent seizure)
- Sleep deprivation
- Emotional or physical stress

Etiologies of secondary, or reactive, seizures include:

- Hypoglycemia (most common cause of reactive seizure)
- Hyponatremia
- Alcohol withdrawal
- Trauma
- Drugs/Toxins
- Tumor
- Infection (e.g., meningitis, encephalitis, CNS abscess)
- Eclampsia

Diagnoses that mimic seizure:

- Pseudoseizure
- Syncope

Diagnostic Testing

As always, diagnostic testing should be directed by history and exam. Guidelines for patients presenting after uncomplicated seizure who are back to baseline and have no complaints and a normal physical exam include:

Laboratory testing

For new-onset, first-time seizure, the only lab values routinely recommended are a chemistry panel (for sodium and glucose) and a pregnancy test.

For patients with recurrent seizures, several common medications have levels that can be checked rapidly in the ED (phenytoin, carbamazepine, phenobarbital, etc.). Further testing should be guided by the history and physical exam, but can include urine analysis and pregnancy test.

Patients in status epilepticus should receive a more complete laboratory profile including LP to identify possible underlying causes.

CT scan

Every patient with a new-onset seizure should undergo head CT to rule-out intracranial lesions. Although the timing of the CT scan is debated, it can be very quickly and easily done in almost every emergency department in the country.

Patients with recurrent seizures should undergo head CT scan if they have a change in their seizure pattern (i.e. new type of seizure, increased frequency of seizures), significant trauma, fever, prolonged postictal time, new neurological deficit, or other concerning symptoms.

All patients in status epilepticus should undergo head CT once stabilized.

Lumbar puncture

LP should be considered for any patient with status epilepticus, severe headache, fever, persistent altered mental status, or immunocompromised state (especially HIV). Head CT scan should be performed prior to LP to rule out an intracranial lesion that may cause herniation during LP.

MRI

Every patient with a new-onset, first-time seizure should receive an MRI as part of their work-up, but this is typically done in the outpatient setting.

Electroencephalogram (EEG)

All patients with a new-onset, first-time seizure should also receive an EEG as part of their outpatient work-up.

Patients in status epilepticus need emergent, continuous EEG monitoring to ensure that they are truly no longer seizing.

How do I make the diagnosis?

Most patients who present to the Emergency Department with a chief complaint of seizure have already stopped seizing by the time they arrive. The diagnosis is made primarily by getting a good history from family, bystanders, or paramedics who witnessed the event. Description of a postictal period by bystanders or paramedics is suggestive of seizure.

In cases where the event was not witnessed, physical exam findings such as bite marks on the tongue or lips, or urinary or fecal incontinence may suggest a recent seizure. Minor head trauma may be present but does not help to distinguish between seizures and other etiologies. A focal neurologic deficit mimicking a stroke, referred to as Todd's paralysis, may also be present. However, this is a diagnosis of exclusion and the patient should undergo work-up for other causes of the paralysis. Patients may also have tachycardia, diaphoresis, tremulousness, and/or anxiety. These findings may suggest alcohol withdrawal, drug use, or hypoglycemia as possible causes of seizure. It is important to pay close attention to all the details of the history and physical exam as some types of seizures have specific treatments.

Alcohol withdrawal

Patients that present with seizures from alcohol withdrawal (delirium tremens) may present with anxiety, tremulousness, and altered mental status. Patients in alcohol withdrawal will have abnormal vital signs including tachycardia, hypertension, hyperthermia and tachypnea. This is predominantly a clinical diagnosis. An elevated blood alcohol level does not rule out this diagnosis as chronic alcoholics may seize at any blood level.

Eclampsia

Eclampsia is a life threatening disorder that must be treated immediately. All female patients presenting with seizure or possible seizure must be assessed for pregnancy. Pregnant women with an underlying seizure disorder may experience increased seizure frequency during pregnancy, however any pregnant patient with seizure must be suspected of having eclampsia. Clues to the diagnosis include vision complaints, edema of the face, hands, and feet, proteinuria on urine analysis, and hypertension.

Toxins

Many drugs have the potential to lower the seizure threshold, but several drugs cause seizures more commonly. In any patient being treated for tuberculosis, suspect isoniazid-induced seizures. Patients with a history of depression may have overdosed on tricyclic antidepressants (look for a widened QRS and prominent terminal R wave in aVR on EKG).

Trauma

Intracranial hemorrhage or brain injury may be the cause of a patient's seizure and should be suspected in patients with any signs or symptoms of head injury.

Pseudoseizure

Pseudoseizure is a difficult diagnosis to make since as many as 25% of patients initially thought to have pseudoseizure are eventually diagnosed with a true seizure disorder. Nevertheless, clues to this diagnosis include a rhythmic, controlled shaking activity, ability to talk or follow commands during the seizure, recall of a seizure that involves both sides of the body, or lack of a postictal period. EEG monitoring is helpful in assessing for pseudoseizure, but is frequently not available in the ED setting.

Status epilepticus

Status epilepticus is present in any patient in whom there is no return to baseline between seizures. In patients with non-convulsive seizures, this can be a difficult diagnosis to make without immediate EEG monitoring. Physicians must have a low threshold to treat patients aggressively even if they cannot confirm the diagnosis immediately.

Treatment

“Benzos, benzos, and more benzos.”

General treatment principles that apply to all seizure patients include management of the ABC's and supplemental oxygen. Keep the patient safe from falling or other injuries and remove restrictive clothing. Do not place anything in the patient's mouth except possibly a bite block or oropharyngeal airway to protect the tongue.

- First line: benzodiazepines (usually lorazepam)
- Second line: fosphenytoin/phenobarbital/valproic acid
- Third line: versed/pentobarbital/propofol infusions

The preferred route of seizure medications is intravenous administration. However, if it is difficult to obtain an IV, then lorazepam, midazolam, and diazepam can all be given intramuscularly. A common dose of benzodiazepines is 2 mg of lorazepam or midazolam (5 mg of diazepam) every 2-5 min until seizures are controlled. Many emergency departments also have rectal diazepam available. Oral administration of medications should not be used in patients without a normal mental status.

Common Medication Dosing

- Lorazepam/midazolam: 2 mg PO/IM/IV q 2-5 min as needed
- Diazepam: 5 mg PO/IV/IM q 2-5 min as needed (also available PR)
- Phenytoin: 15-20 mg/kg PO/IV

- Fosphenytoin: 15-20 phenytoin equivalents/kg IV
- Phenobarbital: 20 mg/kg IV (use single dose of 60-120 mg PO for oral load)
- Valproic acid: 15-45 mg/kg IV

Patients in status epilepticus will usually need to be intubated to control the airway.

Some etiologies of seizure have specific treatments:

- Eclampsia – Magnesium sulfate
- Hyponatremia – Hypertonic saline
- Isoniazid – Pyridoxine
- Hypoglycemia – Dextrose

Disposition

All patients presenting to the ED with seizure must have appropriate outpatient follow-up, usually with a Neurologist. First-time seizure patients will usually require further work-up for seizure, typically with MRI and EEG. Patients should be warned to avoid engaging in activities where they or others would be at risk if they had another seizure (e.g., swimming or bathing alone, cooking with open fire, driving, etc) until they have been cleared to return to these activities. Additionally, many states require physicians to report any patient with a diagnosis of seizure and have restrictions on driving privileges.

Pearls and Pitfalls

- 1% of the population will have a seizure sometime during their lifetime
- A patient with first-time, new-onset seizure who is back to baseline and has a normal exam needs a chemistry panel, pregnancy test, and head CT in the ED
- Medication noncompliance is the most common cause of recurrent seizures
- History and physical exam findings may offer clues about the etiology of seizure and appropriate treatment
- Benzodiazepines are the first line treatment for seizures in the ED
- Be aggressive when treating status epilepticus

Selected References

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