Seizures

I have been asked to provide an article on seizures, which is a fairly common entity seen in the practice of emergency medicine. Seizures are excessive firing of brain neurons resulting in abnormal motor, sensory or autonomic responses. In EMS, and in the ED, we generally deal with (and are most concerned about) those types of seizures which are generalized rather than partial (focal). The classification system basically breaks down as:

1) Partial seizures (formerly known as focal seizures)
2) Generalized Seizures

Now each of the above main categories contains sub-categories which I will briefly touch upon. For Partial Seizures, we have:

A) Simple (no loss of consciousness) partial seizures with motor signs, or sensory symptoms, or autonomic symptoms or psychic symptoms.

B) Complex partial seizures - consciousness is impaired

Partial Seizures involve a limited area of the brain and only one hemisphere -this is why the symptoms are focal.

Look for the purpose of this discussion let's keep it simple -- if you evaluate a patient with uncontrolled shaking of one arm who is awake, that patient has a partial, simple Seizure. If the patient shaking one arm is unconscious, that patient is classified as partial, complex seizure.

The seizures we are most familiar with are the generalized seizures. Generalized seizures involve both hemispheres of the brain rather than a limited isolated area.

These generalized seizures can present as dramatic, full body tonic-clonic activity (what we formerly referred to as grand mal seizures) or more subtle absence seizures whereby the patient experiences loss of consciousness for a short period of time (usually less than one minute). Sometimes with absence seizures will be associated with mild muscle twitching.

To summarize, seizures are causes by abnormal electrical events in the brain. If both hemispheres are involved, seizures are generalized. If only one hemisphere is involved, the seizure is partial.

Some patients experience recurrent seizures without known cause. These patients are classified as epileptics. Other patients have seizures when exposed to certain toxic materials, environmental stresses, metabolic derangements or certain disease processes. In the United States 10% of patients have at least one seizure in their lifetime and the incidence of epilepsy is approximately 1%.

So let's examine some specific causes of seizures-other than epilepsy. Many seizure types have reversible causes, so it is important to understand them and include them in your differential diagnosis of the new-onset seizure patient:
Reversible Causes for Seizures:

- **Hypoglycemia**—everyone thinks about this and on one misses this, right? Wrong. Even though we have been deluged with protocols to check blood sugar in any patient with mental status change, sometimes we forget to do this simple, life saving test. If the patient is hypoglycemic, D50 should be administered as per adult protocols. If an IV cannot be initiated, IM or sq glucagon can be administered. More ideally, the EMT should use the Easy IO for access in the tibia or humerus. Dextrose can be administered into the intraosseous device.

- **The Patient in alcohol withdrawal**—if the EMT obtains a history that the seizing patient has chronic alcoholism, the patient may well be experiencing acute alcohol withdrawal with seizures. 10% of people actively withdrawing from alcohol will have seizures as part of the withdrawal process. These patient are EXTREMELY difficult to evaluate and treat, because so often they have co-morbid mixtures of various other problems (head trauma, low thiamine, hypoglycemia, hypoinagnesemia, cardiac arrhythmia, brain bleed, etc). These patients can be some of the most challenging in your practice.

- **Hypomagnesemia**—I have seen patient die from this condition. Alcoholic patients with poor nutrition and who experience alcohol withdrawal seizures should have magnesium levels checked and replenished asap.

- **Uremia**—Non dialysis Renal failure patients with profound elevations in the blood urea nitrogen can experience seizures. Dialysis patients can experience seizures during dialysis because of "dialysis dysequilibrium syndrome" (headaches, nausea, agitation, convulsions) which occurs at, or near, the end of a rapid dialysis session

- **Subarachnoid hemorrhage**—8% of patients with subarachnoid hemorrhage have seizures, usually at the onset of the bleed.

- **Subdural hemorrhage**—subdural hemorrhages are the most common type of hemorrhage associated with seizure. Seizures may be partial (focal) or generalized and status epilepticus is not uncommon.

- **Stroke**—Stroke can be a common cause of new-onset seizure in patients over age 50. The post-ictal patient may be difficult to examine for neurological deficit-so repeat neuro checks are vitally important to identify the presence of stroke.

- **Brain Abscess**—Half of patients with brain abscesses have seizures at some point during their illness. History of fever, headache, HIV can be clues to the diagnosis.

- **Overdose of cocaine, PCP, MDMA, Tricyclic antidepressants, Amphetamines, Isoniazid, Theophylline**—Certain drugs and stimulants are frequently associated with seizure activity. Some of these drugs are prescription medications (Tricyclic antidepressants, Theophylline for COPD patients, INH used for prevention or treatment of tuberculosis), others are illegal drugs. The seizures may occur in the setting of an intentional overdose, or accidental overdose. A good history and attention to detail with regard to prescription medications and recreational drugs is essential in these patients.
• Eclampsia—not all pregnant patients who seize have eclampsia. Nearly one percent of women of childbearing age have epilepsy, and seizures may become more frequent during their pregnancy. Remember however, that if a patient in the third trimester (or even postpartum) experiences a new onset seizure—it is likely caused by eclampsia. The maternal mortality rate is high and risk factors include hypertension, multiple gestations, diabetes, extremes of age. The pre-eclamptic patient will have hypertension, proteinuria, and edema. Treatment for eclampsia is aggressive seizure control with IV magnesium as per your protocols. Additionally, versed may be used in conjunction. Rapid assessment by an obstetrician is mandatory as fetal delivery is definitive therapy.

• Febrile seizures in pediatrics—seizures with fever are usually benign, but not always. Simple febrile seizures are generalized seizures associated with fever, occurring in children ages 6 months to roughly 5 years. 5% of children experience febrile seizures, which are usually short duration, are not consecutive and—following the post-ictal period after fever control—the child looks well. If, on the other hand, the child with a seizure and fever experiences a prolonged or multiple consecutive seizures, a prolonged post-ictal state, appears "toxic" after waking up (or has a purpuric rash)—then a serious infection such as meningitis must be considered and the child must undergo complete evaluation to rule in or rule out this life-threatening condition.

Regardless of the cause of the seizure, the EMT must be prepared to manage the airway. Often times the gag reflex is deficient and the patient vomits in the post-ictal state. The patient should be placed in left lateral decubitus position and dentures removed. Be prepared to suction the airway. A bite block may be helpful to facilitate suctioning. Provide supplemental oxygen. If the patient has received a benzodiazepine (Versed for example) to control the seizure, sometimes the patient will experience apnea due to the Versed—and the airway must be controlled. Our squads do not carry Ativan (it requires refrigeration) so our protocols have Versed for seizure control. It may be difficult to gain IV access in a seizing patient. Remember the Easy 10 for quick access via proximal tibia or humeral head. Airway management may be difficult if the patient has trismus. Versed, plus fentanyl or morphine may help to relax the patient enough to gain access to the oropharynx and airway. The KING VISION, recently rolled out as part of our April 2012 Airway ConEd is an excellent tool to access the difficult airway almost effortlessly. The LCD screen and optics are excellent and I highly recommend that all intermediate and advanced EMTs become familiar with this tool.