

SAEMS
SEIZURE STANDING ORDER
Self-Learning Module

PURPOSE

This SAEMS Standing Order Self-Learning Module has been developed to serve as a template for EMS provider training. The intent is to provide consistent and concise information to all providers practicing within the SAEMS Region. The content of the Module has been reviewed by the Protocol Development and Review Sub-Committee, and includes the specific standing order, resource and reference material, and instructions for completing the Self-Learning Module to obtain continuing education credit. One hour of SAEMS continuing education credit may be issued following successful completion of the module.

OBJECTIVES

Upon completion of this learning module, the participant will be able to:

1. Describe three types of seizures.
2. List three seizure interventions that may be employed by any level provider.
3. Describe those seizure patients appropriate for BLS care.
4. Describe the situations for which IM midazolam is indicated.

INSTRUCTIONS

1. Review the accompanying information, Standing Order, and any additional reference material as necessary.
2. Complete the attached posttest and return it to your supervisor or base hospital manager for continuing education credit.

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INTRODUCTION

Seizures may be frightening to witness and are a common reason for calls for EMS. In fact, 10% of people will experience a seizure at some point in their lives. It is reasonable to assume that most EMS providers will care for at least one seizure patient over the course of their careers.

A seizure is the result of abnormal excessive electrical activity affecting all or part of the brain. It typically lasts from a few seconds to a few minutes, although patients may have seizures that are continuous or that recur without return of consciousness—status epilepticus—which may cause brain damage or death if not promptly treated. Other problems associated with seizures include hypoxia, acidosis, hyperthermia, hypotension, and cerebral ischemia.

There are several different types of seizures, depending on how much and which part of the brain is affected. They may be broadly classified as partial (localized to one area of the brain) or generalized (affecting the entire brain). (Erich, 2010) Partial seizures, also known as *focal seizures*, are further divided based on the extent to which consciousness is affected. Simple partial seizures have no effect on consciousness, while complex partial seizures involve some alteration in consciousness, without its actual loss. Because they involve the entire brain, all generalized seizures involve a loss of consciousness and are classified by their effect on the body, which may range from a simple interruption of awareness and activity to the total body convulsions commonly recognized as seizure activity. (Wikimedia Foundation, Inc., 2012)

Seizures, regardless of type, are also divided into epileptic and non-epileptic seizures. Epileptic seizures are defined as recurrent, unprovoked seizures. (Wikimedia Foundation, Inc., 2012) An explanation of what that means might be best approached by discussing non-epileptic seizures. A seizure that occurs acutely as a result of a traumatic brain injury is a non-epileptic seizure, because it is *provoked* by the head injury and is a single event. If the seizure recurs, originating from the lesion left by the injury, it is then an epileptic seizure. Other causes of non-epileptic seizures include

- Fever, leading to febrile seizures
- Metabolic disturbances, such as hypoglycemia, hyponatremia or hypoxia
- Drug intoxication, as with local anesthetics or stimulants (legal and illegal)
- Normal doses of certain drugs that lower seizure threshold, such as tricyclic antidepressants
- Drug withdrawal (anticonvulsants, antidepressants, alcohol, benzodiazepines and barbiturates)
- Space-occupying lesions in the brain (abscesses, tumors)
- Infection, such as encephalitis, meningitis, or malarial parasites
- Seizures during (or shortly after) pregnancy can be a sign of eclampsia
- Arteriovenous malformations can cause headaches, seizures, and cerebral hemorrhage
- Hemorrhagic stroke can occasionally present with seizures, embolic strokes generally do not (though epilepsy is a common later complication); cerebral venous sinus thrombosis, a rare type of stroke, is more likely to be accompanied by seizures than other types of stroke
- Witnessing a traumatic event may result in *psychogenic* non-epileptic seizure (Wikimedia Foundation, Inc., 2012)

While some epileptic seizures may be attributed to a known cause, such as a head injury or stroke, a significant number are idiopathic, meaning they have an obscure or unknown cause. There are several conditions that may mimic a seizure and may require further medical evaluation

- Syncope
- Closed head injury
- Hypoglycemia
- Rigors from sepsis
- Dystonic reaction
- Catatonic state
- Parkinsonism
- Somatoform disorder
- Anxiety
- Substance withdrawal (non-alcohol/benzodiazepine)

The Seizure Standing Order may be used for patients with either partial (focal) or generalized seizures, febrile seizures, or status epilepticus, and with patients who are postictal (altered state of consciousness experienced after a seizure). Excluded from the standing order are patients with dysrhythmias where ACLS might be used, hypoglycemic patients in need of dextrose and pregnant patients greater than 20 weeks gestation. These patients are more likely to benefit from treatment of the underlying condition (hypoglycemia or eclampsia) that may have caused a seizure.

Focal (Partial) Seizures

Partial seizures are subdivided into simple partial seizures and complex partial seizures. Simple partial seizures are, simply, seizures that occur without any change in mental status. Depending on where in the brain they originate, they present with motor, sensory, psychological or autonomic symptoms. Simple motor seizures arise from an area in the motor cortex and cause jerking, rigidity, or spasms in the muscle group controlled by that area. Similarly, simple sensory seizures arise in one of the areas of the brain that interpret sensation, and the patient sees, hears, tastes, smells or feels something in the absence of a physical stimulus. Simple psychological seizures may cause amnesia, feelings of *déjà vu*, or sudden intense emotions unrelated to present circumstances, while autonomic seizures affect those areas that control the functions of our organs and may result in sudden tachycardia, nausea, diarrhea, or urinary incontinence. Complex partial seizures, on the other hand, have symptoms accompanied by a change in consciousness. These patients may simply appear dazed

or confused, and unable to respond to questions or directions. In addition, they may demonstrate coordinated but purposeless repetitive behaviors such as lip-smacking or picking at clothing. These patients may at first glance appear conscious, perhaps walking (or running) with eyes open, but they are not appropriately processing information from their environment and may be at significant risk for injury. (WebMD, LLC, 2012)

Generalized Seizures

Generalized seizures derive their name from the fact that they involve both cerebral hemispheres. As a result, these seizures all share the common trait of a loss of consciousness, which may last from less than one second to several minutes. There are six types of generalized seizure: absence (a French word, spelled the same as the English word but pronounced “*ab SAHNS*”), myoclonic, atonic, tonic-clonic, clonic, and tonic.

Absence seizures, formerly known as *petit mal* seizures, cause a loss of consciousness lasting only a few seconds, usually with little or no change in muscle tone. The only signs that a seizure is occurring are sudden cessation of activity, accompanied by a blank stare or rapid blinking, during which the patient is unresponsive to external stimuli. These seizures occur predominantly in children and may occur several times each day. The patient typically has no awareness of the seizure, but may notice gaps in time. (WebMD, LLC, 2012)

Myoclonic seizures are sudden sporadic muscle contractions (“jerks”) that usually involve both sides of the body. The spasms may be so violent that they cause patients to involuntarily drop or throw objects they are holding. The loss of consciousness that accompanies the seizure is usually so brief it goes unnoticed. Commonly experienced examples of normal (non-pathologic) myoclonus are *hypnic jerks* that occur in some people as they drift off to sleep and hiccups (Wikimedia Foundation, Inc., 2012).

Atonic seizures, also known as *drop attacks* or *akinetic seizures*, cause a sudden complete loss of muscle tone, usually affecting the arms and legs, resulting in a fall. The unconsciousness that accompanies this type of seizure usually lasts only a few minutes and may be followed by total paralysis, also lasting only a few minutes. Because the patient is unconscious and limp while falling, face and head injuries are common. Additionally, this type of seizure tends to be resistant to drug therapy, so patients sometimes wear protective headgear. (Epilepsy Foundation of Greater Chicago, 2012)

Generalized tonic-clonic seizures (commonly known as *grand mal* seizures) are the most common type of seizure, as well as the most easily recognized, and the most likely

to initiate an EMS response. They are characterized by a stiffening of the muscles (the tonic phase), followed by jerking or twitching of the extremities and face (the clonic phase). (Epilepsy Foundation of Greater Chicago, 2012) The tonic phase typically lasts 30 to 60 seconds and may be heralded by an *epileptic cry*, which is an unconscious verbalization that occurs with contraction of the diaphragm. During this phase the patient does not breathe due to rigidity of the diaphragm and intercostal muscles. The clonic phase also usually lasts from 30 to 60 seconds. While breathing usually returns during this phase, it is likely to be irregular. This type of seizure uses a tremendous amount of oxygen and the patient may become cyanotic. Incontinence during this phase is common, as are injuries inside the mouth as the patient bites cheek or tongue. (WebMD, LLC, 2012) Once the clonic phase ends, most patients enter the postictal phase, during which they will be lethargic, confused, and may complain of headache. Breathing may be noisy due to relaxation of the oropharynx and may seem labored as the body tries to replenish the oxygen used. Extreme tiredness and a desire to sleep are common, even as the lethargy and confusion resolve. This resolution varies between individuals and may last from minutes to hours. Rarely, patients have an additional tonic phase before the postictal period, resulting in a tonic-clonic-tonic seizure. (Epilepsy Foundation of Greater Chicago, 2012) Prior to the onset of tonic-clonic seizures, some patients get one or more warning sensations called an *aura*. These are actually *simple partial seizures that secondarily generalize*, so patient may experience any of those symptoms. (Wikimedia Foundation, Inc., 2012)

The isolated tonic and clonic seizure types are unusual. The tonic seizure has the stiffening of the muscles without a subsequent clonic phase, while the clonic seizure has jerking or thrashing without an initial tonic phase. Both of these seizure types usually last from 30 to 60 seconds and may be followed by a postictal period.

Febrile Seizures

Febrile seizures occur when a child between the ages of 6 months and 5 years has a fever higher than 102°F, typically as a result of a viral illness. They are relatively common in children of this age range, occurring in up to 5% of children, and usually have no lasting impact on the child. Only 2-5% of children that have a febrile seizure go on to develop epilepsy, although 30% may have another febrile seizure at some time. They are often quite frightening for family and caregivers to observe, so in addition to caring for the patient, the EMS provider is well positioned to provide information and reassurance for witnesses.

While this type of seizure usually has no lasting effect, some do result in injury to the patient and they may be the result of a serious illness, such as meningitis. Additionally,

this may be a non-epileptic seizure with a different cause that happens to have occurred in a patient with a fever. The patient should receive a thorough assessment to identify possibly dangerous conditions needing further treatment.

Status Epilepticus

While most seizures end within a few minutes, both epileptic and non-epileptic seizures may progress to a condition known as status epilepticus, in which the seizure lasts longer than five minutes. While status epilepticus can occur with any type of seizure, it is most likely to cause brain damage or death when it involves generalized tonic-clonic seizures. Approximately 42,000 people per year die following episodes of status, with thousands more suffering brain damage.

The majority of episodes of status epilepticus occur in patients who are younger than 15 or older than 40 years of age. While they usually cause no harm, febrile seizures are a leading cause of status in the very young. At the other end of the age spectrum, stroke is the most likely cause.

Whatever the cause, early treatment is the key to maximizing the patient's chance of survival. For adults with status epilepticus, mortality rates are close to 38% if it continues longer than one hour.

IMPLEMENTING THE SEIZURE STANDING ORDER

The first priority when caring for patients having a seizure, regardless of cause or type, is keeping the patient safe until the seizure stops. For patients with convulsions, whether a result of a partial or a generalized seizure, clear the area of anything hard or sharp, and pad those things you are unable to remove (like the ground under the patient's head), and loosen any clothing that might interfere with breathing. Remove the patient's glasses. Do not, however, attempt to use any form of restraint to stop the patient's movements and do not attempt to force the mouth open or force anything between the patient's teeth. Attempting to do any of these could cause injury to the patient or the provider. If possible, turn the unconscious patient onto one side to keep the airway clear of blood or saliva. (Erich, 2010)

If the patient is having a complex partial seizure, the provider should watch the patient closely and speak to the patient in a calm, friendly voice. If the patient is walking, the provider should remove dangerous objects from the patient's path or try to gently shepherd the patient away from dangers such as stairs, traffic, etc. Grabbing a patient having a complex partial seizure may cause the patient to struggle or strike out, so that should be avoided except to protect the patient from immediate harm, such as an oncoming car. (Epilepsy Foundation of America, 2012)

The Seizure Standing Order may be used for all patients who have had or who are having a seizure, unless the patient is hypoglycemic, pregnant greater than 20 weeks, or experiencing a dysrhythmia that might benefit from ACLS interventions. If the patient had a single seizure that has stopped by the time EMS arrives, *and* the patient has a known seizure disorder, *and* the patient is hemodynamically stable with a normal (baseline) mental status, a BLS unit may transport the patient. A BLS unit may also transport a child with a fever that has had a single seizure that has resolved and who is hemodynamically stable and has returned to their baseline mental status.

For patients who are not excluded that are actively seizing, either when EMS arrives or while in EMS care, treatment with a benzodiazepine is ordered. Benzodiazepines have long been the first-line drug for prehospital treatment of active seizures that meet the Standing Order's inclusion criteria. Since the results of the RAMPART (Rapid Anticonvulsant Medication Prior to Arrival Trial) study were released in February 2012, midazolam has been the benzodiazepine of choice. All benzodiazepines work well at controlling a seizure once they are given. Midazolam is different in that it can be given intramuscularly or intranasally, so it may be given to an actively seizing patient without the need to first start an IV, thus minimizing the average time between the decision to medicate the patient and therapeutic benefit. In a study comparing IM midazolam with IV lorazepam in the treatment of status epilepticus, **73.4%** of patients in the group assigned to receive midazolam were no longer seizing on arrival at the emergency department, compared with **63.4%** of those assigned to receive lorazepam (Silbergleit, et al., 2012). In a study comparing intranasal midazolam with rectal diazepam for pediatric seizures in the prehospital setting, the intranasal midazolam was found to be significantly more effective. In that study, midazolam had **100%** prehospital seizure control with a mean seizure duration of 11 minutes and **0%** intubations, compared with **78%** seizure control, a mean seizure duration of 30 minutes and a **33%** intubation frequency in the patients treated with diazepam. Children receiving midazolam instead of diazepam also had a lower hospital admission rate (40% vs. 89%) and were less likely to have another seizure in the ED (Holsti, et al., 2007). It is important to note that intranasal administration of midazolam requires the use of an atomizer such as the Mucosal Atomizer Device (MAD) for effective absorption and to minimize risk of aspiration. A maximum of one milliliter of midazolam may be given per nostril, regardless of medication concentration. Midazolam may also be given IV or IO using $\frac{1}{2}$ the IM/IN dosage. The standing order dosage is weight-based and evidence-based. During the trial there was an expectation that 25% of the population receiving a dose of midazolam, 10 mg IM, would require intubation. This is a known, expected complication of treatment. The study found that only about half that number needed an endotracheal tube. Given that patient weights are "guesstimates" in the field, if a patient appears borderline a provider may opt for the lower dose, or a call to medical direction for

consultation. The standing order includes an order for repeat dosing in the event the first dose does not achieve seizure control.

Several of the conditions that cause non-epileptic seizures (discussed earlier) are potentially life-threatening, as is status epilepticus. Additionally, benzodiazepines have the potential to cause respiratory depression. Patients with a first time seizure, or patients that require a benzodiazepine to stop a seizure should be transported by an ALS unit to an emergency department for monitoring and further evaluation.

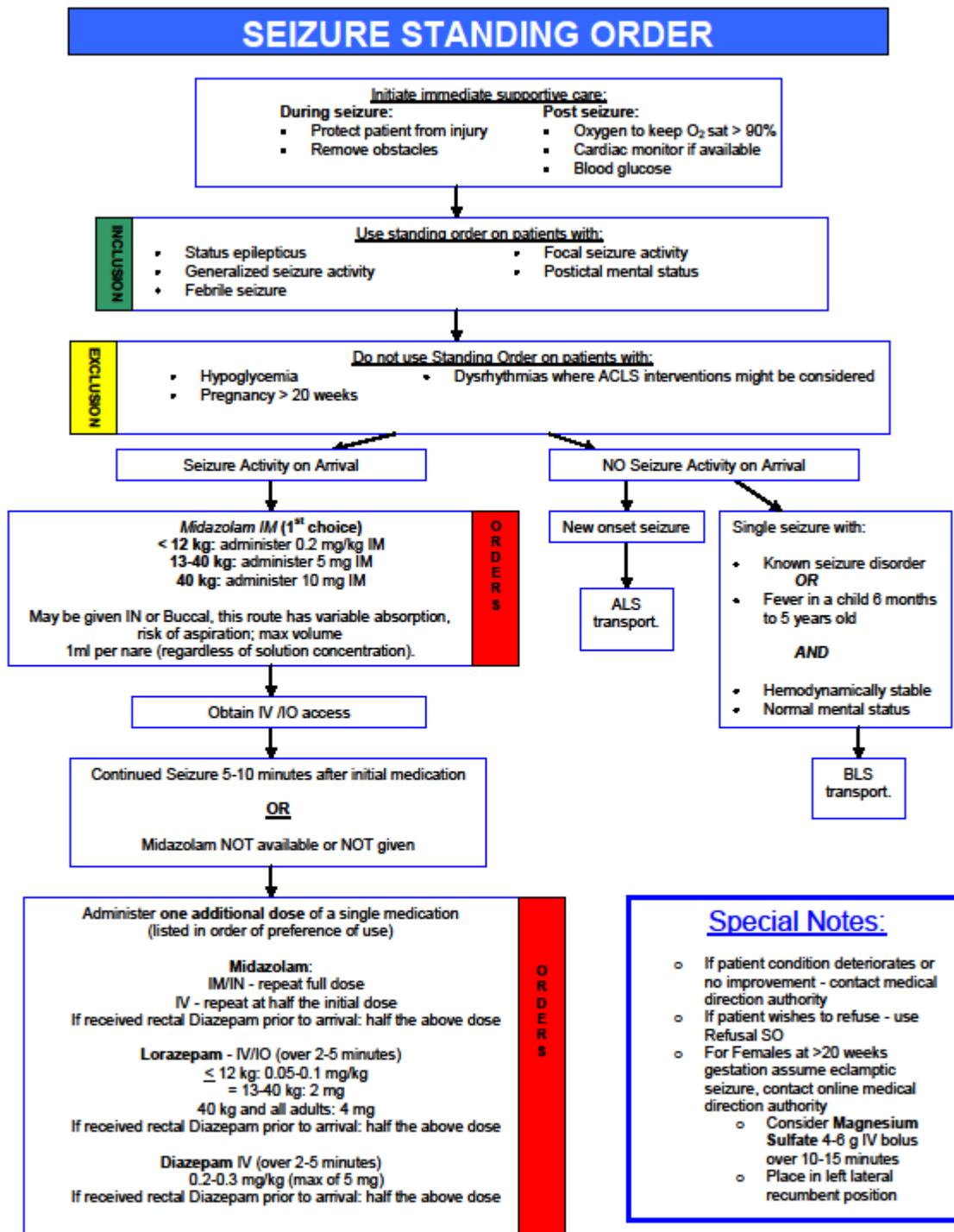
Once the seizure has ceased, care of the patient is largely supportive. ABCs are always the priority, but most likely to be of concern with generalized tonic-clonic, tonic, and clonic seizures, as these typically have a postictal period during which the patient is at risk for aspiration. The patient should be maintained in a lateral recumbent position until consciousness returns to baseline, if possible, to allow for continued drainage of blood and secretions. If this position is contraindicated, the patient should be frequently and thoroughly suctioned to minimize the risk of aspiration. Oxygen should be used as needed and as tolerated to maintain an O₂ saturation greater than 90%, although with the confusion that occurs with so many of the types of seizures, finding a delivery mode the patient will tolerate could prove challenging.

As the patient regains consciousness, some confusion is expected and patient should be reoriented and reassured as necessary. This post-seizure period is also the time for the provider to assess for injuries and other medical concerns. If the seizure was not witnessed by EMS, bystanders and family should be questioned in an attempt to elicit a description of the seizure, as well as any other information about the patient's history. (Erich, 2010) Complications resulting from a seizure may include associated trauma such as shoulder and hip dislocations, spinal fractures and intracranial bleeding. Hypoxia and respiratory failure are also considerations when assessing the seizure patient. Keep in mind that paralytics (those used during Rapid Sequence Intubation) do not stop the seizure, they only hide it. Finally, an uncontrollable seizure is one that does not respond to standard treatment and may require alternate pharmacologic agents.

SUMMARY

Seizures are so varied and complex that there is a branch of neurology devoted solely to their study and treatment. Despite that, the emergency care of this patient population can be distilled down to a set of principles that will prepare the prehospital provider to render appropriate care.

SEIZURE STANDING ORDER



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POSTTEST

Name _____ Date _____

1. You are called to the home of a twenty-five-year-old man with a known seizure disorder. Shortly after your arrival the patient becomes unresponsive and begins having tonic-clonic movements of all extremities and frothing at the mouth. Which of the following would be one of your first interventions?
 - a. Restrain the patient for his own safety.
 - b. Place a folded blanket under the patient's head.
 - c. Insert an oropharyngeal airway.
 - d. Ask family about the patient's medications, allergies, and history

2. The above patient's family tells you he had a seizure that stopped, but started again a few minutes later, while the patient was still postictal. Which of the following conditions fits this description?
 - a. Absence seizures
 - b. Pre-eclampsia
 - c. A myoclonic seizure
 - d. Status epilepticus

3. You are on an ALS truck with a twenty-eight-year-old female who is 26 weeks pregnant and complaining of a headache. She has a history of a seizure disorder. While you are checking her initial blood pressure, her eyes roll back, she becomes rigid, and then begins having generalized tonic-clonic movements in her extremities. After quickly padding any surfaces on which she might harm herself, what is your next step?
 - a. Contact medical direction.
 - b. Give 10 mg midazolam IM.
 - c. Intubate the patient.
 - d. Finish checking the blood pressure, tying the arm if necessary.

4. Which of the following interventions can and should be done by any level of provider for a patient with generalized seizures?
 - a. Protect the patient from injury by removing or padding objects on which the patient might get harmed.
 - b. Insert a bite block or stick between the teeth to prevent biting the tongue.
 - c. Loosen tight or constricting clothing such as a tie or scarf.
 - d. Hold the patient down. (continued on next page)

- e. Turn the patient to one side once the seizure has subsided to minimize the risk of aspiration of secretions.
 - i. a, b & c
 - ii. b & d only
 - iii. a, c & e
 - iv. all of the above
 - v. none of the above

5. You respond to the home of a two-year-old with a known seizure disorder. You see the child sitting on the floor playing with blocks, then notice as she stops what she is doing, her eyelids flutter rapidly, and her head droops forward slightly. After 5-10 seconds, she resumes her activity as if nothing has happened. Which type of seizure did you likely witness?
 - a. Simple partial
 - b. Absence
 - c. Generalized tonic-clonic
 - d. Myoclonic

6. While the fever that causes them may stem from a serious illness such as meningitis, febrile seizures are relatively common in small children and usually have no lasting impact.
 - a. True
 - b. False

7. Which patient gets midazolam 10 mg IM?
 - a. A 10 kg child with recurrent absence seizures
 - b. A 30 week pregnant woman with new onset of generalized tonic-clonic seizures
 - c. A 70 kg man with a normal fingerstick and who is having an active generalized tonic-clonic seizure.
 - d. A patient that had a generalized seizure prior to your arrival and who is now lethargic and snoring.

8. The IV midazolam dose is one-half the IM/IN dose.
 - a. True
 - b. False

9. You are called to the home of an eighteen-month-old boy whose parents describe a generalized tonic-clonic seizure. They say the patient has no significant medical history, but has been fussy, pulling on his ear and has been hot to touch. He is starting to wake up, but the parents would like him evaluated.

His fingerstick and vital signs are normal, except for his temperature, which is 102°F. En route to the hospital, you witness a second seizure. You have not had the opportunity to initiate an IV. He is a “Yellow” (12-14 kg) on the Broselow tape and his mother tells you he weighs 27 pounds. He is safe in her arms on your stretcher. Which of the following would be your next action?

- a. Provide oxygen and supportive care only—febrile seizures are excluded from the standing order.
 - b. Give midazolam 2.4 mg IM or IN.
 - c. Quickly start an IV and give midazolam 2.4 mg via the IV.
 - d. His GCS is less than 8—intubate!
10. Patients having a complex partial seizure and walking toward danger such as the edge of a cliff or a busy street should be gently encouraged and guided toward safety. Forceful physical restraint should be saved as a last resort, as these patients may react violently.
- a. True
 - b. False
11. What is the difference between partial and generalized seizures?
- a. Only generalized seizures have a loss of consciousness.
 - b. Only generalized seizures have jerking or spasms.
 - c. Only generalized seizures may have an alteration in mental status.
 - d. Status epilepticus occurs only with generalized seizures.
12. Which one of the following patients would NOT be appropriate for BLS transport after a seizure (all are now drowsy but arousable to baseline, with normal vital signs)
- a. A three-year-old with a fever of 102.5°F.
 - b. A sixteen-year-old with a known seizure disorder who bit the inside of his cheek and has blood tinged sputum.
 - c. A forty-year-old who denies any medical history.
 - d. A sixty-year-old who forgot to take her anticonvulsant meds, had a seizure yesterday and another today.
13. Partial seizures are also known as (choose from below) seizures.
- a. Absence
 - b. Myoclonic
 - c. Grand mal
 - d. Focal

14. (Choose from below) is/are a medical emergency associated with significant morbidity and mortality.
- a. Febrile seizures
 - b. Status epilepticus
 - c. Complex partial seizures
 - d. Epilepsy
15. Which of the following is the first priority when a patient begins having a seizure?
- a. Prevention of injury
 - b. Starting an IV
 - c. Inserting an airway adjunct
 - d. Attaching cardiac monitor leads

EVALUATION

Please answer the following questions by marking the appropriate response:

	Lowest Worst Least				Highest Best Most
1. To what extent did this module meet your needs?	1	2	3	4	5
2. There was a balance between theoretical and practical information.	1	2	3	4	5
3. The time required was appropriate to the content.	1	2	3	4	5
4. The module increased my knowledge and understanding of the topic.	1	2	3	4	5
5. References or audiovisuals were adequate.	1	2	3	4	5
6. Overall, this program was worthwhile.	1	2	3	4	5

7. Additional comments: _____
