EPILEPSY AND SEIZURES

INTRODUCTION

There are many different types of seizure disorders. Seizures can be caused by drugs or alcohol, or they can be caused by withdrawal from drugs or alcohol. They can also be caused by head injury, infection, pregnancy, low blood sugar, fever, a lack of oxygen to the brain, damage to the brain by a stroke, a brain tumor, or certain psychiatric disorders.

But the most common cause of seizure disorders is epilepsy. Epilepsy is a disease of the brain and the nervous system. Epilepsy, as with the other seizure disorders, causes seizures. Seizures are also called convulsions. Epileptic seizures are usually caused by a part of the brain – a seizure focus – that sends out violent and uncoordinated electrical signals; in some cases of epilepsy, however, there is no specific seizure focus. In response to the erratic, uncoordinated, and intense electrical signals, the patient with epilepsy experiences a seizure.

Epileptic seizures are sudden, involuntary movements caused by abnormal brain activity.

Epilepsy is common, and there are actually many types of epilepsy that produce very different signs and symptoms. Approximately 1% of the population – approximately 300,000 people – has epilepsy. There are some surgical procedures that can help if seizures are not controlled with medical treatment. However, most people with epilepsy must take medications to control the disease and they must take the drugs for their entire life because there is no cure for epilepsy.

OBJECTIVES

When the student has finished this module, he/she will be able to:

1. Identify three causes of seizure disorders.
2. Identify the most common cause of seizures.
3. Identify the correct definition of an epileptic seizure.
4. Identify the correct names of an epileptic seizure
5. Identify the three stages of an epileptic seizure.
6. Identify the correct name for the signs/symptoms that immediately precede a seizure.
7. Identify signs and symptoms of a seizure.
8. Identify the two biggest risks to a patient during an epileptic seizure.
9. Identify the three basic treatments for epilepsy.
10. Identify two goals to remember when someone is having a seizure.

SEIZURES AND THE NERVOUS SYSTEM

The nervous system is divided into three parts: the brain, the spinal cord and the peripheral nerves. The brain and the nervous system are the “command center” of all the body’s activities.
The brain is inside the skull, and at the base of the skull at the level of the neck, the spinal cord begins. The spinal cord is a long body of nervous tissue attached to the brain. It is inside the spine, and all along the length of the spinal cord, the peripheral nerves – long, thin strands of nervous tissue like wires – leave the spinal cord and travel to the organs (heart, lungs, liver, kidneys, glands, etc) and to every part of the body. Peripheral nerves also travel back through the spinal cord to the brain.

The nervous system coordinates and controls our conscious functions (for example, the ability to speak, move, etc.) and our unconscious functions (for example, our heart rate and breathing). All of this happens by way of electrical signals that start in the brain, and travel through the spinal cord and the peripheral nerves to the heart, muscles, lungs, etc.

The brain takes in information from the internal and external environment by way of the peripheral nerves. In response to the information it receives, the brain sends out electrical signals through the peripheral nerves to various organs and parts of the body. These electrical signals are basically messages, or instructions, and the body responds to these signals.

For example, if someone is running to catch a bus, the brain receives information that that person needs more oxygen and that more blood is needed in the legs. In response, the brain and the nervous system sends signals that increase the rate of breathing and make the heart pump harder and faster. The brain and the nervous system also send out signals that control our conscious functions such as speech and movement.

Learning Break: Basically, every activity of the human body, conscious or unconscious, is controlled by the brain and the nervous system.

Normally, the electrical signals the brain and nervous system use to control and coordinate are organized and purposeful. However, people with epilepsy have an area or areas in their brain that send out messages that are disorganized and cause harm.

WHAT ARE THE CAUSES OF EPILEPSY?

There are many types of epilepsy and there are many types of seizures. The type of epilepsy that will be discussed here is epilepsy that occurs in adults and does not have an obvious cause. (Remember, some seizures can be cause by infection, trauma, etc.) This type of epilepsy is called idiopathic, and no one knows what causes idiopathic epilepsy.

Idiopathic epilepsy is basically caused by an area or areas of the brain that send out powerful, disorganized electrical signals.

However, researchers do know what is happening in the brain during an epileptic seizure. In the normal brain (and in the brain of someone who has epilepsy, as well), there is always a lot of electrical activity going on. Some of this electrical activity is stimulating and some is inhibiting, and there is a constant balance between the two. For example, the blood vessels that supply the brain, kidneys, heart, etc. can open or close, but most of the time they just need to stay open at a certain diameter to make sure enough blood gets through to the organs. Maintaining the blood vessels at that diameter depends
on a balance between the stimulating impulses (which would open them) and the inhibiting impulses (which would close them).

An epileptic seizure occurs when there is an imbalance between the stimulating brain signals and the inhibiting brain signals. There is an area or areas of the brain that suddenly and unpredictably sends out stimulating signals that are extremely powerful and disorganized; another to view this is as an electrical “storm.” The inhibiting signals are simply not strong enough to balance them out, and the body responds with an epileptic seizure.

**Learning Break:** If you have ever touched a live electrical wire, then you have an approximate idea of what an epileptic seizure is like. The strong, sudden, and unexpected electrical current—which is very much like the strong, sudden electrical stimulus of an epileptic seizure—can knock you down, and it will certainly cause you to move in a very erratic and uncontrolled manner.

**WHAT ARE THE SIGNS AND SYMPTOMS OF AN EPILPETIC SEIZURE?**

Just as there are many types of seizure disorders, there are many types of seizures. The type of seizure that idiopathic epilepsy causes—the type of seizures that are very dramatic and very frightening—are called **tonic-clonic seizures.** They are also called **grand mal seizures.** An epileptic seizure episode has three parts.

In the period of time immediately before the seizure, many people will some signs and symptoms that are a warning that the seizure is about to happen. These signs and symptoms are called the **aura.** _These signs and symptoms can be very subtle._ Some times the person will simply become very quiet and stare blankly; he/she looks as if they are thinking very deeply. Some times you might notice that the person begins to tremor and lose some coordination.

**Learning Break:** The aura is different for each person, and many times—but not always—the person with epilepsy can recognize his/her aura and will know that a seizure is imminent. Not everyone will have an aura.

The next part of the seizure episode is the actual seizure. A tonic-clonic seizure is an unforgettable event to witness. These seizures are called tonic-clonic because they cause **intense muscular tension (tonic, as in muscle tone) and rapid muscle contractions (clonus).** A tonic-clonic seizure can be identified by these signs and symptoms.

- Loss of consciousness.
- Loss of bladder control.
- Rapid muscular contractions and movements alternating with periods of intense muscular tension.

**Learning Break:** People with a tonic-clonic seizure lose consciousness. You may hear someone say that it impossible to have a seizure and remain awake. But there are seizure disorders in which the person can have a seizure and not lose consciousness. However,
these seizure disorders do not cause the sudden, violent, and dramatic muscle and body movements of a tonic-clonic seizure.

The person is unconscious and thrashing violently. The back will be arched and the arms and legs will move back and forth rapidly and out of control; this is the clonic period. If the person is standing, he/she will lose balance and fall. After the sudden, intense movements, the person will become very stiff and rigid because of the intense muscular tension; this is the tonic period. The person may lose control of his/her bladder or bowels. Most seizures do not last very long. After 30 to 60 seconds, the seizure will end spontaneously.

After the seizure has ended, the person enters the third stage of a seizure episode. This is called the postictal period. During this time, the patient sleeps very deeply and cannot be aroused. The postictal period may be lengthy, and when the person wakes up, he/she may remember the aura period, but will not remember the events of the seizure itself. The person may be confused and disoriented.

**ARE EPILEPTIC SEIZURES DANGEROUS?**

For the most part, a single epileptic seizure in and of itself is not highly dangerous. There is some evidence that people with epilepsy have a shortened life expectancy. There is also some evidence that people with epilepsy have a higher risk of sudden death, death that is not related to a seizure.

But although the seizure itself is not particularly dangerous, remember that a seizure causes sudden, unpredictable loss of consciousness and violent, uncontrollable muscle contractions and movements. **The physical safety of the patient is definitely at risk.** The patient is unconscious and thrashing violently. It is not unusual for someone to fall and strike his/her head, break bones, and become bruised and cut.

Aside from the physical safety of the patient, **the other big risk during a tonic-clonic seizure is the lack of oxygen.** During a tonic-clonic seizure, the rapid, intense muscular contractions and the intense muscular tension prevent the chest from expanding and contracting. The person having a tonic-clonic seizure essentially stops breathing. For young, healthy individuals, this can be tolerated. But for older people or people who have cardiac or respiratory problems, the lack of oxygen can be dangerous.

**Learning Break:** Many people with idiopathic epilepsy have single seizures. However, some people with idiopathic epilepsy have a condition called status epilepticus. In status epilepticus, there are multiple tonic-clonic seizures, one after another. At times, someone with status epilepticus can have periods of seizure activity that can last for many hours. This is very dangerous and requires aggressive treatment.

**WHAT ARE THE TREATMENTS FOR EPILEPSY?**

People with idiopathic epilepsy must realize that there is no cure for this disease. There may be long periods during which someone with epilepsy does not have a seizure. But the pattern of seizures and the number of seizures someone will have cannot be
accurately predicted. **Idiopathic epilepsy is treated using medications, surgery, and to a lesser degree, a special diet.**

**Medications are the cornerstone of treating idiopathic epilepsy.** Some of the most common medications used to treat idiopathic epilepsy are (The generic name is followed by the trade name in parentheses):

- Phenytoin (Dilantin®)
- Valproic acid (Depakote®)
- Carbamazapine (Tegretol®)
- Levetiracetam (Keppra®)
- Lamotrigine (Lamictal®)
- Gabapentin (Neurontin®)
- Topirimate (Topamax®)
- Oxcarbazepine (Trileptal®)

These are all oral medications taken by mouth and most often take two or three times a day. As with any medication, it can take time to adjust the dosage. Some of the medications such as phenytoin, carbamazapine, and valproic acid are adjusted by periodically checking the level of the drug in the blood.

**Learning Break:** Many people find it difficult to take these medications faithfully. They have unpleasant side effects, many people need to take a combination of several of these drugs, and they must be taken indefinitely. If someone has not had a seizure in a long time, it can be easy for them to decide to stop taking their phenytoin, valproic acid, etc.

Approximately 30% of all people with idiopathic epilepsy will not respond to medications. **Surgery** can be used to either a) remove the area of the brain that is causing the seizures, or b) interrupt the nerve pathways that transmit the seizure impulses. If the seizure focus and/or the nerve pathways can be clearly identified, and no important parts of the brain or nervous system will be harmed by the surgery, it can be a good option. Many people who have surgery for epilepsy no longer have seizures and do not need medications.

For a few people – mostly children – a special diet called the **ketogenic diet** may be very helpful. This diet contains a lot of fat and very few carbohydrates (e.g., breads, starches, etc). When fats are digested, one of the breakdown products is ketones. No one is sure why, but when someone with epilepsy uses ketones for energy, the incidence of seizures can be dramatically reduced.

**TAKING CARE OF SOMEONE HAVING A SEIZURE**

Most people with idiopathic epilepsy live a normal life, but there is always a possibility of a tonic-clonic seizure. As a health care professional, you are responsible for your patient’s safety, so you need to know what to do if/when someone has a seizure. **The two most important goals to focus on and remember when someone is having a tonic-clonic seizure are a) remain calm, and b) Stay with the patient and protect the patient.**
• Remain calm: This is easy to say, but difficult to do. It can be especially difficult to stay calm if there are non-medical people witnessing the seizure; they will almost certainly become excited and can add to the confusion. The simplest way to remain calm and focused is to remember this fact: **For the great majority of people, the seizure will only last a minute or so and the patient will not be harmed.**

• Check your watch or a clock and note the time.

• Call for help, but if you cannot do this without leaving the patient, **don’t leave the patient.**

• Do not try and insert anything into the patient’s mouth; he/she is not in danger of swallowing the tongue.

• Do not try and give the patient anything to eat or drink during the seizure or during the postictal period.

• Do not try and restrain the patient. It is impossible to do and you may injure the patient or yourself.

• Remove any objects nearby that the patient may hit during the seizure.

• Try and protect the patient’s head. This can be done by placing a pillow, folded blanket, etc. under the head.

• If the person is on the floor, *gently* try and roll him/her on the side so they do not aspirate secretions into the lungs.

• After the postictal period, the patient may be confused and disoriented. Although he/she is awake, you must still make sure the patient’s safety is monitored.

**In summary, your goals are to stay calm and keep the patient safe, and that can be done with some knowledge and some basic common sense.**