Guidelines for Seizure Management

Seizure management
(Revision 2010)
Rectal diazepam administration
(Revision 2010)
Vagal nerve stimulation
(Revision 2010)

Seizure Management

Overview

A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. If the electrical disturbance is limited to only one area of the brain, then the result is a partial seizure. For example, the student may experience confusion, loss of awareness, aimless movements, or uncontrolled body movements. If the electrical disturbance affects the entire brain, the result is a generalized seizure.

Epilepsy or a *seizure disorder* is a chronic condition that is characterized by recurrent seizures. Many students with epilepsy have more than one seizure type and may have other symptoms as well.

Some seizures may result from an acute medical illness (e.g., with a diabetic during a hypoglycemic episode) or an acute injury (e.g., head injury) and cease once the illness is treated. Some children may have one seizure without the cause ever being known.

Classification of Seizures

The following table summarizes the classification of seizures:

Generalized Seizures	Clinical Manifestations
Tonic-clonic seizures (***formerly known as*** grand mal seizures; affects the entire brain) Onset: any age	The eyes roll upward, the student loses consciousness, falls to the ground, and becomes rigid as muscles tighten (tonic phase). This is followed by jerking movements of the entire body as muscles undergo rhythmic tightening and relaxation (clonic phase). During this phase, the student may become incontinent of stool and urine as his/her muscles contract and relax. Breathing may be shallow or even stop briefly, but renews as jerking movements end. Generalized seizures usually last 1-2 minutes. After the tonic-clonic phase, movement slows and is followed by drowsiness or deep sleep that can last several hours (postictal state).
Absence seizures (***formerly called*** petit mal seizures, "lapses," or "staring spells") Onset: age 4-12	These seizures are characterized by a brief loss of consciousness with minimal or no alteration in muscle tone and sometimes go unrecognized. The seizures can be mistaken for daydreaming or inattentiveness. Students may: • Simply stare blankly for 5-10 seconds • Drop objects because of loss of muscle tone • Have minor movements such as lip-smacking • Experience twitching or slight hand movements The student will be unable to recall what happened during these brief periods of "blankness." If untreated, seizures

Generalized Seizures	Clinical Manifestations
	may occur many times a day. Seizures can be precipitated by fatigue, stress, hypoglycemia, or hyperventilation.
Atonic seizures ***(also known as drop attack)*** Onset: age 2-5	Manifested as a sudden, momentary loss of motor tone. The student may or may not lose consciousness. A mild atonic seizure may cause a sudden, brief head drop. During a more severe atonic seizure, the student may suddenly fall to the ground, lose consciousness briefly, and then get up as if nothing happened. If a student has frequent atonic seizures, a helmet is worn to prevent injury to the head or face.
Myoclonic seizures	Characterized by sudden, brief contractures of a muscle or group of muscles without loss of consciousness. ***No postictal state.***

Partial Seizures	Clinical Manifestations
Simple Partial Seizures (focal seizures; affects just one part of the brain) Onset: any age	Manifestations are dependent on the area affected and tend to be localized. The student may, or may not, lose consciousness and may be aware of the seizure. For example, a student's eyes or eyes and head turn to one side and the arm on that side may be extended with the fingers clenched. The student may appear to be looking toward the closed fist. It is important for an eyewitness to give a clear description of the seizure, especially which body parts are initially involved, to aid in diagnosis and treatment. Also, noting the circumstances that precipitated the episode can help in treatment. Students may also experience a postictal stage after a partial seizure. Simple partial seizures may spread and become generalized. ***Consciousness is never impaired.***
Complex Partial Seizures (psychomotor seizures) Onset: age 3and up	The most common type of seizures. These seizures often begin with an **aura** or warning that the seizure is about to occur. Most commonly, the aura is described as a strange feeling in the pit of his/her stomach that rises up to the throat. Often this sensation is accompanied by odd or unpleasant odors or tastes, auditory or visual hallucinations, or feelings of elation or strangeness. A student may cry or run for help. During this time, the student is often unaware of his/her environment and unable to respond to the environment. After the aura, the student may suddenly become limp or stiff, appear dazed, and confused and apathetic. The most obvious behaviors may be lip smacking, repeating words,

Partial Seizures	Clinical Manifestations
	chewing, drooling, swallowing, and nausea and abdominal pain followed by stiffness, a fall, and sleep. Complex partial seizures may spread and become generalized. ***Consciousness is always impaired.***

Potential Settings

Many students with a history of seizures attend a regular classroom and participate in regular school activities, with modifications that are determined by the parents, health care provider, school nurse, and school staff. As with all medical conditions, every effort is made to protect the student's privacy, especially during the occurrence of a seizure. School personnel having contact with the student are to be familiar with the student's medications and potential side effects, be able to recognize signs of seizure-related behavior, know what to do when signs are observed, and know how to implement the established school emergency plan.

Medications Currently Used to Treat Seizures (this list includes only a sample of medications available to treat seizures) **Additional medications to treat seizures may become available for use in the U.S.A. as approved by the FDA and prescribed by the medical care provider.**

Generic Name	Trade Name	Seizure Type	Adverse Reactions
Carbamazepine	*Tegretol*	Secondary tonic/clonic Complex partial Simple partial	Allergic reactions, dizziness, ataxia, muscle incoordination, nausea, behavioral changes, blurred or double vision, aplastic anemia, hepatitis
Clonazepam	*Klonopin*	Absence Myoclonic Tonic/clonic	Sedation, hyperactivity, aggressiveness, slurred speech, double vision, behavior changes, increased salivation
Ethosuximide	*Zarontin*	Absence	GI upset, loss of appetite, headache, lethargy, behavior changes, dizziness, dystonia, myelosuppression, drug-induced lupus
Felbamate—used only with caution and informed consent due to serious adverse reactions	*Felbatol*	***Partial and generalized (reserved for severe epilepsy)***	**Aplastic anemia, hepatic failure,** anorexia, weight loss, nausea, insomnia, headache, fatigue
Gabapentin	*Neurontin*	Partial, patients >12 years	Somnolence, dizziness, ataxia, fatigue

Generic Name	Trade Name	Seizure Type	Adverse Reactions
Lacosamide	*Vimpat*	Partial	Dizziness, headache, nausea, double vision
Lamotigine	*Lamictal*	Partial Tonic-clonic Absence Atonic Myoclonic	Somnolence, dizziness, rash, nausea
Phenobarbital	*Luminal*	Tonic-clonic Partial Febrile	Sedation, hyperactivity, changes in sleep pattern, inattention, irritability, cognitive impairment
Phenytoin	*Dilantin*	Tonic-clonic Complex partial Simple partial	Gingival hyperplasia, hirsutism, nystagmus, blurred or double vision, ataxia, rashes, folate deficiency, drug-induced lupus, myelosuppression
Pregabalin	*Lyrica*	Partial	Blurry vision, dizziness, dry mouth, weight gain, sleepiness, swelling of hands and feet, trouble concentrating
Primidione	*Mysoline*	Tonic-clonic Complex partial Simple partial	Sedation, hyperactivity, ataxia, behavior changes, rare hematological and hypersensitivity reactions
Rufinamide	*Banzel*	Lennox-Gastaut Syndrome (also known as myoclonic-astatic epilepsy)	Allergic reactions, dizziness, drowsiness, headache, nausea, tiredness, vomiting, appetite changes, sore throat, blurred vision, tremor, blood in urine; behavior, mental, mood changes, trouble sleeping, suicidal thoughts or attempts
Tigabine	*Gabatril*	Partial	Dizziness, somnolence, headache, depression
Topiramate	*Topamax*	Partial Tonic-clonic Atonic Myoclonic Absence	Somnolence, anorexia, fatigue, difficulty with concentration, nervousness
Valproate Valproic acid	*Depakote* *Depakene*	Myoclonic Absence Tonic-clonic	Hair loss, tremor, elevated liver enzymes and liver failure, irregular menses,

Generic Name	Trade Name	Seizure Type	Adverse Reactions
		Mixed seizures types	increased appetite, nausea and vomiting, pancreatitis thrombocytopenia

Diet Therapy

In specific cases, students with seizures may be prescribed a ketogenic diet for treatment and control of seizures. Usually this diet is prescribed for students with poorly controlled seizures who cannot tolerate the side effects of anticonvulsants.

The ketogenic diet is designed to induce and maintain a state of ketosis which has been found to metabolically improve seizure control in certain cases. The diet is high in fat (80-90%) and low in carbohydrates and proteins. It is a carefully calculated diet and requires daily monitoring to maintain ketosis. A student on a ketogenic diet is followed by a registered dietitian and has a prescribed meal plan to follow daily. Coordination between the student's neurologist, dietitian, family, and school is recommended for the development of a successful individualized health care plan (IHCP).

Monitoring

The purpose of seizure monitoring is to protect the student from injury during a seizure, to carefully observe the seizure in order to provide information for the management of the seizure disorder, and to distinguish between behaviors related to a seizure and those behaviors not related to it.

Monitoring provides the health care provider with the information needed to better manage the student's medication. An increase in the number of seizures may indicate that the student needs a change in medication or that he/she is not receiving the prescribed medication. A change in medication may be needed because of a change in the student's metabolism. In addition, antiepileptic medication may be toxic. Therefore, any side effects from the medication should be documented and reported to the school nurse, family, and/or health care provider. Careful monitoring of the student can improve the management of seizures.

Signs of an Emergency

A series of consecutive seizures in which the student does not regain consciousness is called *status epilepticus*, which is a medical emergency. Immediate medical care is required. Seizures that last longer than **5 minutes** require emergency medical services. Seizures lasting longer than 30 minutes can cause brain damage. Status epilepticus can lead to respiratory failure, brain damage, and death. Therefore, it is critical that the student receive immediate medical attention.

Managing a Seizure

Managing a seizure in school consists of protecting the student, observing the student, and getting medical assistance when needed. The procedures on the following pages are guidelines for managing a student having a seizure and what to do after the student has a seizure. Included in the guidelines is the **First Aid Flow Chart for Seizures** algorithm (see page 165).

Components of the Individualized Health Care Plan *(IHCP)*

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for managing a seizure and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.
Note: Equipment, medication, and supplies are provided by the parents/guardians.

A sample seizure action plan and seizure observation record (or seizure log) are available from http://www.epilepsyfoundation.org/about/professionals/.

For a student with seizures, the following items should receive particular attention:

- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure.
- Student's baseline or normal behaviors.
- Whether student experiences auras, or can anticipate when seizures may occur.
- Behaviors that indicate a seizure may be about to occur.
- Actions to take if the student has a seizure.
- Medications the student is taking, including rescue treatments, and signs of adverse reactions or toxicity.
- Determining the need for seizure precautions, and what these precautions will be.
- Latex allergy alert.
- Standard precautions.

Additional resources and supplementary materials for managing students with seizures are available at http://www.epilepsyfoundation.org/programs/schoolnurse/schoolnurse.cfm.

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Epilepsy Foundation of America. Available online at http://www.epilepsyfoundation.org.
Epilepsy Foundation of America. (2008) *Seizure Training for School Personnel*. Available at http://www.epilepsyfoundation.org/local/virginia/upload/Overhead-Presentation-Oct08.ppt.
Hockenberry, M.J. & Wilson, D. (2007). *Wong's Nursing Care of Infants and Children*. (8th ed.). St. Louis: Mosby, pp. 1652-1669.
Physician Desk Reference Consumer Drug Information. (2000-2010). Available online at http://www.drugs.com/pdr/.
Vimpat.com. (2009). Vimpat. Available online at http://www.vimpat.com.

Procedure for Managing a Seizure

If the student has a seizure:

1. Remain calm.
   No one can stop a seizure once it starts.
2. Time the seizure. Document all of the student's activity during a seizure: the time seizure began, the time seizure ended, area of body where the seizure began, any movement of the seizure from one area of the body to another, type of movements of the head, face, and/or arms.
3. Check for medical alert I.D. and follow the student's individualized health care plan (IHCP).
   - If applicable, provide seizure rescue treatment.
4. Have an adult stay with the student during the seizure to monitor his/her progress.
5. Put on gloves, if available.
6. Place student on side. If possible, put something flat and soft (like a folded blanket or jacket) under student's head so the student cannot bang against the floor.
   This positioning prevents the tongue from blocking airway and helps the student not to choke on secretions.
7. **Do not place anything in the student's mouth**.
   Padded tongue blades and airways are not accepted practice because they may induce vomiting, cause potential damage to teeth, and may be aspirated.
8. Loosen tight clothing, especially around the student's neck.
9. If student is standing or sitting, gently lower student to the ground to avoid a fall. Clear the area of anything that could hurt the student. **Do not attempt to restrain student** or use force.
   Do not remove student from a wheelchair unless necessary.
10. Do not give the student any oral medications, food or drink during a seizure.
11. Provide emotional support.
12. Call (911) Emergency Medical Services if:
    - Student stops breathing.
    - Seizure lasts longer than 5 minutes.
    - This is student's first seizure.
    - Repeated seizures without regaining consciousness.
    - Student cannot be awakened and is unresponsive to pain after seizure ends.
    - Pupils are not equal in size after seizure.
    - There is evidence of student injury.
    - Student has diabetes or is pregnant.
    - Seizure occurs in water.
    - Parents request emergency evaluation.

Prepare school environment to be as safe as possible for the student who has a history of seizures.

Be aware of the potential for head injuries with uncontrolled seizures. The student may require a lightweight helmet for head protection, especially for seizures that produce sudden changes in muscle tone (atonic, myoclonic, akinetic). Prepare for potential problems associated with seizures. For example, if the student has copious secretions with a seizure, a bulb syringe or suction machine will need to be available.
Pathways and environments should be free of unnecessary objects. For example, unused toys, wheelchairs, storage boxes, etc. should be removed from the environment.
Supervision during use of hazardous machinery or equipment (such as that found in a shop class) should be available.

After a Student Has a Seizure:

1. After the seizure is over, clear secretions from the student's mouth with a bulb syringe or suction catheter. Keep child on his/her side.
   Do not try to clear the student's mouth until the seizure has ended.
2. Monitor student's breathing.
   Check position of head and tongue. Reposition if head is hyperextended. ***If student is not breathing, activate the school emergency plan and begin rescue breathing.***
3. Talk with student to determine student's level of awareness.
   Note if the student is alert, confused, drowsy, etc. and document findings.
   If student remains unconscious after seizure is over, maintain open airway and assess breathing. If necessary, begin ***rescue breathing or CPR***.
4. Determine and document whether or not the student is able to move arms and legs, or if there is change in the student's ability to move.
5. Check for injuries and provide care, if needed.
6. Check for loss of control of urine and stool. Provide privacy.
   Loss of control is very embarrassing to the student. Clean the student to make him/her more comfortable.
7. ***Remain with the student until they have regained full awareness of their surroundings.***
   Make the student comfortable; allow him/her to sleep as needed. Do not give food or liquids until fully alert and swallowing reflex has returned.
   After the seizure, the student may sleep for 30 minutes up to a number of hours (postictal period). Refer to the *First Aid Flow Chart for Seizures* (see page 165) to determine the disposition of the student post seizure.
8. Document the length of seizure, what happened during and after the seizure.
   Notify school nurse, family, and/or health care provider as per the individualized health care plan (IHCP).

Sources:

Epilepsy Foundation of America. *(*2008). *Seizure Training for School Personnel*. Available at http://www.epilepsyfoundation.org/local/virginia/upload/Overhead-Presentation-Oct08.ppt.

Hockenberry, M.J. & Wilson, D. (2007). *Wong's Nursing Care of Infants and Children*. (8th ed.). St. Louis: Mosby, pp. 1652-1669.

First Aid Flow Chart for Seizures

At onset of seizure, begin first aid immediately:

- Place student gently on the floor
- Keep airway clear by placing student on their side
- Time the seizure
- Protect student from injury by removing any objects that could cause injury
- Protect head by placing something soft (i.e., rolled up coat or sweater) under head
- DO NOT RESTRAIN STUDENT
- DO NOT PLACE ANYTHING IN MOUTH

****Refer to Individualized Health Care (IHCP) Plan for student-specific instructions**

- Is this the first time the student has had a seizure?
- Is the student a diabetic?
- Is the student pregnant?
- Is the student injured?

Yes

CALL 911 IMMEDIATELY

No

- Perform first aid and observe student for details of the seizure
- Swipe Vagal Nerve Stimulator (VNS) with magnet, if applicable

Does the seizure stop within **2 minutes?**

Yes

- Allow student to rest for 15 to 30 minutes
- Keep airway clear
- Contact parent/guardian
- Arouse student every 5 minutes

No

- Prepare to administer seizure rescue medication, if student-specific order on file
- Continue to monitor

Can the student be aroused?

Yes

Return student to class or send home. Refer to IHCP.

NO

Does the seizure stop within **5 minutes?**

Yes

No

- CALL 911
- Administer seizure rescue medication per trained staff, if student-specific order on file
- Notify parent/guardian and school nurse
- Stay with student until EMS arrive

Document event on Student Treatment Record (STR)

CALL 911 if:

- Student stops breathing.
- Seizure lasts longer than 5 minutes.
- This is student's first seizure.
- Repeated seizures without regaining consciousness.
- Student cannot be awakened and is unresponsive to pain after seizure ends.
- Pupils are not equal in size after seizure.
- There is evidence of student injury.
- Student has diabetes or is pregnant.
- Seizure occurs in water.
- Parents request emergency evaluation.

Seizures may be any of the following:

- Episodes of staring with loss of eye contact.
- Staring involving twitching of the arm and leg muscles.
- Generalized jerking movements or stiffening of the arms and legs.
- Unusual behavior for that person (e.g. running, belligerence, making strange sounds, etc.)
- Altered mental status

Modified from *Guidelines for Managing Seizures in the School Setting*, School District of Escambia County, Florida. http://ese.escambia.k12.fl.us/eval/health/guidelines/Seizures%20Guidelines%20Final%207-06-%207-7-09.pdf

Rectal Diazepam for Seizures

A *seizure disorder* or e*pilepsy* is a chronic condition that is characterized by recurrent seizures. A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. Many students with epilepsy have more than one seizure type and may have other symptoms as well. Some students continue to experience seizures despite medical treatment. Acute prolonged or repetitive seizures are detrimental to a student's health.

Studies show that rectal diazepam can be a safe and effective treatment for acute repetitive or prolonged seizures. Although intravenous diazepam can produce serious respiratory depression, published studies of rectal diazepam have found no instances of serious respiratory depression. However, some anecdotal stories of respiratory depression exist. The most common side effect of rectal diazepam is sleepiness. Other side effects that have been reported include dizziness, headache, poor coordination, pain, nervousness, slowed speech, diarrhea, and rash. The greatest incidence of side effects is when more than one dose is given.

Rectal diazepam is available as a rectal gel. The most commonly prescribed form is Diastat®, a rectal gel that comes pre-packaged as a quick delivery set in a syringe with a flexible, molded tip. Diastat Acudial 10 mg or 20 mg syringes are dialed and locked to the prescribed dose. A 2.5 mg Diastat syringe is also available. It can be stored for three years at room temperature.

Potential Settings

The need to give rectal diazepam can occur anywhere. Measures should be taken to protect the privacy of the student as much as possible. Students who may require rectal diazepam on the bus should have an adult aid available on the bus. Guidelines regarding where and how diazepam can be administered should be covered in the student's individualized health care plan.

Staff Preparation

Rectal diazepam can be administered by a registered school nurse, licensed practical nurse, or other adult with specialized training in appropriate techniques and problem management. Guidelines regarding who can administer rectal diazepam should be included in the student's individualized health care plan. These persons should also have training in cardiopulmonary resuscitation. Any school personnel who has regular contact with a student who requires rectal diazepam should receive general training covering the student's specific needs, potential problems and implementation of the established emergency plan.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for the administration of rectal diazepam and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student who requires rectal diazepam, the following items should receive particular attention:

- Details of events which would necessitate the administration of rectal diazepam.
- Need to call 911 and activate the school emergency plan when rectal diazepam is given.
- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure.
- Actions to take when the student has a seizure.
- Side effects to monitor.
- What to do if respiratory depression is noted.
- Student's baseline or normal behaviors.
- Whether student experiences auras, or can anticipate when seizures may occur.
- Behaviors that indicate a seizure may be about to occur.
- Other medications the student is taking and signs of adverse reactions or toxicity.
- Latex glove allergy alert if applicable.
- Standard precautions.

Sources:

Dreifuss, FE, et al. (1998). A Comparison of Rectal Diazepam Gel and Placebo for Acute Repetitive Seizures. *The New England Journal of Medicine* 338 (26): 1869-1875.

Epilepsy.com. Diastat. Available online at www.epilepsy.com.

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National Institute of Neurological Disorders and Strokes. (2009). *Safe and Effective Treatment for Acute Repetitive Seizures Available for At-Home Use*. Originally released June 1998. Available online at www.ninds.nih.gov.

Physician Desk Reference (PDR). (2000-2010). Consumer Drug Information. Diastat Acudial Gel. Available online at http://www.drugs.com/cdi/diastat-acudial-gel.html.

Procedure for Administering Rectal Diazepam

Note: Equipment, medication and supplies provided by parents.

1. Review procedure prior to having to implement it.
2. Verify the medication order and medication administration parental permission form.
3. Don gloves.
4. Obtain assistance of another adult, if possible.
5. Remove protective cover from the medication syringe and lubricate the rectal tip with lubricating jelly (comes with syringe).
6. Turn the student on his or her side (left side preferable) facing you. Bend the upper leg forward and separate the buttocks to expose the rectum.
7. Gently insert the syringe tip into the rectum. The rim should be snug against the rectal opening. Slowly count to three while gently pushing in the plunger. Count to three again before removing the syringe. Hold the buttocks together while counting to three one more time.
8. Keep the student on their side facing you and note the time the medication was given.
9. **Call 911 and activate the emergency plan.**
   911 must be called and the emergency plan activated whenever rectal diazepam is given by school personnel.
10. Observe the student for side effects. Monitor respiratory status throughout the seizures and afterwards.
    Respiratory depression can be a consequence of a seizure and/or of seizure medications.
11. Remove gloves and wash hands when appropriate.
12. Document the administration of diazepam, student's response, and implementation of the emergency plan.

Sources:

Dreifuss, FE, et al. (1998). A Comparison of Rectal Diazepam Gel and Placebo for Acute Repetitive Seizures. *The New England Journal of Medicine* 338 (26): 1869-1875.

Epilepsy.com. Diastat. Available online at www.epilepsy.com.

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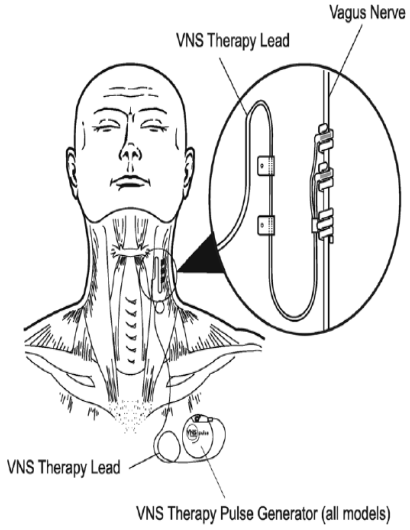
Vagal Nerve Stimulation for Seizures

A *seizure disorder* or e*pilepsy* is a chronic condition that is characterized by recurrent seizures. A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. Many students with epilepsy have more than one seizure type and may have other symptoms as well. Some students continue to experience seizures despite medical treatment. Acute prolonged or repetitive seizures are detrimental to a student's health.

Vagal nerve stimulation (VNS) has been found to reduce the frequency and intensity of some seizures. It involves the insertion of a device similar to a pacemaker under the skin on the left side of the chest. This vagal nerve stimulator can send intermittent electrical signals to the brain by stimulating the left vagus nerve in the neck. The vagus nerve is one of the cranial nerves that controls the muscles responsible for swallowing, coughing and voice sounds. It is not fully understood how VNS works, but the theory is that the stimulation alters nerve pathways that lead to a seizure. Benefits of VNS are not always apparent immediately. Seizure activity may improve immediately, or it may improve over a two-year time period

The vagal nerve stimulator works in two ways. It is automatically programmed to deliver stimulation throughout the day. Typically, the stimulator activates "on" for 30 seconds once every 5 minutes. It can also be activated to give extra stimulations manually between pre-programmed stimulations by placing a magnet over the stimulator and then removing the magnet.



The VNS system consists of a pulse generator which is battery-operated and looks much like a pacemaker implanted under the skin of the chest. Programming of the generator is accomplished with a wand attached to a computer at the physician's office. A strong magnet can also be used to activate the VNS on demand if the student senses that a seizure is about to occur or has just started. In addition, the magnet can temporarily suspend activity of the VNS if activation of the VNS affects normal eating, speaking, or singing.

The most common side effects of VNS are hoarseness and tingling or pain in the throat or neck. Cough, headache, and ear pain have also been reported. Side effects tend to diminish over time. Equipment that could interfere with the stimulator should be avoided. This includes strong magnets, MRI scanners, hair clippers, and loudspeaker magnets. Areas which display pacemaker warning signs should also be avoided. The additional handheld magnets supplied for manual stimulation of the system can damage credit cards, cell phones, and computer disks.

Potential Settings

The VNS system delivers stimulation on a regular, ongoing basis. The need for additional VNS to prevent a seizure can occur anywhere. Measures should be taken to protect the privacy of the student.

Staff Preparation

VNS can be administered by the student or by an adult with training in appropriate VNS techniques and problem management. Any school personnel who has regular contact with a student who requires VNS should receive general training covering the student's specific needs, potential problems and implementation of the established emergency plan. This training should include what to do when a seizure occurs and how and when to activate VNS.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for the vagal nerve stimulation and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student who requires vagal nerve stimulation, the following items should receive particular attention:

- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure.
- Whether student experiences auras, or can anticipate when seizures are about to occur.
- Behaviors that indicate a seizure may be about to occur.
- Actions to take when the student has a seizure.
- When and how to use VNS magnets.
- Side effects to monitor.
- Student's baseline or normal behaviors.
- Other medications the student is taking and signs of adverse reactions or toxicity.
- Standard precautions.

Sources:

Cyberonics, Inc. (2008). *Epilepsy Patient's Manual for Vagus Nerve Stimulation with the VNS Therapy System.* Houston, TX: Cyberonics, Inc. Available online at http://us.cyberonics.com/en/.

Cyberonics, Inc. (2007-2010). *VNS Therapy*. Available online at http://us.cyberonics.com/en/vns-therapy/.

Kennedy PA & Schallert G. (2001). Practical Issues and Concepts in Vagus Nerve Stimulation: A Nursing Review. *Journal of Neuroscience Nursing* 33(2): 105-112.

Zalvan, C et al. (2003). Laryngopharyngeal Dysfunction From the Implant Vagal Nerve Stimulator. *Laryngoscope* 113(2): 221-225.

Procedure for Activating Vagal Nerve Stimulation

Note: Equipment and supplies provided by parents.

1. Review literature that comes with the vagal nerve stimulator.
2. Student or trained caregiver should keep magnet with student at all times. The watch-style magnet attaches to the wrist with a wristband. The pager-style magnet comes with a belt clip so that the magnet and clip can be removed as a unit from the belt without coming apart. Always keep magnets at least 10 inches away from credit cards, televisions, computers, computer disks, microwave ovens, watches, or other magnets.
3. If student senses a seizure is about to occur, place the magnet over the Pulse Generator site for one second and then move it away. This will cause the VNS system to deliver extra stimulation. This can be done by the student or by any adult trained in using VNS. *To use the pager-style magnet, remove the belt clip and magnet from the belt and place the label against the Pulse Generator. To use the watch-style magnet, position the wrist so that the label can be placed over the generator.*
4. To temporarily stop stimulation (turn "off" the Pulse Generator) when student needs to sing or speak in public, while eating, or if stimulation is ever painful, put the magnet over the Pulse Generator and leave it there. The Pulse Generator will not stimulate while the magnet is in place over top of it, but it will start when the magnet is removed. The magnet should not be used for more than four hours in a row because it can decrease the Pulse Generator battery.
5. Check the pulse generator battery on a regular basis. Pass the magnet over the Pulse Generator for one second to see if it causes stimulation and is working.
6. If stimulation ever hurts, hold the magnet in place to stop stimulation and contact school nurse and health care provider immediately.
7. If student complains, of sore throat, hoarseness, or any other problems with the VNS, document in student log and notify the school nurse and family.

Sources:

Cyberonics, Inc. (2008). *Epilepsy Patient's Manual for Vagus Nerve Stimulation with the VNS Therapy System.* Houston, TX: Cyberonics, Inc. Available online at http://us.cyberonics.com/en/.

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Illustration Source:

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