Ready, Aim, Misfire!
Seizures and their treatment

Jeanie Kaeberle APRN, FNP-C, CCRN, CEN
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Learning objectives

1. Define Seizures and Epilepsy and their cause and origination
2. Discuss ongoing management of Seizures and Epilepsy and different treatment modalities.
3. Discuss emergency management for the actively seizing patient
4. Discuss the School Nurse’s role in helping to care for these patients
Epidemiology
Seizures: Clinical expression of abnormal excessive synchronous discharges of neurons, residing primarily in the cerebral cortex. This abnormal paroxysmal activity is usually intermittent and usually self-limited, lasting seconds to minutes.

(Wilfong 2015)
The Evolution of a Seizure

Each Seizure has a beginning, middle and end

- Prodromal
- Aura
- Ictal Phase
- Post Ictal

The Phases of a "Tonic-Clonic" Seizure

- Prodromal Aura
- Tonic Phase
- Clonic Phase
- Postictal Phase
Frontal lobes: Responsible for high level cognitive function, personality, memory, anxiety, alertness, and awareness; frontal and temporal lobes are the most epileptogenic

Temporal Lobe: Responsible for receptive and expressive speech, epileptogenic

Parietal Lobe: Responsible for bringing all perception together; called the association cortex, rarely the source of seizures

Occipital Lobe: Responsible for vision, uncommon origin of seizures
How Are Seizure or Epilepsy Diagnosed?

- Description of the seizure and its video recording often helps to diagnose the type.
- Scans of the brain using CT scans and MRI are used to detect visible brain damage.
- EEG or Electro Encephalogram is used to detect the electrical activities of the brain.
- Genetic testing can many times lead to diagnosis, but not always.
- Infections that leave residual scarring can also lead to epilepsy.
Types of Seizures

- Febrile
- Focal
- Generalized
- Infantile Spasm
Febrile Seizures

- 3 to 5 percent will have a febrile seizure in the first 5 years of life. 30% of these patients can go on to develop additional febrile seizures. 3-6% of those with febrile seizures will go on to develop afebrile seizures or epilepsy.
- There is familial link
- Characteristics are development of a fever >38.0 C or 100.4 F, followed by tonic clonic movements.
- They are usually limited to less than 4 minutes, but can go on up to 15 minutes.
- The child should return to normal behavior at the end of the episode.
  (Millichap et al., 2016)
Infantile Spasms

* Diagnosed in Infancy
* Cause is not always clear
* Occurs in 2-3 per 10000 births
* Treatment is Adrenocorticotropic hormone or (ACTH) or Vigabatrin (VGB)

American Academy of Neurology 2009- accessed 7/1/16
Focal Seizures

2 Types:
- Simple partial
- Complex partial
Both sides of the brain are affected, synchronous epileptic discharges

Types:
- Tonic clonic
- Absence
- Myoclonic
- Tonic
- Clonic
- Atonic
Characteristics of Generalized Seizures

* Tonic-Clonic - most recognized generalized seizure
* Myoclonic - rapid brief contractions – can appear clumsy
* Tonic - Tense or stiffening of extremities often associated with seizures that occur during sleep
* Clonic – Rhythmic jerking movements of extremities related to underlying brain disease
* Absence - brief starring spells, no warning can interfere with learning and development
What is Epilepsy? How is it different from Seizures?

- Complex group of signs and symptoms
- Epilepsy is considered present when any of the following exists:
  - 1. Two unprovoked seizures occurring more than 24 hours apart
  - 2. One unprovoked seizure and a probability of further seizures similar to the general recurrence risk after 2 unprovoked seizures usually related to a structural lesion such as a stroke, TBI or CNS infection
  - 3. Diagnosis of an epilepsy syndrome
- (Wilfong 2015)
Benign Rolandic Epilepsy- Most common form of epilepsy in children it accounts for approximately 1/3 of middle childhood epilepsies diagnosed. Usually occurs between the ages of 3 to 13. Normal development, familial link in some cases about 20%. Usually occur when asleep. Characterized by facial twitching, drooling and inability to speak. For most children, they grow out of this type of seizure within 5 years of onset. 95% are seizure free by the age of 14.
**Childhood Absence Epilepsy:** 5-20 second staring and unresponsiveness. Can occur hundreds of times during the day. Usual onset is between the ages of 4-10. About 80% of these children will outgrow their seizures. These children are at higher risk for long term cognitive and behavioral issues.

**Juvenile Absence Epilepsy:** 5-20 second staring and unresponsiveness are present. Peak age of onset is between 10 and 12 years of age.
Landau-Kilhefner syndrome is a form of epilepsy that occurs in the sleep cycle, it typically occurs between 3-6 years of age. Developmental regression is generally present; loss of language function is a hallmark sign.

Juvenile myoclonic epilepsy: usually presents after 10 years of age. Normal development. They can have myoclonic jerks, absence seizures and generalized seizures. It is common for them to occur when they awaken. It can be a life long condition but can terminate around the age of 20.
When do we treat seizures?

- Not everyone who has a seizure will require treatment
- EEG often times helps to decide.
- If considered to come from an infectious cause, treatment with antibiotics in addition to other treatments
- Anti-epileptics may or may not be required for life
Common drugs that are FDA approved for use in children:

* **Treatment for Partial or Tonic Clonic seizures:**
  
    Carbamazepine (Tegretol®), Phenytoin (Dilantin®), Valproic Acid (Depakote®), Phenobarbital

* **Absence seizures:**
  
    Valproic Acid (Depakote®), Ethosuximide (Zarotin®)

* **Other approved AEDs for use in children:**
  
    Lamotrigine (Lamictal®), Levetriacetam (Keppra®), Oxcarbazepine (Trileptal®), Topiramate (Topomax®) and Zonisamide (Zonegran®)
Rescue Treatment: Benzodiazepines

Diazepam; Most often used. Rectal route. Pros: widely available Cons: need for privacy

Midazolam: Considered to be most effective for rescue. Intranasal and buccal common routes
Pros: easy to administer Cons: education and storage
Treatment: Vagus Nerve Stimulator

http://us.livanova.cyberonics.com/vns-therapy/how-vns-therapy-works
retrieved 7/1/16
Treatment: Dietary Interventions

- Ketogenic Diet - first appeared in the 1920s
- mostly fats with little or no carbohydrates
- Labor intensive, requires high level of dietary compliance
- Effective for 60% of patients in studies.
- Modified Adkin’s diet some benefit
- Low GI diet
Treatment: Surgical Options

• Often last resort
• Not always an option for all patients
• Assessment involves the identification of specific area of the brain where seizures are originating from and removing that area without causing further neurological impairment.
Innovative Tools for Management

- Monitoring Devices and Tracking:
  - Smartwatch - detects repetitive motion, GPS
  - Apps for cell phones with cameras and sensing devices
  - Seizuretracker.com
Seizure Dogs

Seizure response dogs are a special type of service dog specifically trained to help someone who has epilepsy or a seizure disorder.
Increasing research for intractable epilepsy

- Pros: In resistant epilepsies has shown a reduction in seizures
- Cons: Not FDA regulated. Minimal studies
BREAK
What can trigger a seizure?

- Factors that can provoke seizures
- Some People are able to modify lifestyle to lessen chances of seizures
What can trigger a seizure?

- Stress
- Infection
- Lack of consistency in taking meds
- Lack of sleep
- Exposure to known triggers (bright lights, smells etc)
Emergency Treatment for Seizures

What are your facility’s emergency plans for seizures? Does the child have a history of seizures?
Safety first

- Make sure the child is in a safe location
- If no trauma is suspected, reposition onto their side if they are unconscious
- Time the seizure
- If seizure stops and child returns to baseline-document
- If seizure does not stop, administer rescue medication as needed
Follow the plan

- Each child should have a specific plan for their seizures
- Rescue meds are now moving towards the buccal and nasal routes in many places.
- Document accordingly and notify parents
When to call 911

- Seizure lasts longer than 5 minutes
- Child does not return to prior level of consciousness
- Seizures are repetitive and are not responsive to rescue medications
- Concern for traumatic injury
What happens if the seizures don’t stop?

- Need immediate medical treatment. Activate EMS
- Transport to local ER
- Evaluation in ER:
  - Electrolytes including glucose
  - History of seizures, any changes in medications
  - Recent fevers, or stressors
Inpatient Treatment Protocols

Proposed Algorithm for Convulsive Status Epilepticus
From “Treatment of Convulsive Status Epilepticus in Children and Adults” Epilepsy Currents 16.1 - Jan/Feb 2016

Time Line

0-5 Minutes Stabilization Phase

4. Instill ECG monitoring
5. Collect finger stick blood glucose. If glucose < 60 mg/dL then
   Adults: 100 mg thiamine IV then 50 IU D5W IV
   Children ≥ 2 years: 2 mL/kg D5W IV. Children < 2 years: 4 mL/kg D2.5% IV
6. Attempt IV access and collect electrolytes, hematology, toxicology screen, if appropriate anticonvulsant drug levels

If patient at baseline, then symptomatic medical care

5-20 Minutes Initial Therapy Phase

A benzodiazepine is the initial therapy of choice (Level A):
Choose one of the following 3 equivalent first line options with dosing and frequency:
- Intranasal midazolam (10 mg for > 40 kg, 5 mg for 13-40 kg, single dose, Level A OR)
- Intravenous lorazepam (0.1 mg/kg/dose, max: 4 mg/dose, may repeat dose once, Level A OR)
- Intravenous diazepam (0.15-0.2 mg/kg/dose, max: 10 mg/dose, may repeat dose once, Level A OR)
If none of the 3 options above are available, choose one of the following:
- Intravenous phenobarbital (15 mg/kg/dose, single dose, Level B OR)
- Rectal diazepam (0.2-0.5 mg/kg, max: 20 mg/dose, single dose, Level B OR)
- Intranasal midazolam (Level B), buccal midazolam (Level B)

If patient at baseline, then symptomatic medical care

20-40 Minutes Second Therapy Phase

There is no evidence based preferred second therapy of choice (Level U):
Choose one of the following second line options and gives a single dose:
- Intravenous fosphenytoin (20 mg PE/kg, max: 1500 mg PE, single dose, Level U OR)
- Intravenous valproic acid (40 mg/kg, max: 3000 mg/dose, single dose, Level B OR)
- Intravenous levetiracetam (600 mg/kg, max: 4500 mg/dose, single dose, Level U)
If none of the options above are available, choose one of the following (foot given already):
- Intravenous phenobarbital (15 mg/kg, single dose, Level B)

If patient at baseline, then symptomatic medical care

40-60 Minutes Third Therapy Phase

There is no clear evidence to guide therapy in this phase (Level U):
Choices include repeat second line therapy or anesthetic doses of either thiopental, midazolam, pentobarbital, or propofol (all with continuous EEG monitoring)

If patient at baseline, then symptomatic medical care

Disclaimer: This clinical algorithm/guideline is designed to assist clinicians by providing an analytic framework for evaluating and treating patients with status epilepticus. It is not intended to establish a community standard of care, replace a clinician's medical judgment, or establish a protocol for all patients. The clinical conditions contemplated by this algorithm/guideline will not fit or work with all patients. Approaches not covered in this algorithm/guideline may be appropriate.

AES.org 2016 accessed 7/1/16
Status Epilepticus

* Rescue medications – Lorazepam, Midazolam
* Reload baseline medications if doses have been missed
* Add second AED
* Add Third AED
* If seizures do not stop, consider intubation and progression to burst suppression
Example of Action Plan

![Seizure Action Plan](https://www.epilepsyfoundation.org)

### Seizure Action Plan

**Effective Date**

<table>
<thead>
<tr>
<th>Student's Name</th>
<th>Date of Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent/Guardian</td>
<td>Phone</td>
</tr>
<tr>
<td>Other Emergency Contact</td>
<td>Phone</td>
</tr>
<tr>
<td>Treating Physician</td>
<td>Phone</td>
</tr>
</tbody>
</table>

#### Significant Medical History

#### Seizure Information

<table>
<thead>
<tr>
<th>Seizure Type</th>
<th>Length</th>
<th>Frequency</th>
<th>Description</th>
</tr>
</thead>
</table>

Seizure triggers or warning signs:

Student's response after a seizure:

#### Basic First Aid: Care & Comfort

Please describe basic first aid and procedures:

Does student need to leave the classroom after a seizure?  
- Yes  
- No

If YES, describe process for returning student to classroom:

#### Emergency Response

A "seizure emergency" for this student is defined as:

Seizure Emergency Protocol (Check all that apply and clarify below):

- Contact school nurse at ____________________________
- Call 911 for transport to __________________________
- Notify parent or emergency contact
- Administer emergency medications as indicated below:
- Notify doctor
- Other ____________________________

#### Basic Seizure First Aid

- Stay calm & track time
- Keep head flat
- Do not attempt to resist
- Do not attempt to move or prevent
- Stay with child until fully conscious
- Record details in log

For non-epileptic seizure:

- Protect head
- Keep child安静

#### Treatment Protocol During School Hours (include daily and emergency medications)

<table>
<thead>
<tr>
<th>Drug/Other</th>
<th>Dose &amp; Time of Day Prescribed</th>
<th>Common Side Effects &amp; Special Instructions</th>
</tr>
</thead>
</table>

Does student have a Vagus Nerve Stimulator?  
- Yes  
- No

If YES, describe monitor use:

#### Special Considerations and Precautions (regarding school activities, sports, trips, etc.)

Describe any special considerations or precautions:

Physician Signature ____________________________ Date ____________________________

Parent/Guardian Signature ____________________________ Date ____________________________

[www.epilepsyfoundation.org](http://www.epilepsyfoundation.org)
504 Considerations for Seizures and Epilepsy

* Epilepsy 504

EXAMPLE: The student is on medication for seizure activity, but experiences several petit mal seizures each month. This condition substantially limits the major life activity of learning.

* Possible Accommodations and Services:
  - Call parent and document the characteristics of each seizure
  - Assess breathing after seizure
  - Train for proper dispensing of medications; monitor and/or distribute medications; monitor for side effects
  - Train staff and students and prepare an emergency plan
  - Anticipate recovery process should a seizure occur. Move seating/clear space during seizure. Do not insert objects into the student's mouth during seizure; administer no fluids if student is unconscious.

* Turn the unconscious student on his or her side to avoid aspiration of vomit

* Provide rest time and return to academic considerations following seizure.

* Arrange a buddy system, especially for field trips
  - Avoid portable chalk boards or furniture that would topple over easily
  - Provide an alternative recess, adapt activities such as climbing and/or swimming
  - Plan for academic make-up work
  - Alter door openings to allow access from the outside (i.e. bathroom stall doors that swing both ways)

* Observe for consistent triggers (e.g. smells, bright light, perfume, hair spray)

* Provide post-secondary or vocational transition planning

* http://www.epilepsymichigan.org/page.php?id=363

Resources for the school nurse:

The official newsmagazine of the American Academy of Pediatrics

**AAP News**

**Neurology**

**Report offers guidance on creating action plans for students with epilepsy**

by Melanie Dawson, Editorial Intern

A new AAP clinical report highlights issues to consider when prescribing seizure medications for students with epilepsy and creating school medical orders or action plans.


Epilepsy is one of the most common neurologic diagnoses, affecting nearly 1% of U.S. children over their lifetime. Because many do not have complete control over their seizures, school staff should know what to do if a child has a seizure, according to the report from the AAP Section on Neurology and Council on School Health. Advanced planning for students with epilepsy should be completed by a team representing the medical home, school and family before school begins.

Ideally, school nurses write action plans for students with epilepsy based on medical orders from health care professionals. If there is no school nurse, schools may ask prescribing professionals to provide an action plan instead of technical medical orders, or even to train other school staff.

One option is to modify a generic action plan. (See resources.) The action plan should account for:

- least restrictive and most appropriate rescue medication option;
- how to manage potential adverse side effects;
- when the rescue medication should be administered to avoid status epilepticus;
- when it is safe for a child to remain in school following a seizure;
- when to activate emergency medical services; and
- details of communicating with the family and/or physician about the frequency of reporting seizure rescue medication use.

Pediatricians and other prescribing professionals should familiarize themselves with local and state regulations regarding administration of seizure rescue medications by school personnel. In situations of potential liability, an action plan containing instructions on seizure management for unlicensed assistive personnel can ease concerns and help to ensure appropriate care.

Details of the individual action plan and transportation to and from school can be included in an individualized education program or 504 accommodation.

**Resources**

- Epilepsy Foundation
- Epilepsy Foundation sample action plan
- AAP Council on School Health

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Thank you for your attention!
Questions?


References


References


References

References


* All clipart retrieved from http://www.simpsoncrazy.com/, and bing.com unless otherwise noted
Contact Information:

* Jeanie Kaeberle APRN, FNP-C, CCRN, CEN
* jkaeberle@kumc.edu