PEDIATRIC SEIZURES

Illinois Emergency Medical Services for Children
4th Edition – November 2018

This educational module is eligible for 1.5 CEs.
Illinois EMSC is a collaborative program between the Illinois Department of Public Health and Ann & Robert H. Lurie Children’s Hospital of Chicago aimed at improving pediatric emergency care within our state.

Since 1994, the Illinois EMSC Advisory Board and several committees, organizations and individuals within EMS and pediatric communities have worked to enhance and integrate the following pediatric specific components into our state emergency care system:

- Education
- Practice standards
- Injury prevention
- Data initiatives
- Disaster preparedness
The goal of Illinois EMSC is to ensure that appropriate emergency medical care is available for ill and injured children at every point along the continuum of care.

This educational activity is being presented without bias or conflict of interest from the planners and presenters.
Illinois EMSC Facility Recognition & Quality Improvement Committee

The Illinois EMSC Advisory Board gratefully acknowledges the commitment and dedication of the EMSC Facility Recognition & Quality Improvement Committee for their assistance with this module which was originally published in June 2012. This 4th Edition underwent committee review in 2018 to assure that it is consistent with current practice standards. The contributions of this committee have led to this valuable resource and assists Illinois EMSC in striving toward the goal of improving pediatric emergency care within our state.

Note: nothing in this module should be considered a replacement for prudent and cautious judgment of the health care provider treating the child. Every situation is unique and requires individualized care and independent treatment options.
The purpose of this educational module is to enhance the care of pediatric patients who present with seizures through appropriate

- Assessment
- Management
- Prevention of complications, and
- Disposition (including patient and parent/caregiver education)
EXCLUSIONS

- Management of post traumatic seizures is beyond the scope of this module and will not be addressed.

- Neonatal seizures are not addressed in the body of this module. However, information can be found in Appendix C.
Few health care problems elicit more distress than witnessing a child having a seizure. It is terrifying to many. When the victim is a child, and the observer is a parent or caregiver, that terror can become panic.

This module seeks to aid you in minimizing that distress and maximizing the outcome for your patient with evidence-based guidelines.
OBJECTIVES

At the conclusion of this module, you will be able to:

- Manage the child with a seizure in the prehospital and Emergency Department (ED) settings
- Identify the distinguishing characteristics between types of seizures in the pediatric patient
- Explain the rationale for specific diagnostic testing
- Provide educational information related to care of a child with seizures

NOTE: Hyperlinks are provided throughout the module to offer additional information
INTRODUCTION AND BACKGROUND
3.4 million people in the U.S. have active epilepsy
- 3 million are adults (age 18 years and older)
- 470,000 are children (age 0-17 years)

General Epilepsy Population costs
- The direct health costs of epilepsy in the U.S. range from $10,192 to $47,869 per person annually.
In 2014, 10,027 children age 0-17 years in Illinois were seen in the emergency department with the principle diagnosis of epilepsy/convulsions.
In 2010-2011, Illinois EMSC conducted a statewide survey of Emergency Department practice patterns (including medical record reviews) related to children presenting with:

- Simple Febrile Seizure (SFS)
- Unprovoked Seizures (UnS), and
- Status Epilepticus (SE)
Opportunities for improvement:

- Less than half of responding facilities had a protocol/policy/guideline/clinical pathway that addressed the clinical management of seizures (44%) or clinical management of SE in particular (19%)

- In the prehospital management of pediatric seizures, blood glucose assessments were documented in only 34% of SFS patients and slightly over half of UnS/SE patients

- For UnS/SE patients, seizure precautions were either not taken or not documented in more than 1/3 of the cases
A SEIZURE IS:

- Abnormal neuronal activity
- A sudden biochemical imbalance at the cell membrane
- Repeated abnormal electrical discharges
- Seen clinically as changes in motor control, sensory perception and/or autonomic function
Parents/caregivers may report seeing:

- Repetitive non-purposeful movements
- Staring
- Lip-smacking
- Falling down without cause
- Stiffening of any or all extremities
- Rhythmic shaking of any or all extremities

**Seizure activity *cannot* be interrupted with verbal or physical stimulation⁷**
Parents/caregivers may report the child is:

- Feeling nauseated
- Feeling odd or peculiar
- Losing control of bowel or bladder
- Feeling numbness, tingling
- Experiencing odd smells or sounds
Consciousness is the usual alertness or responsiveness the child demonstrates.

Parents/caregivers may report or you may observe the child to have:
- Baseline alertness
- Diminished level of consciousness
- Unresponsive and unconscious
CLINICAL PRESENTATION: EVENTS THAT MIMIC SEIZURES

- Apnea
- Breath Holding
- Dizziness
- Myoclonus
- Pseudoseizures
- Psychogenic Seizures
- Rigors
- Shuddering
- Syncope
- Tics
- Transient Ischemic Attacks

I May Be Shakin’...
But It Ain’t A Seizure!
## Seizure Classifications

<table>
<thead>
<tr>
<th>Generalized</th>
<th>Partial</th>
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<tbody>
<tr>
<td><strong>Involves BOTH hemispheres of the brain</strong></td>
<td><em><em>Involves motor</em> or autonomic# symptoms with altered level of consciousness</em>*</td>
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<tr>
<td><strong>Always involves loss of consciousness</strong></td>
<td><strong>May start in one muscle group and spread</strong></td>
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<tr>
<td><strong>Types:</strong></td>
<td></td>
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<tr>
<td>- Tonic or clonic movements or combination (grand mal)</td>
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<tr>
<td>- Absence (petit mal)</td>
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<tr>
<td>- Myoclonic</td>
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<tr>
<td>- Atonic (e.g., drop attacks)</td>
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<tr>
<td>- Infantile spasms</td>
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</tbody>
</table>

### Types of symptoms:

1. Motor* - head/eye deviation, jerking, stiffening
2. Autonomic# - pupillary dilatation, drooling, pallor, change in heart rate or respiratory rate
3. Somatosensory+ - smells, alteration of perception (déjà vu)
GENERALIZED SEIZURE CLASSIFICATION: DESCRIPTIONS

- Absence – Abrupt lapses of consciousness lasting a few seconds
- Atonic – Abrupt, unexpected loss of muscle tone
- Myoclonic – Rapid short contractions of one or all extremities
Febrile seizures are the most common seizure disorder in childhood, affecting 2 - 4% of children between the ages of 6 months and 5 years.
FEBRILE SEIZURE

- Caused by the increase in the core body temperature greater than 100.4°F or 38°C
- Threshold of temperature which may trigger seizures is unique to each individual
- Can occur within the first 24 hours of an illness
  - Can be the first sign of illness in 25 - 50% of patients
FEBRILE SEIZURE: CHARACTERISTICS

- Are benign
- Occurrence: between 6 months to 5 years of age
- May be either simple or complex type seizure
- Seizure accompanied by fever (before, during or after) **WITHOUT ANY**
  - Central nervous system infection
  - Metabolic disturbance
  - History of previous seizure disorder
FEBRILE SEIZURE: TWO TYPES

Simple Febrile
- 6 months – 5 years of age
- Febrile before, during or after seizure
- Includes all of the following
  - Seizure lasting less than 15 minutes
  - Generalized seizure
  - Occurs once in a 24-hour period

Complex Febrile
- 6 months – 5 years of age
- Febrile before, during or after seizure
- One or more of the following
  - Prolonged (lasting more than 15 minutes)
  - Focal seizure
  - Occurs more than once in 24 hours
FEBRILE SEIZURE: PREHOSPITAL ASSESSMENT

- Assess the A,B,Cs
- Assess neurological status (D = Disability using AVPU)
- Obtain seizure history from a dependable witness:
  - How long was the seizure?
  - What did it look like (movements, eye deviation)?
  - History of previous seizures (child and family)?
  - Does the child have a current illness/fever?
  - Any indications of trauma or abuse?
  - Length of postictal phase?
- List current medications
  - Include any antipyretics given (time and dose)
AVPU

The AVPU scale (Alert, Voice, Pain, Unresponsive) is a system by which a healthcare professional can measure and record a child’s level of consciousness.

The AVPU scale should be assessed using these identifiable traits, looking for the best response of each:

A  **Alert** – the infant is active, responsive to parents and interacts appropriately with surroundings; the child is lucid and fully responsive, can answer questions and see what you're doing.

V  **Voice** – the child or infant is not looking around; responds to your voice, but may be drowsy, keeps eyes closed and may not speak coherently, or make sounds.

P  **Pain** – the child or infant is not alert and does not respond to your voice. Responds to a painful stimulus (e.g., shaking the shoulders or possibly applying nail bed pressure).

U  **Unresponsive** – the child or infant is unresponsive to any of the above; unconscious.
Monitor the A, B, C, Ds

Position with spinal motion restriction (if trauma)

Follow seizure and aspiration precautions (per EMS System protocol)

Physical exam
  - Check blood glucose
  - If blood glucose ≤ 60 mg/dL, treat as appropriate

Refer to the EMSC Seizure protocols (Appendix A)
FEBRILE SEIZURE: ED ASSESSMENT

- Baseline assessment
- Vital signs (including temperature)
- Assess the A, B, C, Ds
- Continue providing and documenting seizure and aspiration precautions
**Full History**
- Obtain seizure history from a dependable witness:
  - When did the seizure occur?
  - How long was the seizure and what did it look like?
  - How was the child acting immediately before the seizure?
  - History of previous seizures (child and family)?
  - History of developmental delay/recent loss of milestones?
  - Does the child have a current illness/fever?
  - Any indications of trauma or abuse?
  - Length of postictal state?
  - Immunization history?

- List current medications
  - Include any antipyretics given (time and dose)
FEBRILE SEIZURE: ED MANAGEMENT

- If still having a seizure, follow Status Epilepticus protocol
- Complete physical exam – to identify the source of fever
- Lab testing – No routine lab tests are necessary for the diagnosis of simple febrile seizures
  - Direct lab testing toward identifying the source of fever
Evidence-based recommendations from the 2011 American Academy of Pediatrics (AAP) Subcommittee on Febrile Seizures\textsuperscript{12} are as follows:

“A lumbar puncture should be performed in any child who presents with a seizure and a fever and has meningeal signs and symptoms (e.g., neck stiffness, Kernig and/or Brudzinski signs) or in any child whose history or examination suggests the presence of meningitis or intracranial infection.”

Current data \textit{does not} support routine lumbar puncture in well-appearing, fully immunized children who present with a simple febrile seizure.
Additional evidence-based recommendations from the 2011 AAP Subcommittee on Febrile Seizures\textsuperscript{12} are as follows:

“In any infant between 6 and 12 months of age who presents with a seizure and fever, a lumbar puncture is an option when:
- the child is considered deficient in Haemophilus influenza type b (Hib) or Streptococcus pneumoniae immunizations (i.e., has not received scheduled immunizations as recommended) or
- when the immunization status cannot be determined because of an increased risk of bacterial meningitis.”

“A lumbar puncture is an option in the child who presents with a seizure and fever and is pretreated with antibiotics, because antibiotic treatment can mask the signs and symptoms of meningitis.”
<table>
<thead>
<tr>
<th>Simple Febrile Seizure</th>
<th>EEG</th>
<th>CT/MRI</th>
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<td><em>not</em> be performed in a neurologically healthy child.</td>
<td>Not indicated</td>
</tr>
<tr>
<td></td>
<td>Results are <em>not</em> predictive of recurrence or development of epilepsy</td>
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There are no current national guidelines addressing diagnostic testing recommendations for complex febrile seizures.
Reassess temperature

Consider giving antipyretic if not previously administered

As source of fever is identified, treat appropriately
Here are some frequently asked questions parents/caregivers may have prior to discharge:

- **Is my child brain damaged?**
  - There is no evidence of impact on learning abilities after seizure from SFS.

- **Will this happen again?**
  - If child is under 12 months of age at time of first seizure, recurrence rate is 50%
  - If child is greater than 12 months of age at time of first seizure, recurrence rate is 30%
  - Most recurrences occur within 6-12 months of the initial febrile seizure
Will my child get epilepsy?
- For simple febrile seizures, there is no increased risk of epilepsy

Why not treat for possible seizures or fever?
- Anticonvulsants can reduce recurrence. However, potential side effects of medications outweigh the minor risk of recurrence
- Prophylactic use of antipyretics does not have impact on recurrence

For complex febrile seizures, there is a slight increase in the risk of epilepsy.
Instruct parent/caregivers to prevent injury during a seizure:
- Position child while seizing in a side-lying position
- Protect head from injury
- Loosen tight clothing about the neck
- Prevent injury from falls
- Reassure child during event
- **Do not** place anything in the child’s mouth
Prior to discharge home...

- Educate regarding use of:
  - Thermometer
  - Antipyretics for fever management
  - When to contact 9-1-1 or ambulance
    - Call after 5 minutes of seizure activity

- Identify a Primary Care Provider for follow-up appointment and stress importance of follow-up

- Provide developmentally appropriate explanation of event for child and family members
1. Simple Febrile Seizures:
   A. Indicate an underlying neurological condition
   B. Require anticonvulsant medication
   C. Occur in children 6 months to 5 years of age
   D. Frequently lead to epilepsy

2. Which of the following are important history questions?
   A. Was there trauma?
   B. What did the seizure look like?
   C. Medications and herbal supplements?
   D. All of the above

3. Diagnostic workup in the ED is based on suspicions of:
   A. Meningitis
   B. Trauma
   C. Unknown immunization status
   D. All of the above

4. Discharge education should include instructing parents on which of the following?
   A. Scheduling an EEG
   B. Actions to take to protect the child from injury during a seizure
   C. Importance of a follow up MRI
   D. Anticonvulsant medications

*Proceed to next slide for answers*
1. Simple Febrile Seizures:
   C. Occur in children 6 months to 5 years of age

3. Diagnostic workup in the ED is based on suspicions of:
   D. All of the above

2. Which of the following are important history questions?
   D. All of the above

4. Discharge education should include which of the following?
   B. Actions to take to protect the child from injury during a seizure
FIRST UNPROVOKED SEIZURE
This is a first seizure that occurs *without* an immediate precipitating event.

Etiology may be:

- *Remote symptomatic* (related to a pre-existing brain abnormality/insult)
- *Cryptogenic or idiopathic* (no known cause)
FIRST UNPROVOKED SEIZURE: PRESENTATION

Parents/caregivers may describe symptoms consistent with the following:

- Partial seizure
- Generalized onset, tonic-clonic seizure
- Tonic seizure

Remember: this is a seizure that occurs \textit{without} an immediate precipitating event.
FIRST UNPROVOKED SEIZURE: PREHOSPITAL ASSESSMENT

- Assess the A, B, C, Ds
- Obtain seizure history from a dependable witness:
  - How long was the seizure?
  - What did it look like (movements, eye deviation)?
  - History of previous seizures (child and family)?
  - Does the child have a current illness/fever?
  - Any indications of trauma or abuse?
  - Length of postictal state
- List current medications
  - Include any antipyretics given (time and dose)
Monitor the A, B, C, Ds

Position with C-Spine protection (if trauma)

Follow seizure and aspiration precautions (per protocol)

Physical assessment
  - Check blood glucose
  - If blood glucose ≤ 60 mg/dL, treat as appropriate

Refer to EMSC Seizure protocols (Appendix A)
FIRST UNPROVOKED SEIZURE: ED ASSESSMENT

- Baseline assessment
  - Vital signs (including temperature)
  - Assess the A, B, C, Ds
  - Continue providing and documenting seizure and aspiration precautions
FIRST UNPROVOKED SEIZURE: ED ASSESSMENT (CONT.)

- If still seizing, follow the Status Epilepticus protocol

- Full History
  - Obtain seizure history from a dependable witness:
    - Recent exposures (chemical, industrial)?
    - When did the seizure occur?
    - How long was the seizure and what did it look like?
    - How was the child acting immediately before the seizure?
    - History of previous seizures (child and family)?
    - History of developmental delay/recent loss of milestones?
    - Does the child have a current illness?
    - Any indications of trauma or abuse?
    - Immunization history?
    - Length of postictal state?
List current medications
  - Include any antipyretics given (time and dose)
  - Include anticonvulsants given by prehospital team (time and dose)

Physical exam
  - Head-to-toe assessment
Laboratory tests are based on individual clinical circumstances and may include:

- CBC with differential
- Blood glucose
- Electrolytes
- Calcium, magnesium, phosphorous
- Urine drug/toxicology screen
- Urine HCG (age/sex dependent)

Lumbar puncture is only indicated if there are other symptoms that suggest a diagnosis of meningitis.
MRI should be considered for:
- Children under 1 year of age
- All children with significant acute cognitive or motor impairment
- Unexplained abnormalities on neurologic exam
- Seizure of focal onset without generalization
- Abnormal EEG

Abnormalities on MRI are seen in up to 1/3 of children
- However, most abnormalities do not influence immediate treatment or management (such as need for hospitalization)
Emergent CT Scan (without contrast) should be considered for any child who exhibits any of the following:

- Significant, acute cognitive or motor impairment
- New focal deficit not quickly resolving
- Not returned to baseline

MRI is the modality of choice, if available.
Obtain on **ALL** children in whom a nonfebrile seizure has been diagnosed

- Can be arranged as an outpatient
- Should be interpreted by a neurologist (preferably pediatric neurologist)

EEG results will:
  - Help predict the risk of recurrence
  - Classify the seizure type or epilepsy syndrome
  - Influence the decision to perform additional neuroimaging studies
FIRST UNPROVOKED SEIZURE: ED MANAGEMENT

If child is still actively having seizures...
- Refer to the Status Epilepticus protocol

When child is stable...
- Consult with Neurologist (or Intensivist)
  - For possible medication recommendations
  - To determine disposition:
    - Admit to observe
    - Transfer (if neurologist is unavailable)
    - Discharge home with Primary Care Provider and Neurology follow-up
The majority of children who experience an unprovoked seizure will have few or no recurrences
- Approximately 10% will go on to have additional seizures regardless of therapy

Predictors of recurrence include: abnormal EEG, underlying etiology, and abnormal neurologic exams
- Remote symptomatic – recurrence risk over 2 years is above 50%
- Cryptogenic or idiopathic – recurrence risk over 2 years is 30-50%
- If first seizure is prolonged, recurrent seizures are more likely to be prolonged.
Type of medication (if offered) depends on:

- Type, frequency and severity of seizures
- Side effects, titration, drug interactions, dosing forms, cost of drug
- Neurologist preference
Prior to discharge home...

- Identify Primary Care Provider and Neurologist for follow-up appointments
- Provide plan for outpatient EEG
- Provide parental support
  - Access to prescription resources
  - Social services resources
- Consider rescue medication for home, based on neurologist recommendation (e.g., rectal diazepam)
Instruct parent/caregivers to prevent injury during a seizure:

- Position child while seizing in a side-lying position
- Protect head from injury
- Loosen tight clothing about the neck
- Prevent injury from falls
- Reassure child during event
- Do not place anything in the child’s mouth
- Instruct in use of 9-1-1 or ambulance services
- Provide developmentally appropriate explanation to child about the seizure event and treatment
- Discourage swimming alone
- No driving a car until cleared by a physician
Here are some frequently asked questions parents/caregivers may have prior to discharge:

- **How likely is it that my child will have seizures again?**
  The risk of recurrence relates to the underlying etiology and EEG results (normal or abnormal). The majority of children who experience an unprovoked seizure will have few or no recurrences. Approximately 10% will go on to have additional seizures regardless of therapy.\(^\text{14}\)

- **Is there a risk of dying from the seizure if we don’t start medication today?**
  Sudden unexpected death is very uncommon (usually related to an underlying neurologic handicap rather than seizure activity). There are no studies showing treatment after a first seizure alters the small risk of sudden death.\(^\text{14}\)
1. Which of the following is a true statement regarding a First Unprovoked Seizure:
   A. Occurs without a precipitating event
   B. Is never associated with an underlying neurological condition
   C. Always leads to epilepsy
   D. Requires immediate initiation of antiepileptic medication

2. Children who have a First Unprovoked Seizure...
   A. Should have their blood glucose checked by ambulance staff
   B. Could proceed to have Status Epilepticus
   C. Will require anti-pyretics to prevent seizures
   D. A and B

3. All children who have had a First Unprovoked Seizure should have an outpatient EEG.
   A. True
   B. False

4. The majority of children who have a First Unprovoked Seizure will have few or no recurrences.
   A. True
   B. False

Proceed to next slide for answers
1. Which of the following is a true statement regarding a First Unprovoked Seizure:
   A. Occurs without a precipitating event

2. Children who have a First Unprovoked Seizure...
   D. A and B

3. All children who have had a First Unprovoked Seizure should have an outpatient EEG.
   A. True

4. The majority of children who have a First Unprovoked Seizure will have few or no recurrences.
   A. True
STATUS EPILEPTICUS
STATUS EPILEPTICUS: DEFINITIONS

- Seizures that persist without interruption for more than 5 minutes

- Two or more sequential seizures without full recovery of consciousness between seizures

This is a life threatening emergency that requires immediate treatment.
Commonly occurs in children with epilepsy (9-27% over time)

Complications from Status Epilepticus result from both the impact of the convulsive state on the body systems (such as the cardiac and respiratory systems) and the neuronal cellular injury which leads to cell death.

Rapid termination of the seizure activity protects against neuronal injury.
<table>
<thead>
<tr>
<th>Type</th>
<th>Incidence</th>
<th>Description</th>
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<tbody>
<tr>
<td>Remote Symptomatic SE</td>
<td>33%</td>
<td>Status Epilepticus (SE) with no immediate event but the child had a previous history of CNS malformation, traumatic brain injury or chromosomal disorder</td>
</tr>
<tr>
<td>Acute Symptomatic SE</td>
<td>26%</td>
<td>SE with concurrent acute illness (e.g., meningitis, encephalitis, hypoxia, trauma, intoxication)</td>
</tr>
<tr>
<td>Febrile SE</td>
<td>22%</td>
<td>SE with a febrile illness but not a Central Nervous System infection (e.g., sinusitis, sepsis, upper respiratory infection)</td>
</tr>
<tr>
<td>Cryptogenic SE</td>
<td>15%</td>
<td>SE with no identifiable cause</td>
</tr>
</tbody>
</table>
STATUS EPILEPTICUS: PREHOSPITAL ASSESSMENT

- Assess the A, B, C, Ds

- Obtain seizure history from a dependable witness:
  - When did the seizure begin?
  - What did it look like (movements, eye deviation)?
  - History of previous seizures (child and family)?
  - Does the child have a current illness/fever?
  - Any indications of trauma or abuse?
  - Emergency Information Form for Children with Special Needs?
STATUS EPILEPTICUS: PREHOSPITAL ASSESSMENT

- List current medications
  - Include any antipyretics given (time and dose)
- Do the parents have any anticonvulsant medications (e.g., rectal diazepam)?
- Have parents given any anticonvulsant medications (time, route, and dose)?
STATUS EPILEPTICUS: PREHOSPITAL ASSESSMENT

- Assess the A, B, C, Ds
- Positioning (with C-Spine protection if trauma)
  - Jaw thrust
  - Recovery position (side-lying)
- Provide nasal airway, if needed
- Seizure safety precautions (per protocol)
- Aspiration precautions (per protocol)
- Oxygen
- Suction
- Blood glucose testing
  - If blood glucose < 60 mg/dL, treat as appropriate
STATUS EPILEPTICUS: PREHOSPITAL ASSESSMENT

- If parent/caregiver has rectal diazepam and has not given it, the parent/caregiver should be requested to administer it
  - Document time and dose
  - Follow Pediatric Seizures ALS guideline (if appropriate)
  - Contact Medical Control

REFER TO APPENDIX A for EMSC Seizure Protocols
Minimize seizure time as much as possible and provide drug therapy promptly.

- Drug therapy to halt seizure
  - With IV/IO access, administer *LORazepam IV/IO
  - If no IV/IO access, administer:
    - Diazepam PR, or
    - Midazolam IN

*The Institute for Safe Medication Practices recommends using Tall Man (mixed case) letters in order to distinguish drugs with similar sounding names – decreasing the chances of safety errors.
Assess the A, B, C, Ds

Full vital signs; check bedside glucose and treat (per protocol)

Continue to provide and document seizure and aspiration precautions (per protocol)

Review Prehospital History and Treatment
STATUS EPILEPTICUS: ED MANAGEMENT

- Full History
  - Obtain seizure history from a dependable witness:
    - How long has the seizure been going on and what did it look like when it started?
    - How was the child acting immediately before the seizure?
    - History of previous seizures (child and family)?
    - History of developmental delay/recent loss of milestones?
    - Does the child have a current illness?
    - Any indications of trauma or abuse?
    - Immunization history?
STATUS EPILEPTICUS: ED ASSESSMENT

- Assess E (exposure)
  - List current medications
    - When were they last given?
  - Recent exposures - chemical, industrial, infectious?
  - Was patient recently out of the country?
STATUS EPILEPTICUS: ED MANAGEMENT—FIRST 5 MINUTES

- Evaluate airway
  - Suction, position and provide nasal airway as needed
  - Provide 100% oxygen (non-rebreather)

- Establish vascular access
  - Draw labs as determined by history, e.g.:
    - CBC, Electrolytes, Blood glucose, Calcium, Magnesium, Phosphorus
    - Toxicology screen, if indicated by history
    - Antiepileptic drug level, as indicated

- Administer benzodiazepines
  - LORazepam IV/IO 0.1 mg/kg
  - No IV access, give either:
    - Diazepam PR 0.5 mg/kg (max PR dose = 20 mg) or
    - Midazolam IM 0.1 mg/kg or IN 0.2 mg/kg

Benzodiazepines may cause respiratory and cardiac depression.

REFER TO APPENDIX B for sample guidelines
STATUS EPILEPTICUS: ED MANAGEMENT – NEXT 10 MINUTES

- Reassess the A, B, Cs
- Continue supportive airway management
  - Suction, position and provide nasal airway as needed
  - Provide 100% oxygen (non-rebreather)
  - Assess need for intubation
- Evaluate results of rapid blood glucose testing

If the seizure activity continues...
- Administer medications (per guidelines)
  - Repeat IV LORazepam 0.1 mg/kg
  - Administer IV/IM Fosphenytoin 20 mg/kg PE (Phenytoin equivalents)

REFER TO APPENDIX B for sample guidelines
Having administered 2-3 doses of benzodiazepines, and a dose of Fosphenytoin without halting the seizure, consider the patient in refractory Status Epilepticus

Consult with Neurology and/or Intensivist for further management recommendations

If available, evaluate lab results

REFER TO APPENDIX B for sample guidelines
STATUS EPILEPTICUS: ED MANAGEMENT – REFRACTORY SE

- If seizure activity persists (after appropriate doses of benzodiazepines and Fosphenytoin), load with a second long-acting AED that was not used initially (e.g., valproic acid, levetiracetam)
  - Manage with continuous EEG monitoring
  - Contact PICU/NICU to begin transfer to higher level of care

It is imperative to stop the seizure activity. If rapid sequence induction is necessary, use short-acting paralytics to ensure that ongoing seizure activity is not masked.

REFER TO APPENDIX B for sample guidelines
Status Epilepticus: ED Management – Transfer

- For a child in Status Epilepticus after 30 minutes of refractory SE, enact plans to transfer to your PICU/NICU or transport to a higher level of care.

- Continued testing can be arranged in that setting:
  - Consider EEG with new onset SE
  - Neuroimaging (CT/MRI) if etiology is unknown.

REFER TO APPENDIX B for sample guidelines.
STATUS EPILEPTICUS: DISPOSITION

- Discuss child’s progress and advice regarding admission or transfer based on patient status and neurology consultation with parents/caregiver
  - Utilize a specialty/critical care transport team
  - As applicable, explain these events to the child in a developmentally appropriate manner
STATUS EPILEPTICUS: PARENT EDUCATION

- Provide parents/caregivers information regarding child’s condition and treatment plan

- Provide emotional/psychosocial support

- Encourage use of the Emergency Information Form [developed by the American Academy of Pediatrics (AAP) & American College of Emergency Physicians (ACEP)] for possible future events
The Emergency Information Form (EIF) for Children With Special Needs resource was developed by the AAP and the ACEP.

- A standardized medical summary with:
  - Information for prehospital and hospital emergency care personnel
  - Updates entered by caregivers
  - English and Spanish versions
  - 24-hour accessibility
  - Free, Downloadable, interactive forms are available at the ACEP website.

To be completed by both the child’s medical team and parents/caregivers. Copies should be kept by parents, as well as on file at the PCP’s office, subspecialist’s office, local ED, and school nurse’s office.
1. You respond to a 9-1-1 call for a 4-year-old child. You find the child on the floor of the playroom, unresponsive to voice with rhythmic movements of both the upper and lower extremities. The parents report that the child has had seizures, starting at age 2. The seizure activity has always lasted only about 1 minute. The parents called 9-1-1 when the initial seizure stopped, but the seizure started again with about one minute in between. They estimate the child has been seizing for about 15 minutes.

Your FIRST response is to:

A. Move the child to the bed
B. Establish vascular access
C. Protect/position the airway
D. Give rectal diazepam

*Proceed to next slide for answer*
1. You respond to a 9-1-1 call for a 4-year-old child. You find the child on the floor of the playroom, unresponsive to voice with rhythmic movements of both the upper and lower extremities. The parents report that the child has had seizures, starting at age 2. The seizure activity has always lasted only about 1 minute. The parents called 9-1-1 when the initial seizure stopped, but the seizure started again with about one minute in between. They estimate the child has been seizing for about 15 minutes.

Your FIRST response is to:

C. Protect/position the airway
2. How quickly should the first benzodiazepine be given after Status Epilepticus begins?
   A. At 30 minutes
   B. At 20 minutes
   C. Within 5 minutes
   D. After 60 minutes

3. What drugs are used first in status epilepticus?
   A. Lorazepam
   B. Fosphenytoin
   C. Diazepam
   D. A and C

4. Who is likely to have status epilepticus?
   A. Child with a history of epilepsy
   B. Child with encephalitis
   C. Child with a traumatic brain injury
   D. All of the above
2. How quickly should the first benzodiazepine be given after Status Epilepticus begins?
   C. Within 5 minutes

3. What drugs are used first in status epilepticus?
   D. A and C

4. Who is likely to have status epilepticus?
   D. All of the above
Resources and Appendices
Online Resources

American Epilepsy Society
http://www.aesnet.org/

American Academy of Neurology Patient Education Materials
http://patients.aan.com/go/resources

CDC: Epilepsy
http://www.cdc.gov/Epilepsy/

Citizens United for Research in Epilepsy (CURE)
http://www.cureepilepsy.org/

Epilepsy Foundation: Epilepsy and Seizure Response for Law Enforcement and EMS (free online training)
http://www.epilepsyfoundation.org/livingwithepilepsy/firstresponders/

Epilepsy Therapy Project
https://www.epilepsy.com/make-difference/research-and-new-therapies/innovation/epilepsy-therapy-project

Return to Table of Contents
Video Resources

Understanding Epilepsy
www.youtube.com/watch?v=MNQlq004FkE

Types of Seizures
www.youtube.com/watch?v=CDccChHrgRA&feature=channel

Understanding Partial Seizures
www.youtube.com/watch?v=e10FSjHvV74&feature=channel

Understanding Generalized Seizures
www.youtube.com/watch?v=w5Jv0SZRwwk&feature=channel

What Causes Epilepsy?
www.youtube.com/watch?v=6NcqQkKjqTI&feature=fvw

Diagnosing Epilepsy
www.youtube.com/watch?v=HX7L11rhRTw&feature=channel

Seizure Imitators Overview
www.youtube.com/watch?v=J4xJSGpJioI&feature=relmfu
APPENDIX A
EMSC PREHOSPITAL PROTOCOLS
All Pediatric Seizure care guidelines follow this sequence:

- Initial Medical Care/Assessment
- Protect the child from Injury
- Vomiting and aspiration precautions

The next steps depend on the level of care of the responder.
The below prehospital guidelines can be accessed as attachments to this educational module:

- BLS/EMERGENCY MEDICAL RESPONDER (EMR) CARE GUIDELINE
- ALS/ILS CARE GUIDELINE

Source: Illinois EMSC Pediatric Prehospital Protocols
APPENDIX B
SAMPLE EMERGENCY DEPARTMENT GUIDELINES

Return to Table of Contents
The below organizations are providing access to their ED pediatric seizures guidelines. Please acknowledge/cite these organizations if using their work in developing your guidelines and/or educational resources.

- **Advocate Children’s Hospital**
  - Emergency Department Guidelines
  - Status Epilepticus Guidelines

- **OSF St. Francis Medical Center/Children’s Hospital of Illinois**
  - Pediatric Status Epilepticus Guidelines (*click on attachment icon at bottom right of this slide*)

- **Seattle Children’s Hospital**
  - Pediatric Seizures
  - Febrile Seizures

- **University of Chicago Comer Children’s Hospital**
  - Pediatric Emergency Clinical Guidelines
APPENDIX C

NEONATAL SEIZURES
NEONATAL SEIZURES

- Neonatal seizures can be difficult to diagnose
  - May consist of very subtle and unusual physical signs
    - Eye deviation, staring episodes, winking

- In neonates, onset of seizure activity is important in determining etiology
  - First 24 - 72 hours of life
    - Ischemic hypoxia

- 72 hours to 1 week of age
  - Familial neonatal seizures
    - Metabolic disorders
NEONATAL SEIZURES

- Beyond the standard history, ask about the pregnancy, labor and delivery and maternal risk factors

- Physical exam should include head circumference and careful inspection for dysmorphic features and cutaneous lesions

- Consult with a pediatric neurologist to identify infantile seizure disorders
NEONATAL SEIZURES: STATUS EPILEPTICUS

- Assess the A, B, Cs
- Evaluate and maintain airway
- Provide 100% oxygen
- Establish vascular access
  - Obtain rapid glucose
- Administer Medications
  - PHENobarbital 20 mg/kg IV
  - Repeat up to 40 mg/kg total dose
- Contact Neurology
References
REFERENCES


4. AHRQ HCUPnet online query system, with Illinois data provided by IDPH to AHRQ. Retrieved August 30, 2018 from http://hcupnet.ahrq.gov/


THE END