Measures have been taken, by the Utah Department of Health, Bureau of Health Promotions, to ensure no conflict of interest in this activity.
Seizures by the #’s

- 1 in 10 people will have at least 1 seizure in their life
- 1 in 25 children will have a generalized seizure before 5 years of age
- 1 in 100 people will have epilepsy
Objectives

- Review definitions
- Identify various seizure types & categories
- Understand potential causes for seizure
- List aspects of the initial workup after a 1st time seizure
- List common anti-epileptic medication side effects
- Know how to keep a child safe during a seizure
Definition

- Seizure (ictus):
  - abnormal excessive or synchronous neuronal activity in the brain
  - when brain cells send messages again and again in an uncontrolled manner
  - can cause sudden change in level of consciousness, behavior, actions or sensation

- Epilepsy
  - syndrome of recurrent unprovoked seizures

- Status (Epilepticus)
  - Prolonged/persistent seizure
Seizure Characterization

- Age
- Semiology = what it looks like (LOC, head/eyes limbs)
- Onset
- Duration
- Behavior before & after (pre & post-ictal)
- Etiology
  - provoked (e.g. febrile, abscess, structural) vs unprovoked
  - symptomatic vs idiopathic
2 Main Categories

- **Generalized**
  - Tonic-clonic (convulsive, grand mal)
  - Absence (staring, petit mal)
    - Onset 3-6y, <15 seconds
    - ADHD overlap
    - Abrupt onset, + LOC
  - No postictal period
  - Child often unaware
  - May including blinking, chewing or hand movements
  - Atonic (drop)
  - Myoclonic (single jerk)

- **Focal/Partial**
  - Simple
    - Affects only one part of the body
    - Consciousness is not affected
  - Complex
    - Includes change in consciousness & automatisms followed by confusion
    - Often have aura
  - Secondary generalization
Tonic-clonic seizure

A. Tonic phase
- Incontinence
- Epileptic cry
- Generalized stiffening of body and limbs, back arched

B. Clonic phase
- Salivary frothing
- Clonic jerks of limbs, body and head
- Cyanosis

C. Post-ictal confusional fatigue
- Eyes blinking
- Limbs and body limp
- Cyanosis
Absence Seizure
Focal Seizures

**Somatosensory.** Tingling of contralateral limb, face, or side of body

**Central sulcus.**

**Postcentral gyrus.**

**Precentral gyrus.**

**Leg.**

**Trunk.**

**Arm.**

**Face.**

**Focal motor.** Tonic-clonic movements of upper (or lower) limb

**Grimacing.**

**Contraversive:** head and eyes turned to opposite side

**Autonomic.** Sweating, flushing or pallor, and/or epigastric sensations

**Visual.** Sees flashes of light, scotomas, unilateral or bilateral blurring

**Auditory.** Hears ringing or hissing noises

**EEG: Focal motor seizure, left arm and hand**

- Fp1-F3
- F3-C3
- C3-P3
- P3-O1
- Fp2-F4
- F4-C4
- C4-P4
- P4-O2

Repetitive sharp waves over right central region

Epilepsyclassroom.com
Common Pediatric Epilepsy Syndromes

- Febrile Seizure
  - 6m-6y; good prognosis
  - simple vs complex
  - 2-5% of all children
  - antipyretics don’t prevent
  - recurrence:
    - 50% for <12
    - 30% for >12m
  - 2\textsuperscript{nd} feb sz $\rightarrow$ 50% risk of 3rd

- Childhood Absence Epilepsy
  - 4-14y; good prognosis

- Benign Rolandic Epilepsy

- GTCS on awakening

- Juvenile Myoclonic Epilepsy (JME)
  - mixed disorder
  - lifetime risk
Rare Pediatric Epilepsy Syndromes

- Lennox-Gastaut
- Landau-Kleffner
- Dravet syndrome
- Doose syndrome
First unprovoked seizure

- Untreated: 40% at 2y
- Treated: 32% at 2 years
- 80-90% of 2\textsuperscript{nd} seizures occur within 2 years
  - Highest risk within 1\textsuperscript{st} 6 months
Causes for seizure

- CNS infection - meningitis, encephalitis, abscess
- Trauma - acute, scarring
- Vascular - stroke, hemorrhage, vessel malformation, clot
- Hypoxia - hypoxic ischemic encephalopathy
- Metabolic/Electrolyte Imbalance - hypoglycemia, hypercalcemia, inborn errors of metabolism
- Drugs/Toxins/Withdrawal
- Structural - Mass, tumor, cortical malformations/dysplasia
- Idiopathic - genetic
First-time Seizure Workup

- Depends on context
  - E.g. age, fever, trauma, infection, duration

- Should include:
  - Thorough history (including birth, development & family history)
  - Physical exam (head size, skin findings)

- May include:
  - Head CT (if concerned for head trauma)
  - EEG
  - Brain MRI
  - ECG
  - Labs
  - Lumbar puncture
EEG
Brain MRI
MRI - cortical dysplasia
Conditions that Mimic Seizures

- Tics
- Shivering
- Syncope
- Breath Holding Spells
- Reflux
- Excessive startle
- Psychogenic/Pseudoseizures
- Behavioral Variants - self-stimulation
When to Treat

- Rarely after first event
Safety

- Water
- Heights
- Medications
- Helmets
Medications

- Preventive
- Rescue
Common Preventive Medications

- Levetiracetam (Keppra)
- Ethosuximide (Zarontin)
- Oxcarbazepine (Trileptal)
- Valproic acid (Depakote)
- Lamotrigine (Lamictal)
- Topiramate (Topamax)
- Zonisamide (Zonegran)
- Lacosamide (Vimpat)
- Phenobarbital
- Fosphenytoin (Dilantin)
## Side Effects

<table>
<thead>
<tr>
<th>Medication</th>
<th>Side effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levetiracetam (Keppra)</td>
<td>Irritability, fatigue</td>
</tr>
<tr>
<td>Ethosuximide (Zarontin)</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Oxcarbazepine (Trileptal)</td>
<td>Nausea, hyponatremia</td>
</tr>
<tr>
<td>Valproic acid (Depakote)</td>
<td>Tremor, nausea, wt gain, hair loss</td>
</tr>
<tr>
<td>Lamotrigine (Lamictal)</td>
<td>Rash</td>
</tr>
<tr>
<td>Topiramate (Topamax)</td>
<td>Fatigue, cognitive slowing</td>
</tr>
<tr>
<td>Zonisamide (Zonegran)</td>
<td>Rash</td>
</tr>
<tr>
<td>Lacosamide (Vimpat)</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>Sedation, lower IQ</td>
</tr>
<tr>
<td>Fosphenytoin (Dilantin)</td>
<td>Rash, gum overgrowth, bone loss</td>
</tr>
</tbody>
</table>
Common Rescue Medications

- Diazepam (Diastat) - rectal
- Lorazepam (Ativen) - oral
- Midazolam (Versed) - nasal
Other Therapies

- Vagal Nerve Stimulator
- Ketogenic Diet
- Epilepsy Surgery
What to Do

- Remain calm
- Lay child down on his/her side & turn head to side if possible
- Keep objects away from face to help breathing & prevent injury
- Do not put anything in mouth or between teeth
- Protect head and body from banging, sharp or hard objects
- Do not restrain limbs
- >5 minutes or > 2 seizures without recovery → call EMS
After a Seizure

- Allow child to lie quietly
- Reorient to surroundings & recent events
- Reassure recovering child that he/she is safe
- Do not give food/drink until fully alert
- If not breathing or having difficulty, call 911 & start CPR
- Record an accurate description of seizure
  - Length, context, semiology
- Call family
- Discuss event with class as soon as possible
Accommodations

- IEP or 504
- Rescue medication
- Time to recover after an event
Promote Epilepsy Awareness

- Teaches acceptance of others
- De-stigmatizes epilepsy and other health conditions
- Advances learning of brain function
- Enriches health and science lessons

Epilepsyclassroom.com
For more information

- www.epilepsyfoundation.org
- www.utahparentcenter.org
- www.medicalhomeportal.org
- www.epilepsy.com
- www.epilepsyclassroom.com
- www.epilepsyadvocate.com

Meghan.Candee@hsc.utah.edu