Seizures Evaluation vs Referral

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Initial evaluation
1. What is it?
   • Is it seizure?
2. What caused it?
3. What workup should be initiated?
4. When should I refer?

A seizure is abnormal electrical activity in neurons in the brain that can be associated with clinical symptoms

Clinical symptoms of seizures are a result of an area of the brain that are abnormally stimulated

Epilepsy is term used to describe when a person has had two or more unprovoked seizures.

Refractory epilepsy is a term used to describe patients who continue to have seizures and have failed two or more medications

Types of seizures
• Febrile seizures
  • Generalized
  • Focal/partial/complex partial seizures
  • Infantile spasms

Febrile seizure Evaluation
• A febrile seizure is a seizure accompanied by fever (temperature ≥ 100.4°F or 38°C measured by any method), without central nervous system infection, that occurs in infants and children 6 through 60 months of age.
  • Febrile seizures occur in 2% to 5% of all children and, as such, make up the most common convulsive event in children younger than 60 months.
  • Simple vs Complex febrile seizures

Complex vs Simple Febrile seizures
Simple
• A seizure that has occurred in a developmentally appropriate child with fever ≥100.4°F that is...
  • Generalized
  • <15 minutes
  • Evaluation
  • Treatment

Complex
• A seizure that has occurred in a developmentally appropriate child with fever ≥100.4°F that is either...
  • Focal seizure
  • >15 minutes
  • >2 seizures within 24 hours
  • Evaluation
  • EEG, MRI, LP
  • Treatment
Generalized Seizures
- Generalized seizures arise from both sides of the brain but can have multiple manifestations including:
  - Generalized tonic-clonic
  - Absence
  - Tonic
  - Myoclonic

Focal Seizures
- Seizures start in one part of the brain but can spread to adjacent areas of the brain and potentially spread to the entire brain
  - Simple:
    - No alteration in consciousness
  - Complex
    - Alteration in consciousness
    - Clinical manifestations of seizures
  - Focal seizures can spread to involve the entire area of the brain and are classified as focal seizures with secondary generalization

Mimickers of Seizures
- Syncope
- Post-convulsive syncope
- Parasomnias
  - Sleep-walking, sleep talking
- Benign sleep myoclonus
- Stereotypies
- Tics
- Staring spells
- Behavioral changes
- PNES

Staring
- Staring episodes are more likely to occur when a patient is passively listening, watching television, playing video games.
- These episodes can be interrupted by touch or voice
  - Absence seizures:
    - Brief
    - Occur multiple times a day
    - No post-ictal period
    - Lapse in time
    - Generalized activity on EEG
  - Complex partial/focal seizures:
    - Longer in duration
    - Postictal period
    - Occur less frequently (less than absence seizures)
    - Focal activity on EEG

Is it a seizure or mimicker?
- Precipitating factors:
  - Activity, medications, illness, aura
- Description of the episode:
  - Consciousness, eye movements, body movements, duration, time of day, tongue biting, incontinence, post-ictal state, distractibility, ability to suppress movements
- Predisposing factors:
  - Past medical history, illness, family history

Etiology of seizure
- Symptomatic
  - Acute/subacute
  - Metabolic
    - Hypoglycemia
    - Hyperglycemia
  - Infections/inflammatory
  - Stroke
  - HIV
  - Trauma
  - Hypoxic-ischemic encephalopathy
  - Tumors
- Chronic
  - Strokes
  - Infections
  - Adverse effects of medication
  - Inborn errors of metabolism
- Idiopathic
  - The cause of the seizures cannot be identified through diagnostic testing
- Seizures are of genetic origin or chromosomal abnormalities of unknown significance
When should I refer a patient to Neurology?

• Any patient with seizures should be evaluated by Neurology

• Outpatient vs Inpatient
  - Inpatient:
    • Spell capture for episodes that are concerning for seizure affecting the child’s daily life, concern for developmental regression
    • Seizures without complete return to baseline between seizures
    • Status epilepticus
    • New focal deficit occurring after a seizure

Outpatient clinics

Diagnostic tests prior to appointment

• Blood work:
  - Electrolytes: Ca, Mg, Phos, Na

• EEG:
  - Helpful for evaluation of interictal abnormalities
  - Can help in predicting recurrence of seizures
  - A normal EEG does not exclude a diagnosis of seizure
  - Ordering the correct EEG

Types of EEGs

• Routine or 20 minute EEG
  - Helpful in determining interictal abnormalities
  - Sometimes ordered as sleep-deprived routine EEGs in hopes of capturing sleep

• 1 hour EEG
  - Helpful in infants
  - Determining appropriateness of background, sharp or epileptiform abnormalities
  - More time to capture sleep

• Continuous EEG
  - Helpful in capturing episodes
  - Episodes must occur with some frequency

Diagnostic tests

• Imaging
  - MRI is preferable
  - Abnormal neurological exam
  - New onset unprovoked seizure
  - PET
    • Used in intractable seizures or for patients who are a surgical candidate
  - CT
    • May use in emergencies but not image of choice

• LP (if indicated)
• Urine
  - Toxicology, organic acid measurements

Treatment Decision

• Evaluation of risk and benefit
• Age
• Disposition
• Recurrence of seizures
• Side effects of treatment
• Insurance approval
Risk for further seizures

- Risk of second seizure is 20-30% if everything is normal
  - Exception: absence and myoclonic seizures
- Risk for a second seizure if EEG is abnormal is 60%
- Risk of a third seizure is 70%

Risk of having another seizure

- Most seizures stop before 2 minutes and those that do not will likely need medication to stop them.
- Prolonged seizures can cause hypoxia and scarring of brain tissue.
- Seizures that occur during activity of daily living:
  - Driving, bath, climbing, riding a bicycle
- SUDEP: Sudden unexplained death in epilepsy patients:
  - A rare complication of seizures that typically occurs in children

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Risk of treatment

- Medication side effects:
  - Lethargy, personality changes, allergic reactions (Steven’s Johnson Syndrome), liver dysfunction, pancreatitis, weight loss/gain, uterosis, dizziness, tremor, hair loss
- Social stigma
- Affordability of treatment

Treatment

- For first time seizure it will be discussed with the family risk vs benefit and with a lower risk of recurrence could consider no treatment
  - Exceptions: Risk factors, Todd’s paralysis, seizures occurring during sleep
- Whether daily treatment is prescribed the patient should always be given “rescue/abortive medication”.
  - Diastat
  - IN Versed
  - Clonazepam ODT

<table>
<thead>
<tr>
<th>Anti-epileptic medications</th>
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<td><strong>Levetiracetam</strong></td>
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| **Dosage:**
| Children | 20-80mg/kg (divided BID) |
| Adult | 1000-3000mg (divided BID) |
| **Common SE:**
| Irritability
| Aggression
| **Monitoring:**
| None
| **Valproic Acid** |
| **Dosage:**
| Children | 30-60mg/kg (divided BID/TID) |
| Adult | 750-3000mg (divided BID/TID) |
| **Common SE:**
| Tremor
| Hair loss
| **Monitoring:**
| CMP – liver enzymes
| CBC – platelet
| ?Bilirubin
| Monitor other drug levels
| **Phenobarbital** |
| **Dosage:**
| Children | 5-10mg/kg (divided QD-BID) |
| Adult | 90-240mg (qd/BID) |
| **Common SE:**
| Sedation
| Cognitive Delay
| **Monitoring:**
| Monitor other AED levels
| **Lamotrigine** |
| **Dosage:**
| Children | 3-10mg/kg (w/ VPA)
| 5-15mg/kg (w/out VPA) (divided BID) |
| Adult | 300mg (divided BID) *** may need to be adjusted based on other AEDs |
| **Common SE:**
| Stevens Johnson Rash
| Ataxia
| Dizziness
| **Monitoring:**
| Monitor other AED levels
| **Topiramate** |
| **Dosage:**
| Children | 5-10mg/kg (divided BID)
| 10-15mg/kg (divided BID) |
| Adult | Max 200-400mg/d (divided BID) |
| **Common SE:**
| Weight loss
| Cognitive slowing
| Kidney stones
| Paresthesia
| **Monitoring:**
| None
| **Zonegran** |
| **Dosage:**
| Children | 6-12mg/kg (divided QD-BID) |
| Adult | Max 200-600mg/d (divided BID) |
| **Common SE:**
| Weight loss
| Kidney Stones
| Monitor with sulfa drugs
| **Phenytoin** |
| **Dosage:**
| Children | 5-10mg/kg (divided QD-TID) |
| Adult | 300-500mg/d (QD/BID) |
| **Common SE:**
| Gingival hyperplasia
| Hirsutism
| **Monitoring:**
| Monitor other AED levels
| **Clobazam** |
| **Dosage:**
| Children | 0.5-1mg/kg (divided BID) Max 40mg/d |
| Adult | Up to 20mg BID |
| **Common SE:**
| Sedation
| None
| **Oxcarbazepine** |
| **Dosage:**
| Children | 20-50mg/kg (divided BID) |
| Adult | 900-2400mg/d (divided BID) |
| **Common SE:**
| Hyponatremia
| Stevens Johnson rash
| Dizziness
| **Monitoring:**
| Na+ level
| Decreases OCP
| **Lacosamide** |
| **Dosage:**
| Children | 5-10mg/kg (divided BID) Max 20mg/d |
| Adult | Start 100mg/d, go up by 100mg/week, Max 400mg (divided BID) |
| **Common SE:**
| Dizziness
| Ataxia
| N/V
| Double/blurred vision
| **Monitoring:**
| None
| **Vigabatrin** |
| **Dosage:**
| Infants | 50-150mg/kg (divided BID) |
| **Common SE:**
| Sedation
| Peripheral vision loss – rare
| **Monitoring:**
| Close ophtho exam
In Summary

- A seizure is abnormal electrical activity of the brain that can be associated with clinical symptoms.
- Types of seizures - febrile, generalized, focal/partial and infantile spasms.
- Etiology of seizures can be idiopathic or symptomatic.
- Obtain detailed description of event to differentiate seizure versus mimic.
- Refer to neurology with episodes concerning for seizure.
- Workup – Basic labs, eEG/E/IhrEEG/EpEEG, MRI brain, LP when indicated.
- Treatment options – AEDs, Ketogenic diet, Modified adkins diet, VNS, epilepsy surgery.

Thank you!

Questions