





# Pediatric Seizure



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# Objectives

- Discuss types of seizures and complications
- Identify common causes of seizures in a child
- Identify a seizing child
- Assess a seizing child
- Formulate plan of how Treat a seizing child

# Why do we care?

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- Seizures account for approximately 1% on ER visits in people < 18 yrs old
- Scary and can be life threatening
- Treatable



# Seizures

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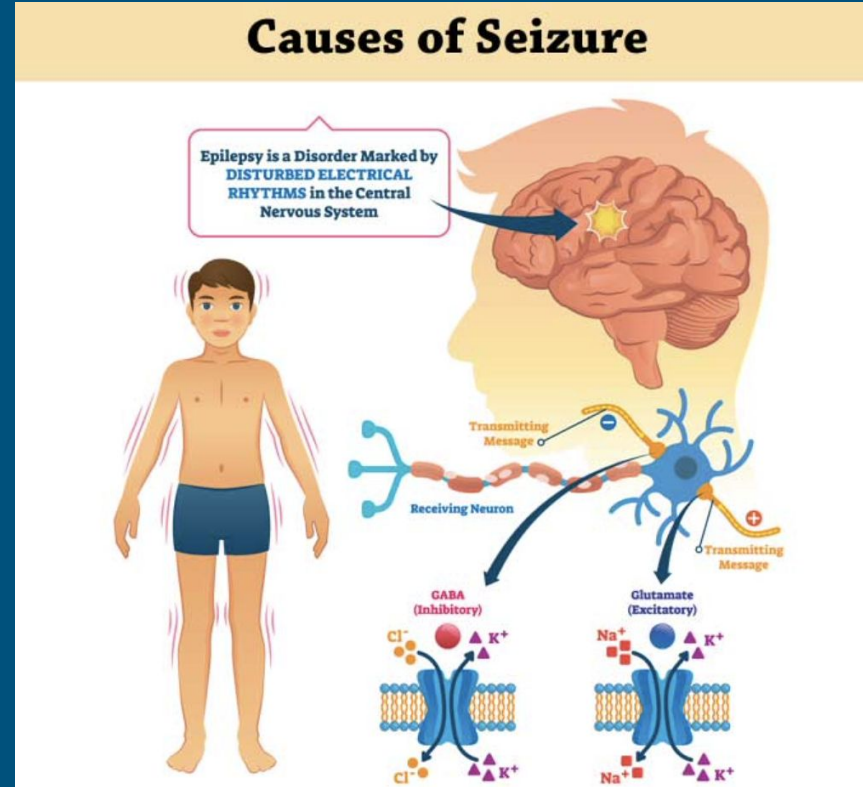
- Scary and can be life threatening
- Treatable
- ~60,000 people in US annually with vast majority of these having known seizures disorder (epilepsy).
- 5-8% of EMS calls are for “Seizures” (Adult and pediatric)
- Most seizures last less than 5 min
- seizures that last longer, often do not stop spontaneously
- Animal data suggest permanent neuronal injury and pharmacoresistance may occur before the traditional definition of 30 min of continuous seizure activity have passed.

# Seizure?

Chaotic, abnormal, high frequency burst or firing of neurons.

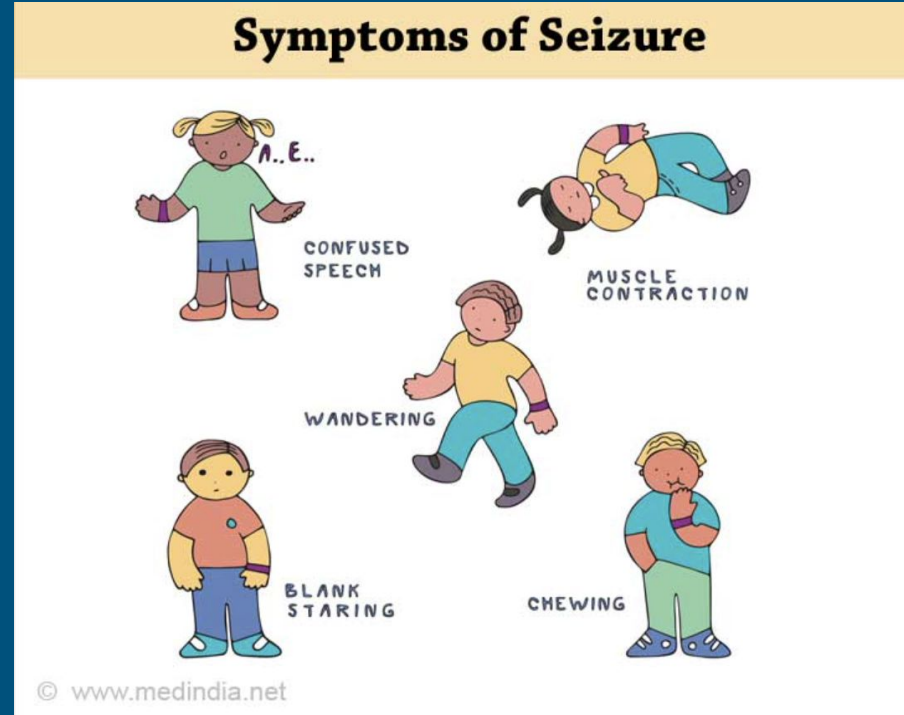
Types:

- Convulsive (Clonic & Tonic)
- Absences Seizures
- Partial (Focal) Seizures



# Seizures

- Important to note exactly what patient was doing?
- Note Laterality
- Any fecal or urinary incontinence
- When appropriate exam tongue for bite marks
- ABCDE's



# Absence seizures

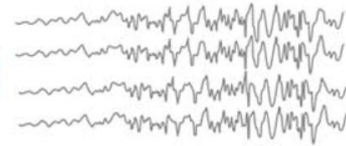
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- Vast majority of cases affect children
- Blank staring, unresponsive to verbal stimulation
- Will return back as if nothing ever happened.

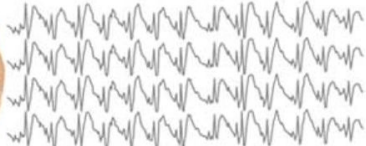
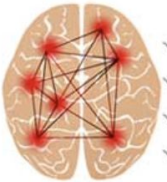


# Seizure types

## Types of Seizures



FOCAL SEIZURE



GENERALIZED SEIZURE

- ▶ Focal or Partial Seizure – Specific part of the brain is affected
- ▶ Generalized Seizure – Both sides of the brain are affected





# Status Epilepticus

5 min or more of:

(i) continuous clinical and/or electrographic seizure activity

or

(ii) recurrent seizure activity without recovery (returning to baseline) between seizures.

## Possible Triggers of Status Epilepticus



Epilepsy syndromes



Cerebral damage



Brain tumor



Electrolyte abnormalities



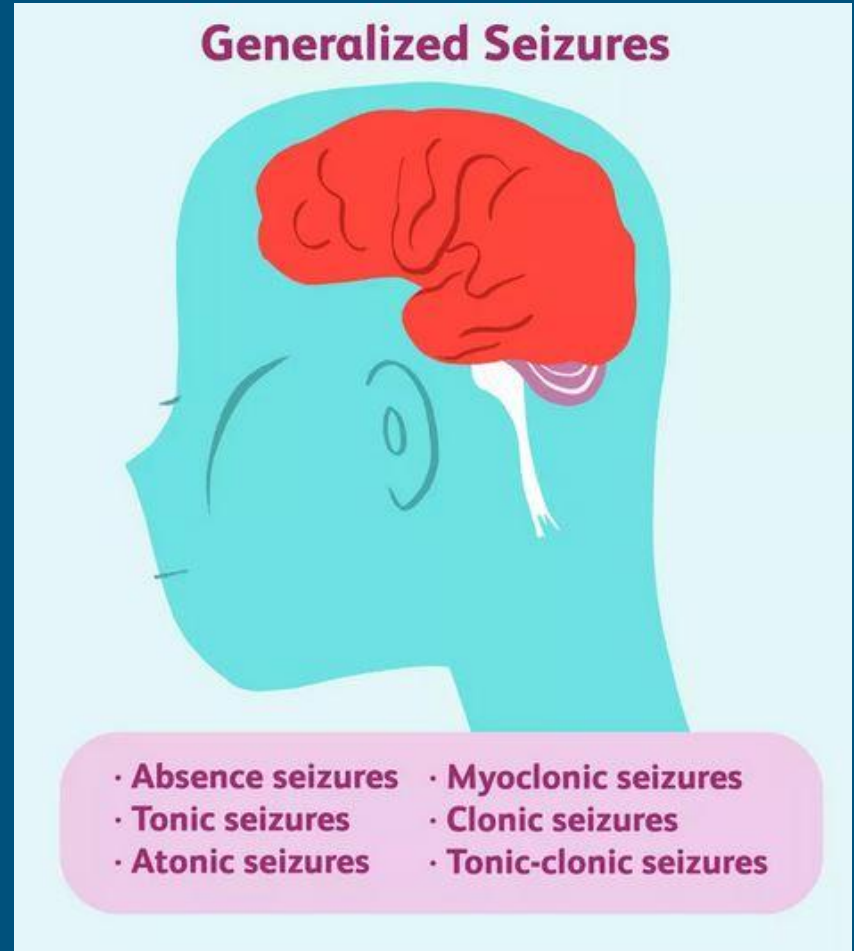
Drug/alcohol overdose or withdrawal



Encephalitis

# Generalized Seizures

- Involve both cerebral hemispheres
  - Convulsive: generalized tonic-clonic seizure
  - Non-convulsive: absence seizures



# Partial Seizures

- Involve only one cerebral hemisphere (and thus only one side of the body)
  - Simple partial (Focal) seizures:
    - Awareness NOT impaired
  - Complex partial seizure:
    - Awareness Impaired or lost

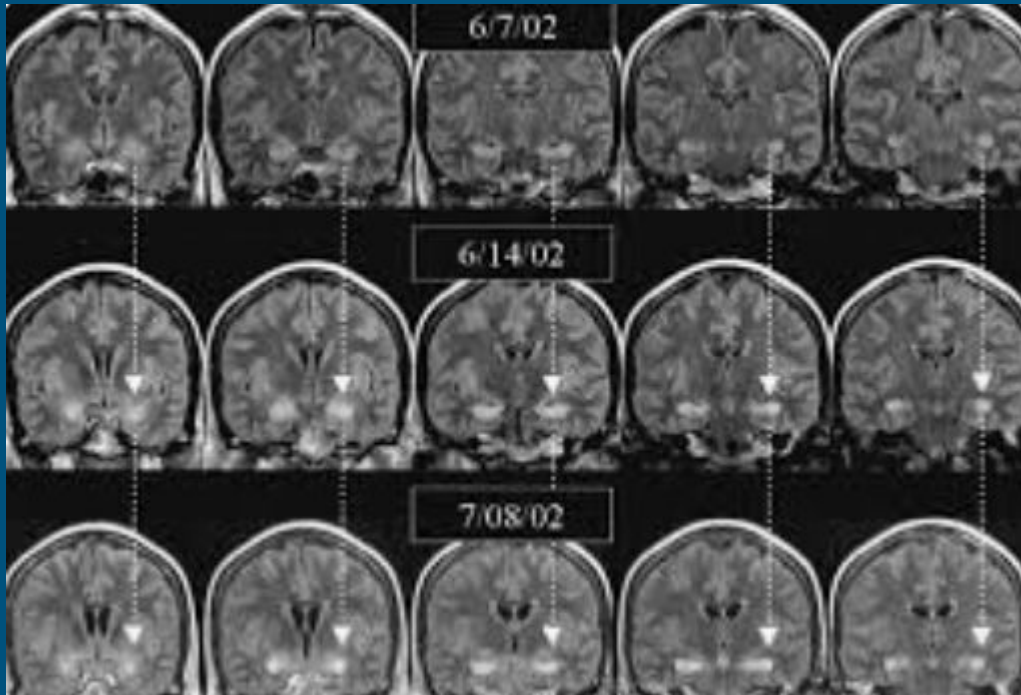
## Focal Seizures



- Focal aware seizures
- Focal impaired awareness seizures

# What is Status Epilepticus?

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# Status Epilepticus

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- Seizure activity lasting greater than 5 minutes, or multiple seizures without interval return to baseline mental status.
- SE is most common in children < 1 year old
- Other forms include
  - non-convulsive SE: prolonged absence or complex partial seizure
  - complex partial SE: may present as waxing and waning mental status and/or intermittent bizarre or unusual behavior

# Status Epilepticus

- The most common causes of SE in children are:
  - 1.) fever (80%),
  - 2.) CNS infection
  - 3.) Epilepsy
  - 4.) Other causes: hyponatremia, toxic ingestions, and metabolic and structural CNS abnormalities
- Children more likely to seize but recover better from acute seizure or SE than adults.

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# Since we all love acronyms... Causes (VITAMIN-E)

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V: Vascular - Stroke or VP shunt

I: Infections - Meningitis, Encephalitis, High Fevers

T: Trauma - Head Injuries

A: AV Malformation - Cavernous Malformations

I: Idiopathic

N: Neoplasms - Primary or secondary cancerous lesions

E: Extras - Hypoglycemia, Hyponatremia, Lack of sleep



# Febrile Seizures



- Most common in 6 months - 5 years
- Occur in 2-5% of all children
- Simple febrile seizures are usually brief (lasting less than 15 min duration), generalized, and non-recurrent.

## Treatment:

- Remove warm coverings.
- Acetaminophen: 10-15 mg/kg orally, do not exceed 50 mg/kg/day (EMT-B and up).

OR

- Ibuprofen: 10 mg/kg orally, do not exceed 800 mg/day.

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- Identify common causes of seizures in a child



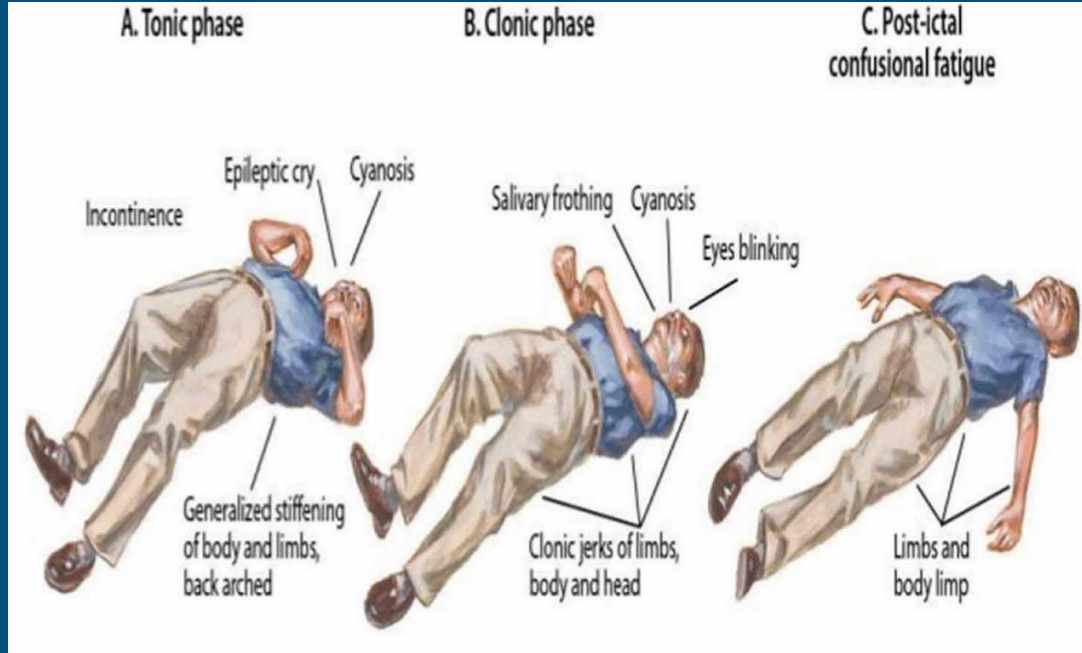
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# Signs and Symptoms

- Lateralized tongue biting
- Flickering eyelids
- Deviation of gaze
- Dilated pupils with a blank stare
- Lip smacking
- Vitals
  - Hypertension
  - Tachycardia
  - Hypoxia



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## Appearance

Abnormal Tone  
↓ Interactiveness  
↓ Consolability  
Abnormal Look/Gaze  
Abnormal Speech/Cry



## Work of Breathing

Abnormal Sounds  
Abnormal Position  
Retractions  
Flaring  
Apnea/Gasping

## Circulation to Skin

Pallor  
Mottling  
Cyanosis

# Get a Good History

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Be sure to take a good history from caregiver!

- Does the Child have a history of seizures?
- If so, are they taking their medications?
- Has the Child had excessive vomiting and loose stools?
- Any trauma?
- Any possible toxic ingestions? Grandma's pills? Pesticides?
- Acting normally lately? Sleeping normally? Recent illness?



**Always check a sugar on a  
— seizing patient!**

**Hypoglycemia can be the  
cause of a kids seizure and  
also the result of their  
seizure!**



# Dravet Syndrome

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- Rare, drug resistant form of epilepsy that begins in the first year of life
- Life long - due to severe SCN1A gene mutations
- Presents with a fever on one side of the body

## Treatment:

- Likely to have rectal Diazepam (Diastat) given by caregiver PTA
- More meds
- Supportive



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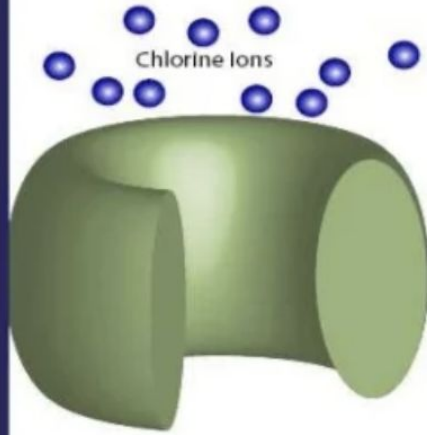
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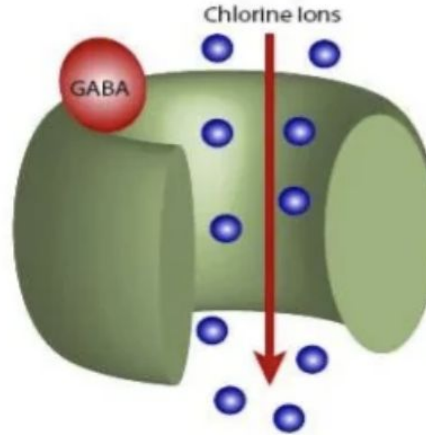
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# Benzodiazepines

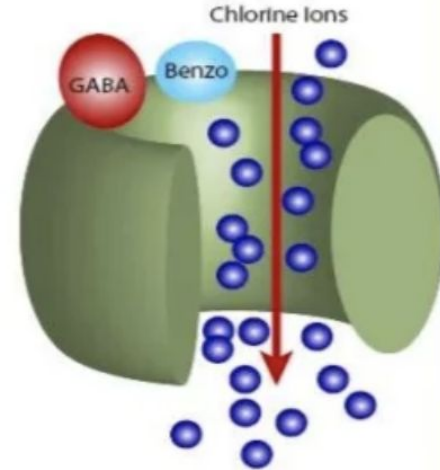
## Extracellular Side of GABA<sub>A</sub> Receptor



1. No chloride influx because GABA has not bound to receptor



2. Normal chloride influx resulting from GABA binding to receptor



3. Increased chloride influx resulting from both GABA and benzodiazepine binding to receptor

# Midazolam (Versed)

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0.2 mg/kg IN/IM: Max single dose is 5mg, may repeat once after 10 min

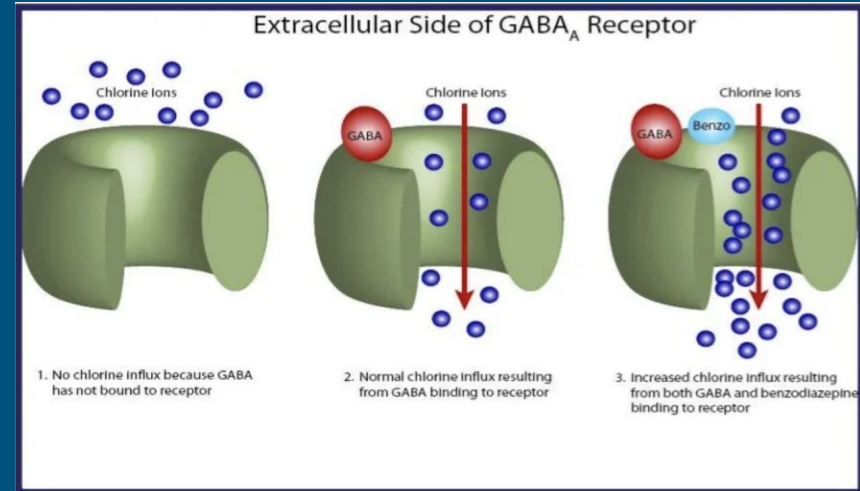
0.1 mg/kg IV/IO: Repeat every 10 minutes as needed, up to 5mg

- Can repeat in 10 minutes if needed
- Increased risk of respiratory depression after 2+ doses
- Give IM if delay in IV establish

# Diazepam

- Class: Benzodiazepine
- Action: binds GABA receptors and enhances effects of GABA. Think of the brakes, they are CNS depressant.
- Indications: anxiety, skeletal muscle relaxation, alcohol withdrawals, seizures.
- Adverse effects: respiratory depression, drowsiness, fatigue, headache, pain at the injection site, confusion, nausea, hypotension, oversedation:

**Contraindications:** children under 6 months, acute angle closure glaucoma, CNS depression, alcohol intoxication, known sensitivity.



# Lorazepam (Ativan)

Class: Benzodiazepine

Action: binds receptors and enhances the effects of GABA

Indications: pre procedure sedation, induction, anxiety, status epilepticus.

Adverse effects: respiratory depression, fatigue, headache, AMS, Nausea and hypotension, paradoxical CNS stimulation.

Dosage: IV/ IO, usually 2-4mg, pediatric 0.1mg/kg. Can give PO ativan for anxiety usually 1 mg PO tab.

**Contraindications:** Children younger than 6 months. Acute angle glaucoma, EtOH intoxication



GENERAL	<p style="text-align: center;"><b><u>SEIZURES / CONVULSIONS</u></b></p> <p style="text-align: center;">Revised 2/15/2021</p>
ALL PROVIDERS	<ul style="list-style-type: none"> <li>➤ A detailed history of seizure activity including onset, duration, type, medication taken (or missed) and prior seizure history is important as it may lead the ED staff to the source of the problem</li> </ul>
INTERMEDIATE	<ul style="list-style-type: none"> <li>➤ Protect patient and provider from injury</li> <li>➤ Reference <b>Primary Management Guideline</b></li> <li>➤ Reference <b>Airway Management Guideline</b> as needed</li> <li>➤ Reference <b>Eclampsia Guideline</b> as needed</li> <li>➤ Reference <b>Ingestion/Poisoning/Overdose Guideline</b> as needed</li> <li>➤ Reference <b>Diabetic Emergencies Guideline</b> as needed</li> <li>➤ Reference <b>Fever Guidelines</b> as needed</li> <li>➤ Reference <b>Alcohol Withdrawal Guideline</b> as needed</li> </ul>
PARAMEDIC	<ul style="list-style-type: none"> <li>➤ Administer a 10 mL/kg bolus of <b>Normal Saline or Lactated Ringers</b> to patients with hemodynamic instability; repeat as clinically indicated</li> </ul>
NOTES	<ul style="list-style-type: none"> <li>➤ If paramedic witnesses seizure activity, administer <b>Midazolam</b> <ul style="list-style-type: none"> <li>• <b>Adult Dose:</b> 10 mg IM/IN; 5 mg IV/IO; may repeat every 10 minutes as needed</li> <li>• <b>Pediatric Dose:</b> 0.2 mg/kg IM/IN, up to maximum dose of 10 mg; 0.1 mg/kg IV/IO, up to maximum dose of 5 mg; may repeat every 10 minutes as needed</li> <li>• <u>IM/IN route/dosing preferred in seizing patients without IV/IO access; may use IV/IO route/dosing if IV/IO in place prior to seizure</u></li> </ul> </li> <li>➤ Prepare to actively manage the patient's airway in case of respiratory depression</li> <li>➤ Monitor ETCO<sub>2</sub></li> </ul>
	<ul style="list-style-type: none"> <li>➤ Status Epilepticus exists when witnessed seizure activity continues for &gt; 5 minutes or multiple seizures recur without a return to baseline mental status</li> </ul>

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# Case Scenario

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911 call: 7 month old, not acting right. No known history of seizure. 20 minutes code 3 away.

What next?

- Get Planning!
- Estimate weight. Use the Braslow tape if available
- Calculate Midaz dosing and ETT/igel size based on estimated weight



# Onscene:

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Scene survey: scene safety; universal precautions

Mom says, “he just started floppin’ around and I called 911.”

Patient is still seizing.

- Past history of Epilepsy on Keppra at home
- Mother gave Diastat 0.5 mg PR at time of onset (approx 30 mins ago)
- You **Don't** see any ingestibles or vomit (ie drugs/pills, pesticides, powders)
- No apparent trauma and mother denies known trauma



# How does the patient look? ABCs

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- Patient is still actively seizing
- Irregular respirations
- Generalized tonic/clonic movement



# Check a BGL!

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- His seizures finally stop after 1.8mg IM.
  - In route to the hospital (still 25 mins away), his respirations decreased
    - but he's not seizing... O2 saturations dip down in the upper 80s
  - What do you want to do?
    - Place an NPA
    - Place him on end tidal CO2 and a pulse ox
    - Support respirations to a sat of >95% and a ETCO2 35-45

# Summary

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- ABC's
  - Good History and physical (i.E - pay close attention to what patient is doing).
  - Treat rapidly if still seizing (use weight based dosing)
  - Intervention, Re - evaluation.