

Clinical Pathway

Pediatric Prolonged Seizure

January 2012

Outcomes/Goals	<ol style="list-style-type: none"> 1. Rapid identification and treatment of pediatric patients with seizure activity lasting longer than 5 minutes or repetitive seizures without resumption of neurological baseline 2. Create a team-oriented approach to efficient and timely treatment of status epilepticus. 3. Cessation of seizure activity 		
NURSE documentation	Onset of seizure. Fever history. Recent injury or illnesses. History of seizure activity		
INTERVENTIONS Initiate on arrival	ESI Triage level II Ensure ventilation / provide supplemental oxygen Establish IV / IO access POC glucose Cardiac / SaO2 monitoring		
DIAGNOSTICS	Bedside CBG See Initial Management (page 2) for lab and radiology considerations		
PHYSICIAN (LIP)			
Fluids (if indicated)	Normal Saline bolus 20 ml/kg		
Medication Initial Treatment (first 5 minutes)	D10W 5ml/kg for CBG <50 (<3 months) D25 2ml/kg IV push for children		
	Lorazepam 0.05-0.1 mg/kg slow IV push, repeat q 10 minutes for continued seizure activity See page 2 for full management in Early Status and alternatives if no IV/IO access		
2nd Line Treatment (7 minutes)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;"> ≥ 2 years of age Fosphenytoin 20 mg/kg IV infuse over 10 minutes Continued Benzodiazepines - monitor respiratory status carefully </td> <td style="text-align: center; padding: 5px;"> ≤ 2 years of age Complex febrile seizures or allergy to fosphenytoin consider: Phenobarbital 20 mg/kg IV (max 800 mg) >20 minutes </td> </tr> </table>	≥ 2 years of age Fosphenytoin 20 mg/kg IV infuse over 10 minutes Continued Benzodiazepines - monitor respiratory status carefully	≤ 2 years of age Complex febrile seizures or allergy to fosphenytoin consider: Phenobarbital 20 mg/kg IV (max 800 mg) >20 minutes
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3rd Line Treatment	Phenobarbital 20 mg/kg IV - if fosphenytoin as 2 nd line treatment (max single dose 800 mg) Fosphenytoin 20 mg/kg IV - if given phenobarbital as 2 nd line treatment Levetiracetam (keppra) 20 mg/kg IV Valproic acid 20 mg/kg IV Continue Benzodiazepines		
4th Line Treatment Refractory Status	General Anesthesia / Intubation Midazolam infusion 0.1 mg/kg bolus followed by 0.1 mg/kg/hr gtt up to 0.4 mg/kg/hr Pentobarbital 10 mg/kg load over 30 minutes followed by 1 mg/kg/hr infusion (max 3 mg/kg/hr)		
ADMISSION	Call PICU attending / consult neurology Call primary care physician Prepare family/infant for admission to PICU or Intermediate Unit		
	Status refers to a single, prolonged convulsive seizure lasting >5 minutes or repetitive seizures without resumption of neurological baseline.		

Clinical Pathway Decision Making Process

Pediatric Prolonged Seizure

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Establish IV/IO
Provide adequate ventilation/provide supplemental oxygen
SaO₂/cardiac monitoring

Concurrent Treatment/Diagnosis

consider the following:
Head CT, lumbar puncture, chest xray
Isotonic saline infusion 20mg/kg
Dextrose (D10 or D25)
Consult Neurology and/or PICU

**INITIAL
TREATMENT**
5 MINUTES

Initial Benzodiazepine (IV/IO access)

Lorazepam 0.05-0.1 mg/kg slow IV push
Repeat dose in 3-5 minutes x 3 if continued seizure activity
No IV/IO access
Midazolam 0.4 mg/kg IM or Intranasal
Diastat PR (max single dose 20 mg)
2-5 years: 0.5 mg/kg
6-11 years: 0.3 mg/kg
≥12 years: 0.2 mg/kg

**2nd LINE
TREATMENT**
7 MINUTES

Successful IV/IO placement ≥2 years of age

Fosphenytoin 20 mg/kg IV over 10 minutes (do not exceed 150 mg/min)
• Continued seizure activity give additional 5 mg/kg fosphenytoin >5 minutes

Continue Benzodiazepines/monitor
Airway

Successful IV/IO placement < 2 years of age

Complex febrile seizures or allergy to fosphenytoin consider:
Phenobarbital 20 mg/kg IV (max dose 800 mg) >20 minutes

**3rd LINE
TREATMENT**

After infusion
of 2nd line of
treatment

Phenobarbital 20 mg/kg IV - if fosphenytoin as 2nd line treatment (max single dose 800 mg)

Fosphenytoin 20 mg/kg IV - if given phenobarbital as 2nd line treatment

Levetiracetam (keppra) 20 mg/kg IV

Valproic acid 20 mg/kg IV

Continue Benzodiazepines

Infuse all IV
medications over
20 minutes

**4th LINE
TREATMENT**

Refractory Status

Midazolam infusion

0.1 mg/kg bolus followed by 0.1 mg/kg/min gtt up to 0.4 mg/kg/hr

Pentobarbital

10 mg/kg load over 30 minutes followed by 1 mg/kg/hr infusion (max 3 mg/kg/hr)

Intubation

Continuous infusions/general anesthesia

Prolonged Pediatric Seizure

Goals of Clinical Pathway

1. Rapid identification and treatment of pediatric patients with seizure activity lasting longer than 5 minutes or repetitive seizures without resumption of neurological baseline
2. Create a team-oriented approach to efficient and timely treatment of status epilepticus.
3. **Cessation of seizure activity**

Etiologic classifications of status epilepticus

Most studies of SE epidemiology and outcome have used the following classification of episodes:

- **Acute symptomatic** (26%) - Episodes caused by an acute infection, head trauma, hypoxemia, electrolyte disturbance, hypoglycemia, intoxication or drug withdrawal
- **Progressive encephalopathy** (3%) – SE occurring with an underlying progressive CNS disorder, such as mitochondrial disorder, Rasmussen encephalitis, CNS lipid storage diseases, aminoacidopathies, or organic acidopathies
- **Remote symptomatic SE** (33%) - Episodes secondary to static conditions (eg, remote cerebral insult in the perinatal period)
- **Remote symptomatic with an acute precipitant** (1%) – SE in a patient with a chronic encephalopathy but precipitated by an acute event such as those in acute symptomatic SE
- **Febrile** (22%) – SE for which the only provocation is a febrile illness, after excluding a direct CNS infection
- **Cryptogenic** (15%) – SE without identifiable cause

Refractory Status and Levetiracetam

Refractory Seizures has a mortality rate that ranges from 32-77% and is compounded by other co morbid conditions and multiple organ dysfunctions. RSE may cause irreversible brain injury.

Levetiracetam, owing to minimal drug interactions, can be used to control refractory status epilepticus effectively

Although there are no randomized controlled studies available, clinicians used this drug as soon as it was available on the market on an off-label basis [Trinka, 2007b; Shorvon et al. 2007b].

156 patients who were treated with IV LEV for various forms of SE have been reported with an overall success rate of 65.4%. Trinka and Dobsberger 2007.

Levetiracetam (LEV) has a unique profile in lacking drug interactions as well as significant metabolism in the body Patsalos PN. Clinical pharmacokinetics of levetiracetam. : Clin Pharmacokinet. 2004;43(11):707-24.

Why Propofol isn't used in Status Epilepticus

The development of propofol infusion syndrome, an irreversible chain of events associated with significant morbidity and mortality, is a concern. Propofol infusion syndrome was first described in 1992 by Parke et al. Since then, numerous case reports and reviews have been published.

Reports of severe acidosis and movement disorder after propofol use in infants have caused a significant decrease in its use within that age group.

Metabolic acidosis may be a complication related to prolonged use of propofol, explaining the rarity of this complication in short surgical anesthesia. In contrast, metabolic acidosis in children with prolonged propofol use for sedation and treatment of SE has been reported. Also worrisome is the association of propofol-related metabolic acidosis in patients receiving the ketogenic diet (Ramachandrannair and Corden).

Reviewed and approved: Pharmacy 1/12, PEM section meeting 1/12