

PedsCases Podcast Scripts

This is a text version of a podcast from PedsCases.com on "Status Epilepticus in Children." These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedscases.com/podcasts.

Status Epilepticus in Children

Developed by Michelle Bischoff and Dr. Melanie Lewis for PedsCases.com.
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Introduction

Hi my name is Michelle Bischoff and I'm a second year medical student at the University of Alberta. This podcast was edited by Dr. Melanie Lewis, a General Pediatrician and Associate Professor at the Stollery Children's Hospital.

This podcast will describe the clinical approach to managing a child in status epilepticus.

Please see my additional podcast on seizure types and epilepsy for a more detailed description of seizures and management of epilepsy.

The objectives of the podcast are:

1. Define status epilepticus, and
2. Describe an approach to managing a patient experiencing a prolonged seizure including acute interventions and treatment, as well as history taking, physical examination, and investigations.

Seizures are a common condition experienced by about 3% of children in acute care settings, and are due to abnormal synchronous firing of electrical signals in the brain. There are a number of seizure types including febrile seizures, simple partial, complex partial, and generalized seizures which can be further subdivided into grand mal, myoclonic, absence and atonic seizures. A seizure may be a sign of a serious medical condition – either a neurological injury or disease, or a physiological condition originating outside the brain. Conversely, it may simply be an isolated unprovoked event. In any case, it is important to have an organized approach when encountering a seizing pediatric patient.

Status Epilepticus

Recurrent or continuous seizure activity lasting longer than 30 minutes is defined as status epilepticus and is considered a medical emergency. Most practitioners will however, intervene with pharmacotherapy when seizure activity persists past 5 minutes. Developed by Michelle Bischoff and Dr. Melanie Lewis for PedsCases.com.
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The longer the child seizes, the greater the chance of brain cell death and mortality, therefore, you need to act quickly. A seizure causing status epilepticus is usually generalized tonic clonic, but may rarely present as focal. Causes of a prolonged seizure include trauma (don't forget about shaken baby syndrome), infection, an underlying neurological disorder like a cerebral malformation, and metabolic or electrolyte disturbances like hypocalcemia, hyponatremia or hypoglycemia.

Status epilepticus causes a number of physiological changes in the body, including an elevation in blood pressure early on followed by a BP drop, acidosis with respiratory and metabolic causes, an elevated temperature caused by central sympathetic stimulation and motor activity, mild leukocytosis, and hyperglycemia.

Approach to Management

When managing a child experiencing status epilepticus, the ultimate goal is to stop the seizure, stabilize the patient, and then look for an underlying cause.

If a child is actively seizing, remember ABDFG- monitor the airway, breathing and circulation, and don't forget Glucose! At the same time, aim to prevent injury and aspiration.

Note that you can do a rapid physical and neurological exam while the patient is seizing, and a more detailed assessment once the child is stabilized.

First check the airway. Position the child on his or her side to prevent aspiration and make sure nothing enters the mouth. Give 100% oxygen via nasal prongs or mask if oxygen saturations are decreasing. Suction the patient as necessary and place on a cardio-respiratory monitor.

Check the patient's blood glucose as hypoglycemia is a common seizure precipitant. Dextrose can be given if the child is hypoglycemic. Height and weight should be determined for medication dosing purposes or utilize a Broselow Tape.

Attempt to obtain IV access -although benzodiazepines, the first-line pharmacological treatment for status epilepticus, can also be given rectally or intramuscularly.

If the patient continues to seize, pharmacological treatment IS NECESSARY to stop the seizure.

As I just stated, benzodiazepines are the first line therapy in status epilepticus. Lorazepam (Ativan) is the preferred drug as it has a rapid onset of 3-5 minutes and a long half-life of 12-24 hours. Other initial options are diazepam (Valium) given rectally and midazolam (Versed) given IM. If after the initial dose, seizure activity does not stop, the child may be given subsequent doses, up to a maximum of three, at 5 minute intervals.

In older children, if benzodiazepines fail to stop seizure activity after 3 doses, Phenytoin (Dilantin) should be given intravenously – slowly -as rapid infusion can
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produce dysrhythmias and hypotension. If phenytoin is ineffective, phenobarbital is given IV.

In children under two years of age with a prolonged seizure secondary to fever, Phenobarbital is the first line antiepileptic, then Phenytoin (Dilantin).

Remember that Phenobarbital and benzodiazepines can cause respiratory depression, and given in sequence not infrequently precipitate a CODE. Always be prepared to intubate when utilizing these medications and monitor ABCs continuously.

Physical Exam

The physical examination should include a full systems assessment, including vital signs and cardiorespiratory monitoring, a thorough neurological exam including use of the Pediatric Glasgow Coma Scale and looking for focal neurological signs. As well, assess for possible infections including pharyngitis, otitis media and meningitis via presence of petechiae or meningismus. Keep in mind that older children may demonstrate headache and nuchal rigidity pointing to meningitis, but children under 1 year of age may not have clear meningeal signs even with a brain infection. Also, look for any signs of a CNS injury, such as poor pupil reactivity or asymmetric neurological exam findings. Look for any signs of external trauma which may lead you to suspect an occult inflicted head injury ie Shaken Baby Syndrome.

History

Once the patient is stabilized, you can gather more historical details.

Namely, does the child have a history of seizures or epilepsy or is this an isolated event? About 20% of children with epilepsy have status epilepticus within 5 years of diagnosis. Ask if the child had been ill previously or currently, any history of fever or infectious contacts, any injuries or trauma, ingestion of drugs or toxins, recent antibiotic use or current use of any other medications. If the child is on antiepileptics, has he or she been taking them as scheduled or have there been any changes to dosing or administration?

It is important to ask what preceded the seizure, if there was any warning (a sign that would suggest a focal onset), or symptoms beforehand? Were there any stressors that may have precipitated the seizure such as lack of sleep, food or water deprivation, recent illness or fever?

If the patient is responsive post-ictally, does he or she remember anything about the event?

You should also ask about a history of developmental delay, neurological problems, or any other health issues that might be clues to seizure activity. In addition, question about a family history of seizures, as there are genetic causes of seizures and epilepsy.

Investigations

Investigations are vast when the underlying etiology is unclear.

- As previously stated, check blood sugar right away at the bedside.
- Order a CBC and differential plus calcium, magnesium, phosphorus, electrolytes, liver function tests and metabolic studies as per the history and physical
- Obtain anticonvulsant levels and a toxic screen if patient has a history of seizures and is taking medication or anyone in the house is taking medication the child may have ingested accidentally
- An EEG or electroencephalogram may be ordered to get a graphical depiction of cortical electrical activity. It is the most important diagnostic tool for epilepsy. Electrodes are attached to the patient's scalp and recordings compare electrical activity in all regions of the cerebral cortex.
- A CT scan or MRI of the brain may also be ordered if a structural abnormality or lesion is suspected. If neuroimaging is indicated, the MRI is the preferred modality if the patient is stable, although acutely an MRI is often unobtainable. The MRI allows for better visualization of the brain but one disadvantage is that the child must be immobile for long periods. A CT scan is fast and will rule out hemorrhage or stroke, abscess, or tumor.
- And lastly, to rule out infection, urine and blood cultures may also be ordered. CSF examination via lumbar puncture is indicated if CNS infection (meningitis or encephalitis) is suspected. Note: A CT scan should always be performed before a lumbar puncture to make sure there is no risk of brain herniation.

Treatment

After investigations, the underlying cause must be treated. For instance, hypoglycemia is treated with IV dextrose; infection, sepsis, meningitis or encephalitis is treated with appropriate antibiotics or antivirals; hypocalcemia is treated with administration of calcium, etc.

Most children who have experienced status epilepticus will need to be admitted for further observation and evaluation. If this is a first-time seizure, and no cause is found, the child will usually NOT be treated long-term with anticonvulsants.

Now, some essential take home points:

- Status epilepticus, defined as prolonged or recurrent seizures lasting longer than 30 minutes is a medical emergency
- Remember ABCDFG - airway, breathing, circulation, and don't forget glucose
- First line treatment includes benzodiazepines, namely lorazepam, up to 3 consecutive doses at 5 minute intervals, followed by phenytoin and then phenobarbital if necessary. Remember that these drugs cause respiratory depression, so be prepared to intubate.
- Investigations are vast when the etiology is unknown, so let your history and clinical assessment findings guide you. Don't forget about more occult causes

such as getting into Grandma's diabetic medication or inflicted head injury.

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