



CrackCast Episode 18 – Seizures

Episode overview:

- 1) Define status epilepticus
- 2) List the doses of common medications used for status epilepticus
- 3) List 10 differential diagnoses for seizures
- 4) List 10 indications for head CT in new-onset seizure

Wisecracks:

- 1) How long does a driver in British Columbia require their driver's license be suspended after a seizure?
- 2) What are the most common causes of status epilepticus?
- 3) What are the "cannot miss" causes of seizure?

Rosen's in Perspective:

- seizures are a pathologic excess of neuronal activity that disrupt normal cortical or deep limbic system functioning
- the term epilepsy refers specifically to recurrent unprovoked seizure activity from genetic or acquired brain disorder
- general prevalence of epilepsy is 3% in population
- 10% of population will have a seizure at some point

Seizure categorization:

- 1) **Cause:** Primary or Secondary (provoked)
- 2) **Effect on mentation:** Generalized (tonic-clonic, absence, atonic, myoclonic) or focal
- 3) **Motor activity:** convulsive or non-convulsive

There are 6 factors that define an ictal event:

1. abrupt onset
2. brief duration
3. loss of consciousness
4. purposeless activity
5. unprovoked
6. postictal state



Always ask: was the incident truly a seizure?

Abrupt onset	generalized seizures usually occur without an aura
Brief duration	rarely last longer than 90-120 seconds (this is usually over-estimated by bystanders)
Loss of consciousness	present, unless it is a focal seizure
Purposeless activity	automatisms, undirected tonic-clonic movements
Unprovoked	<u>not provoked by emotional stimuli</u> exceptions: fever in children and substance withdrawal in adults
Post-ictal state	acute altered state occurs post-seizure (except focal or absence seizures)

Simple febrile seizure most common pediatric seizure. Age 6 months to 5 years. Prevalence is 2-5%. 30% of these patients have 1 recurrence.

Red flag: febrile seizure in <6 months, prolonged seizure in any age group, or focal seizure

1) What defines status epilepticus?

Various definitions:

Old definition: at least 30 min of seizure activity – changed because the longer somebody seizes the worse their outcome

New definition: 5 or more minutes of persistent seizures OR a series of recurrent seizures without return to FULL consciousness in between

2) List the doses of common medications used for status epilepticus

First line agents:

Benzodiazepines

- Diazepam - 0.15 mg/kg IV
 - can be given rectally
- Lorazepam - 0.1 mg/kg IV
 - **preferred IV agent:** longer half-life
- Midazolam - 0.2 mg/kg IV / IM / IN
 - preferred for IM or buccal

b. All effective



- c. Give two max doses of benzos then switch to second line
- d. If multiple doses are needed and patient desaturates → intubate
 - avoid long term neuromuscular blockade if possible (rare case where sux. could be used – consider checking K+ on a blood glass) consider EEG for monitoring of epileptiform brain activity

Second-line agents:

All agents are consensus based:

- all need to be given over 10 mins or so!!!
 - Phenytoin - 20 mg/kg IV infusion
 - Fosphenytoin (prodrug) - 20 mg/kg IV infusion
 - Less tendency to cause hypotension and dysrhythmias
 - Phenobarbital - 20-30 mg/kg IV infusion
 - Valproic Acid - 20-40 mg/kg
 - Levetiracetam
 - Lacosamide
 - Propofol infusion

Age considerations:

- Adults 10mg Midazolam x 2, or 4mg Lorazepam x 2
 - Benzo → Benzo → pheny/fosphenyoin → Phenobarbital/Valproate/Propofol
- Children 0.2+0.2 then rule of 20
 - B → B → Phenobarbital → pheny/fosphenyoin

Refractory status epilepticus: “ seizures persistently unresponsive to third-line agents”

Treatment:

Anesthetic doses of:

- midazolam
- propofol
- isoflurane anesthesia

Need non-depolarizing NMB and continuous EEG monitoring

Note: Keppra and Ketamine are new kids on the block. Avoid propofol in young children, as incidence of mitochondrial dysfunction is higher in this population and the mitochondrial suppression of propofol is theoretically harmful.



3) List 10 differential diagnoses for seizures

Table 18-2 Differential Considerations for the Diagnosis of Seizure

EPILEPTIC		NONEPILEPTIC	
Drugs of abuse Intoxication or withdrawal	Alcohol Stimulants LSD, PCP, NMDA Herbal products	Cardiac	Vasovagal (neurocardiogenic) syncope Orthostatic syncope Cardiogenic syncope
Medications	Antibiotics Antiarrhythmic agents Pain medications Antidepressants Antipsychotics	Neurologic	Vertebrobasilar TIA, CVA Global transitory amnesia Migraine Movement disorders
Metabolic	Hypoglycemia or hyperglycemia Hyponatremia or hypernatremia Hypoxia Hypocalcemia Hypomagnesemia	Sleep disorders	Cataplexy Periodic leg movements of sleep Arousal disorders Parasomnia associated with REM sleep
Infectious	Meningitis Cerebritis Encephalitis Cerebral abscess Non-CNS infections	Metabolic	Hypoglycemia or hyperglycemia Hyponatremia or hypernatremia Hyperthyroidism Pheochromocytoma
Structural lesions	Tumor Intracranial hemorrhage Subarachnoid hemorrhage Ischemic CVA	Psychogenic	Panic attacks Nonepileptic convulsion (pseudoseizure)
Systemic	Eclampsia Extreme fever Thyrotoxicosis	Toxic	Extrapyramidal symptoms of antipsychotics Delirium tremens Tetanus
Other	Trauma Posterior reversible encephalopathy syndrome		

Adapted from Carreno M: Recognition of nonepileptic events. *Semin Neurol* 28:297-304, 2008; and Slattery DE, Pollack CV Jr: Seizures as a cause of altered mental status. *Emerg Med Clin North Am* 28:517-534, 2010.
 CNS, central nervous system; CVA, cerebrovascular accident; LSD, lysergic acid diethylamide; NMDA, N-methyl-D-aspartate; PCP, phencyclidine; REM, rapid eye movement; TIA, transient ischemic attack.

4) List 10 indications for head CT in new-onset seizure

Indications for Cranial Computed Tomography in Patients with Seizure in the Emergency Department

Box 18-1

- First seizure
- Acute intracranial process suspected
- History of acute head trauma
- History of malignancy
- Immunocompromised status
- Fever
- Persistent headache
- History of anticoagulation
- New focal neurologic examination
- Age older than 40 years without epilepsy history
- Focal onset before generalization
- Persistently altered mental status

Adapted from ACEP Clinical Policies Committee; Clinical Policies Subcommittee on Seizures: Clinical policy: Critical Issues in the evaluation and management of adult patients presenting to the emergency department with seizures. *Ann Emerg Med* 2004; 43:605-625.



Wisecracks:

1) How long does a driver in British Columbia require their driver's license suspended after a seizure?

The Office of the Superintendent of Motor Vehicles publishes the BC Guide in Determining Fitness to Drive revised Jan 2016, See <http://www2.gov.bc.ca/assets/gov/driving-and-transportation/driving/publications/factsheet-epilepsy.pdf>

Private drivers: 6 months seizure free

Professional drivers: 12 months seizure free

2) What are the special causes for seizure and their Tx?

Other aetiologies:

- e. hypoglycose
 - give D10-25 for kids < 2 yrs (use the rule of 50s)
 - can give D50 when > 2 yrs
- f. Isoniazid overdose: 0.5 g/min pyridoxine IV until seizure stops (max dose 70 mg/kg or 5 g)
 - consider in prolonged refractory seizures despite benzo's
 - ****pyridoxine is the only effective treatment****
- g. Eclampsia
 - seizing woman of childbearing age -
 - Consider in 20 weeks GA to up to 6 weeks postpartum
 - Give IV magnesium 6 g over 15 mins
- h. Water intoxication / hyponatremia
 - children, psych. patients, athletes
 - treat with hypertonic saline 3% - 4-6 ml/kg over 1 hr (up to 100 ml)

OR

- i) 5% hypertonic 50cc or
- ii) 3% hypertonic 100ml-200ml over 1-2 hours
- iii) Or 6% Saline (2 amps bicarb) see: <http://emcrit.org/pulmcrit/emergent-treatment-of-hyponatremia-or-elevated-icp-with-bicarb-ampules/>

3) What are the most common causes of status epilepticus?

As per table 18-1:



- 1) antiepileptic drug associated - withdrawal or under dose ~ 25%
- 2) ETOH related - 15-25%
- 3) drug toxicity / post-stroke / CVA / metabolic (lytes) / hypoxia / post-arrest - 35%
- 4) others: infection, cerebral tumour, trauma, idiopathic - 15%