Epilepsy
Epileptic seizure
Epilepsy
Status epilepticus
Epileptic seizure

**Seizure** - can be defined as abnormal, uncontrolled electrical activity in brain cells.
Mechanisms: Nerve cells transmit signals to and from the brain in two ways by
   1. altering the concentrations of salts (sodium, potassium, calcium) within the cell
   2. releasing chemicals called neurotransmitters (gamma aminobutyric acid). The change in salt concentration conducts the impulse from one end of the nerve cell to the other.

**Seizure Phases**—A seizure often has three distinct phases: **aura, ictus, and postictal state** /old concept/.
Epileptic seizure

**Seizure**

symptom, represents the clinical manifestation of an abnormal and excessive synchronized discharge of a set of cortical nn. in the brain

- **Focal Seizures /Partial seizures/**
  The site of origin is a localized or discreet area in one hemisphere of the brain.

- **Generalized Seizures**
  At the onset, seizure activity occurs simultaneously in large areas of the brain, often in both hemispheres.
Epilepsy - types of seizures

Focal /Partial/ Seizures

- **Without** impairment of consciousness/responsiveness = **SIMPLE PARTIAL SEIZURE**
  - With observable motor or autonomic components (roughly corresponds to the concept of “simple partial seizure)
  - Involving subjective sensory or psychic phenomena only (corresponds to the concept of aura)

- **With** impairment of consciousness/responsiveness (roughly corresponds to the concept of complex partial seizure) = **COMPLEX PARTIAL SEIZURE**

- **Evolving** to a bilateral, convulsive seizure (involving tonic, clonic or tonic and clonic components; replaces the term secondarily generalized seizure) = **SECONDARY GENERALIZED PARTIAL SEIZURE**
Epilepsy - types of seizures

**Generalized Seizures**

- **Tonic-clonic** (in the past, sometimes referred to as grand mal seizures)
- **Tonic**
- **Clonic**
- **Atonic**
- **Absence** (in the past, sometimes referred to as petit mal seizures)
  - Atypical
  - Absence with special features
    - Myoclonic absence
    - Eyelid myoclonia
- **Myoclonic**
  - Myoclonic
  - Myoclonic atonic
  - Myoclonic tonic
Generalized Seizures

- **Tonic-clonic** (in the past, sometimes referred to as grand mal seizures)
  - loss of consciousness during the seizure
  - tonic phase, consisting of increased muscle tone (rigidity) followed
  - by clonic phase, which involves jerking of the extremities
  - autonomic symptoms may also be present.

- **Tonic**
- **Clonic**
- **Atonic**
- **Absence**
- **Myoclonic**
Generalized Seizures

- Tonic-clonic
- Tonic
- Clonic
- Atonic
- Absence (in the past, sometimes referred to as petit mal seizures) The loss of consciousness is so brief that the child usually does not even change position. Most absence seizures last 10 seconds or less. There is no postictal state, but the person usually lacks awareness of what occurs during the seizure.

http://www.youtube.com/watch?v=z9V2sNmIoJk

- Myoclonic
FOCAL Epileptic discharge (TLE l. dx.)

GENERIALIZED epileptic discharge (Abcence s.)
• Epileptic seizure
• Epilepsy
• Status epilepticus
Epilepsy

- from Greek word *epilambanein*, meaning „to seize“ or „to attack“

- Epilepsy is a chronic neurological condition characterized by **recurrent seizures** that are caused by abnormal cerebral nerve cell activity.

  There is a distinction between a patient who has one seizure and a patient who has epilepsy!

  Prevalence: 1%
Epilepsy
Underlying type of cause (etiology)

**Underlying causes will be grouped as:**
- **Genetic**
- **Structural/Metabolic** - results from a known condition, such as stroke, head injury, stroke, poisoning
- **Unknown** - has no known cause, and the person has no other signs of neurological disease or mental deficiency.
Epilepsy
according to the seizure type

- Localization-related or focal epilepsies
  (those with partial onset)

- Generalized epilepsies
  (generalized seizures)
Epilepsy according to the natural evolution

- **Benign epilepsies**
  - Involve seizures which are self-limited in that spontaneous remission, regardless of treatment, occurs at an expected age and is the anticipated outcome in the vast majority of cases,
  - The consequences, if any, of the seizures are generally not disabling over the course of the active seizure disorder.

- **Epileptic encephalopathy**
  severe cognitive and behavioral impairments above and beyond what might be expected from the underlying pathology (e.g. cortical malformation) alone, and that these can worsen over time

  ! suppressing or preventing the epileptic activity, one may improve the cognitive and behavioral outlook of the disorder
Epilepsy according to the natural evolution

- **Epilepsy controlled by treatment**
  - complete seizure control under the treatment

- **Pharmacoresistant epilepsy**
  - the failure to achieve seizure control with the first or second trial of an anticonvulsant medication given at the appropriate daily dosage
Epilepsy- epileptic syndromes

Disorders identifiable on the basis of:
- A typical age onset and a course of the disorder
- Specific EEG characteristics
- Seizure types
- Neuroimaging results - MRI, ...
- +/- Cognitive and behavioural disturbances
Epilepsy- epileptic syndromes

**Benign rolandic epilepsy** (idiopathic focal epilepsy)

- Childhood (3-13yy)
- Predominance of nocturnal seizures- simple partial with sporadic generalization
- EEG: Centrotemporal spikes
- Nearly all patients outgrow the disorder
Epilepsy - epileptic syndromes

Juvenile myoclonic epilepsy (JME)

- Myoclonic jerks on awakening in the morning ("patient may spill or drop things, seldom falls")
- Tonic clonic seizures
- Absence seizures

Inherited condition

EEG: Multiple spike and wave complexes precipitated by photic stimulation
Epilepsy- epileptic syndromes

**Febrile convulsions**
- association with fever in children 3 months - 5 years
  - 5% of them develop epilepsy

**Infantile spasms** (begin up to 12 months)
- sudden brief seizures typically with tonic flexor spasms of the waist, extremities and neck
  - Bad prognosis
  - usually part of the West syndrome (infantile spasms, hypsarrhythmia on EEG, encephalopathy, psychomotor retardation)
Epilepsy - epileptic syndromes

**Lennox-Gastaut syndrome**
- devastating disorder in children
  - Mix types of seizures
  - Mental retardation = epileptic encephalopathy
  - EEG: slow (less than 2.5Hz) spike and wave patterns
Epilepsy - epileptic syndromes

**Mesial temporal lobe epilepsy**
- hippocampal sclerosis - the most common pathology
- Temporal lobe epilepsy - seizures:
  - Vegetative auras or affective symptoms (fear)
  - Complex partial seizure with prolonged impairment of consciousness
  - Followed by orofacial, gestural or reactive automatisms
  - Rare secondary generalization
- Onset: before puberty
Mesial temporal lobe epilepsy
Epilepsy - diagnose

- complete patient **history** (details of birth, childhood, family history, and medication regimen; medical history, history of drug and alcohol use)

- A detailed **description of the seizures** (important to distinguish seizure types)

- **Neurological examination**

- **Electroencephalogram (EEG)**
  EEG is a diagnostic test used to investigate a seizure disorder. It identifies abnormal electrical activity in the brain, provides information about the type of seizure disorder, and locates the area of seizure focus.

- **Neuroimaging**
  Magnetic resonance imaging (MRI scan) or computed tomography (CT scan or CAT scan) are performed when a lesion or other structural cause, such as stroke or tumor, is suspected.
Epilepsy- differential diagnose

- Neurological
  - Transient ischaemic attack
  - Migraine
  - Sleep disorders
    - Narcolepsy with cataplexy
    - REM behaviour disorder
    - somnambulism

- Cardiac
  - Vasovagal syncope
  - Arrhythmias
  - Hypotension
  - Reflex anoxic seizure

- Endocrine/metabolic
  - Changes of blood glucouse, ions

- Psychological
  - Non-epileptic psychogenic seizures
Epilepsy treatment

- Medication - depends on seizure type
  - Partial seizures - carbamazepine
  - Generalized - valproate
  - New generation: levetiracetam, topiramate, gabapentin, pregabalin, zonisamide, lacosamide, retigabine

- Other - Ketogenic Diet, ...

- Surgery
  - VNS
  - Resection of the lesion
  - Calosothomy...
Epilepsy - first aid

- A person experiencing a **generalized tonic-clonic seizure** or a **simple partial seizure** that has become convulsive requires first aid. Call an **ambulance** if the seizure lasts longer than 5 minutes, one seizure follows another without the person regaining consciousness (status epilepticus over 30 min), or the person is seriously injured.

The goals of first aid are to

- prevent injury,
- maintain an open airway,
- provide reassurance to the patient and bystanders,
- recognize an emergency condition, and
- know when to call for help

BZD- i.v., per rectum
Epilepsy- first aid

First aid for epilepsy tonic-clonic seizures

Common symptoms: the person goes stiff, loses consciousness and falls to the floor

Do...
- Protect the person from injury (remove harmful objects from nearby)
- Cushion their head
- Look for an epilepsy identity card/identity jewellery
- Aid breathing by gently placing the person in the recovery position when the seizure has finished (see picture)
- Stay with them until recovery is complete
- Be calmly reassuring

Step 1

Step 2

Step 3

Don’t...
- Restrain the person’s movements
- Put anything in their mouth
- Try to move them unless they are in danger
- Give them anything to eat or drink until they are fully recovered
- Attempt to bring them round

Call 999 for an ambulance if...
- You know it is the person’s first seizure
- The seizure continues for more than five minutes
- One seizure follows another without the person regaining consciousness between seizures
- The person is injured
- You believe the person needs urgent medical attention
Status epilepticus

- Continuous clinical or electrical seizure activity or repetitive seizures with incomplete neurological recovery interictally for a period at least 30 minutes
## Status Epilepticus Algorithm of Treatment

<table>
<thead>
<tr>
<th>Time</th>
<th>Drug Treatment</th>
<th>General Measures</th>
<th>Investigations</th>
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</table>
| 0 min | **IV Access available:** Inj Lorazepam 0.1 mg/kg/IV (max 4 mg) OR Inj Midazolam 0.15-0.2 mg/kg/IV (Max 5 mg)  
**IV access not available:** Buccal Midazolam 0.3 mg/kg (Max 5 mg) OR PR Diazepam 0.5 mg/kg (Max 10 mg) | Airway  
> Breathing  
> Circulation  
> Establish IV access  
> Temperature | Glucose, Sodium, Potassium, Calcium, Magnesium |
| 5 min | Inj Lorazepam 0.1 mg/kg/IV (max 4 mg) OR Inj Midazolam 0.15-0.2 mg/kg/IV (Max 5 mg) | Oxygen inhalation  
> Cardio respiratory monitoring: ECG, BP, SpO₂ | Glucose  
> May consider: CRP, complete blood counts, AED level, Toxic screen, BUN |
| 10 min | **IV Phenytoin** 20 mg/kg (Max: 1000mg) in NS @ 1 mg/kg/min (Max 50 mg per min), OR  
**Inj Fosphenytoin** 20 mg PE/kg, Rate: 3 mg PE/kg/min  
**Repeat** inj. Phenytoin 10 mg/kg / Inj Fosphenytoin 10 mg PE/kg, if no response to initial dose | **Check whether the child is on AED**  
(please see next page for the dose adjustment) |  |
|       | **Refractory SE—even after 10 min of phenytoin/fosphenytoin administration**  
**IV Valproate** 20-30 mg/kg-IV @ max 6 mg/kg/minute.  
OR  
**IV Phenobarbitone** 20 mg/kg in NS @ 1.5 mg/kg/min; **Repeat** 10 mg if no response to initial dose  
OR  
**IV Levetiracetam** (If Liver disease/Metabolic disease/coagulopathy/ on chemotherapy) - 20-30 mg/kg @ 5 mg/kg/min infusion | **Continue monitoring as above**  
> Use vasopressors, if needed  
> Identify and treat medical conditions and electrolyte disturbances |  |
|       | **Consider IV Pyridoxine** 100 mg infusion in children <2 years of age without clear etiology for seizures, and in those with Isoniazid overdose |  |  |

**Coma induction** - seizure continues 10 min after completion of phenobarbitone infusion
Febrile convulsions

- 2-5% of children
- Period 3 months to 5 years
- During a sudden rise in temperature early in the course of illness
- In the absence of intracranial infection