

Seizure



Seizure is not a diagnosis – it is a sign that the **brain is unhappy** (abnormal electrical discharge). Here's a simple, specific & structured way to think of seizures.

3 types

Focal (partial) – focal part of the brain (i.e. frontal, parietal, temporal, occipital).

Generalized tonic clonic (GTC) – whole brain hemisphere – tonic (rigidity) & clonic (jerking) of all 4 limbs with impaired consciousness (GCS).

Status epilepticus – GTC seizure lasting >5 mins.

The severity increases with each type of seizure. A focal seizure can become a secondary generalized seizure which in turn can become status if >5 mins.

Seizure - threshold

Seizure occurs once the threshold is reached

A normal person has a high seizure threshold – i.e. it would take a severe pathology to cause a seizure such as encephalitis, traumatic brain injury, haemorrhage etc.

An elderly / co-morbid person (e.g. dementia, cerebrovascular disease, cerebral palsy) has a low seizure threshold – i.e. it could take a small pathology to cause a seizure such as constipation, dehydration, infection etc.

An otherwise healthy person with a low seizure threshold – primary epilepsy due to congenital or structural reasons in the brain.

Seizure = inside brain +/- outside brain (unhappiness)

Unhappiness inside the brain – e.g. cerebrovascular disease, dementia, traumatic brain injury, tumour, encephalitis, cerebral sinus venous thrombosis

Unhappiness outside the brain – e.g. organ encephalopathy, alcohol, drugs, sepsis, metabolic disturbance

3 types of status

Status - >5 mins of GTC seizure

Partial status – continuous partial seizure with impaired consciousness

Non-Convulsive Status Epilepticus (NCSE) – continuous impaired consciousness without GTC activity but may have signs such as intermittent twitching

Hypoxic brain injury arises around 30 mins into a status. This time increases with partial status and NCSE as seizure activity although continuous, is less pronounced.

Status (true) vs NEAD (functional)

A frequent crash call (esp. on call) for SHOs & registrars is a suspected status. We all know how to treat a status – IV lorazepam 2-4mg followed by loading and assessing ABCDE with ITU involvement for monitoring +/- support of airway.

The difficult part is recognising which are true status and which are functional. A lot of crash calls for status turn out to be functional.

But why bother? Because you are at risk of obtunding the patient with too much lorazepam (ironically, it's then difficult to differentiate between post benzo drowsiness &

post ictal drowsiness..) and pursuing the wrong path with AED loading, ITU involvement, documentation etc.

First and foremost, **relax when called to the crash call** – take a deep breath and rely on your objective assessments rather than emotional reactions. This is tricky at first but with practice you'll get better! Here are some specific signs:

- Look closely at the seizure activity – true status has **equal rigidity and rhythmic jerking of all 4 limbs**
- Lateral tongue biting with molar incisions is specific whilst tip of the tongue biting and urinary incontinence is not.
- True status has **impaired consciousness throughout** with no responses to any external stimuli (try a hard trapezius squeeze).
- **Haemodynamic instability** occurs in true status with ABG showing **hypoxia & raised lactate**.
- **Post ictal phase should last >15 mins**

Hypoactive delirium vs NCSE

Another frequent problem that resident doctors are bleeped for – concerns regarding patients with low GCS / drowsiness. Most of the time this is indeed hypoactive delirium from an acute pathology on BG of dementia or cognitive impairment. However, NCSE can be present esp. in those with unhappiness inside the brain (low seizure threshold).

Telling the difference between the two can be difficult but here are some clues:

- **NCSE – GCS is not usually fluctuant** so consider reassessing around 1 hour later and if there is fluctuation / improvement in the GCS – more likely hypoactive.
- Observe for **intermittent body twitches or eye deviation** in NCSE – spend longer than just 2 mins looking at the patient.
- **History of previous seizures** increases the risk of NCSE

If features of NCSE are present - **load with AED whilst awaiting urgent EEG**. Be careful with IV lorazepam – a lot of patients with NCSE are elderly and may not be an ITU candidate so think twice before obtunding them.

Anti-Epileptic Drugs (AED)

So why concern ourselves with why the patient has had a seizure? To work out why the brain is unhappy and decide whether to prescribe AED. It would be simple enough to give everyone with a seizure AED but there are side effects & complications, tolerance issues, refractory states, inappropriate prescribing in functional / FND etc so it can get a bit more complex..

5 considerations before AED:

1. Trigger for seizure (inside +/- outside brain)
2. Organic vs functional (i.e. NEAD, rigors from sepsis)
3. Severity (focal vs GTC vs status – self terminating or treated)
4. Number (single vs multiple)
5. Risk balance (further seizures vs AED side effects)

4 indications for AED:

1. 2+ seizures
2. 1 seizure if structural brain abnormality
3. 1 seizure if severe / status
4. 1 seizure if risk of further deemed unacceptable (e.g. occupation)

To AED or not to AED is always a risk balance decision – tailored to the individual clinical context. Like a lot of things in medicine, decision making can be nuanced (not black & white) – the key is to explain & **document to justify your decision & thought process.**

Here are a few examples:

- *35-year-old gentleman presents with GTC seizure on BG of alcoholism with signs of withdrawal. You suspect alcohol withdrawal seizure so not for AED – pretty straightforward. But what if he has a diagnosis of primary epilepsy since childhood but has not been compliant with his AED for the past few years but has been abusing alcohol for the same length of time?*
- *85-year-old gentleman with vascular dementia from a NH presents with a severe pneumonia triggering a GTC seizure. You treat the CAP and he improves for discharge. What parameters do you use for whether to start him on AED or not?*

What if he has had 1 GTC seizure on arrival that self-terminated? What if he has had 2 seizures in total? What if he has had NCSE during admission – would you continue his AED on discharge? What if the NH state he has bouts of aggressive behaviour and mood swings due to his dementia (which Keppra can worsen)?

- *20-year-old lady with BG of ADHD, anxiety / depression presents with two GTC seizures requiring treatment but during admission has further seizures which you suspect may be functional. She admits to taking cocaine with a history of impulsive OD behaviour with prescribed medication. She is also trying for a baby with her partner. Do you prescribe AED or not?*

These cases demonstrate that **decision making is not always straightforward**. Now in real life and in uncertain seizure situations - the default is Neurology referral. But if all we do is refer and sit back – we are in danger of not developing, and practicing protocolised rather than practical & pragmatic medicine. So, it's ok to refer but always think before and after!

Additional Key Points

Learn the side effects of the main AED. Commonly, levetiracetam – mood swings and headaches (esp. in the elderly with dementia), lamotrigine – stop if rash occurs, valproate & carbamazepine – hepatotoxicity.

1 month threshold – the **seizure threshold is the lowest for the first month after the acute pathology** (e.g. stroke, encephalitis) then improves afterwards. This explains why some patients are discharged on AED with seizure clinic follow-up in a few months' time in which the Neurologist will consider if AED can be weaned if seizure-free.

Lifestyle interventions – **they are as important as AED** – anything that lowers the seizure threshold must be counselled against such as recreational drug use, alcohol misuse, poor sleep hygiene, stress etc. This is especially important in younger patients!

EEG

EEGs can show more than just seizure activity and is a powerful clinical tool if used in the correct context. Here are the 5 key indications:

- Seizures (focal, generalised, status types)
- Encephalitis (infective vs autoimmune)
- Encephalopathy (drug induced, metabolic, organ)
- Cerebral dysfunction (cerebrovascular, neuro-degenerative)
- Sleep disorder diagnoses (used in sleep clinics)