

Seizures: assessment and management in the emergency unit

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One in 20 people experience at least one seizure in their lifetime.¹ Seizures account for 0.3% of new patient attendances to emergency units.² There are over 27,000 admissions to UK hospitals for possible seizures annually,³ but only 20–40% of these are true (provoked or spontaneous) epileptic seizures. The main differential diagnoses are syncope or psychogenic attacks, though also included are other serious neurological, cardiac and metabolic conditions and many less severe medical conditions.^{4,5} Recognising an

event as a seizure is a clinical diagnosis and depends upon the history more than on physical examination and investigations.

A first seizure is a social emergency, irrespective of its cause, since it threatens driving, education and work. Fear of recurrence often causes sufficient anxiety in both the patient and their family to put the patient's life 'on hold' while awaiting specialist advice. Misdiagnosis at this stage – and, worse, starting antiepileptic medication without firm evidence of epilepsy – is common,⁶ with incalculable effects on lifestyle, self-esteem and effects of unnecessary medication.

Emergency presentations

Adults and teenagers presenting to emergency units with possible seizures comprise two groups: those with first seizures (which can include status epilepticus) and those with previous events.

First seizure

First seizures in emergency units are almost always convulsions. Minor epileptic events (eg complex partial seizures, myoclonic jerks) may have occurred previously but it is usually major seizures that prompt emergency presentation. About 15% are 'acute symptomatic seizures' with identifiable (and removable) underlying causes (Table 1)⁷ which may themselves require emergency management.

Status epilepticus

Status epilepticus may be the first presentation of epilepsy. It is a medical emergency requiring immediate intervention. Essentially, this involves resuscitation, drug treatment progressing from lorazepam (0.1 mg/kg bolus, repeated if necessary after 2 min) to phenytoin (20 mg/kg infusion at 50 mg/min) to phenobarbitone (20 mg/kg infusion at 100 mg/min) and, if necessary, general anaesthesia and ventilation preferably with continuous EEG monitoring.⁸ Clinicians must remain ever mindful that non-epileptic attack disorder commonly mimics status epilepticus.

Seizure with previous events

Further seizures may occur spontaneously in patients previously diagnosed with epilepsy as a result of missing medication or intercurrent illnesses. However, clinicians must not blindly accept the diagnosis in all patients labelled with epilepsy because about 20% of patients treated for 'epilepsy' have syncope or psychogenic attacks.

Emergency assessment

- *Emergency resuscitation:* 'ABC' is rarely required following a first seizure since patients are usually already recovering on arrival.
- *Acute seizure control:* lorazepam is preferable to diazepam for rapid seizure control because it is less lipophilic, has a smaller volume of distribution, better clearance, less accumulation and less

Table 1. Common causes of acute symptomatic seizures in adults.

Infective	cerebral abscess meningitis/encephalitis cerebral malaria
Trauma:	
Head injury (especially penetrating)	immediate (concussive) early (<24 hours) post-traumatic
Neurosurgery	craniotomy
Vascular:	stroke (especially haemorrhagic)
Hypertensive	cerebral venous thrombosis hypertensive encephalopathy eclampsia
Hypoxaemic	cardiac arrest
Toxic	alcohol and medication withdrawal poisoning and overdose medication toxicity illicit drugs
Neoplastic	leukaemia lymphoma metastatic cancer
Metabolic	fat embolism porphyria
Endocrine	hypoglycaemia hypocalcaemia hyponatraemia
Immune	acute demyelination cerebral vasculitis

hypoventilation. Seizures persisting beyond 5–10 minutes should be treated as status epilepticus.

- *Treat underlying cause:* if there is an obvious precipitating factor (Table 1), investigation and treatment of the underlying condition is appropriate.
- *Investigations:* emergency management takes priority over investigations in acute situations. The exception is blood glucose, measurement of which is essential in all patients presenting with altered consciousness – ambulance personnel will often already have done this.

History

Diagnosis depends upon an accurate and detailed history (preferably with witness account) taken by an appropriately experienced clinician. Certain details might influence acute management (previous seizures, medications, alcohol, illicit drugs), but emergency unit histories are necessarily limited for several reasons:

- Patients may be amnesic for the event, confused post-ictally, or drowsy following lorazepam.
- Witnesses may be frightened and unreliable; also, many episodes are unwitnessed, especially in elderly people.
- Previous notes are rarely immediately available.

Emergency unit clinicians must therefore maximise the available history, and obtain any other additional information, for example:

- Clinicians in the emergency unit will often themselves witness further seizures.
- Paramedic crews may describe seizures at the scene or in transit, or have spoken to witnesses.
- Telephoning a relative or friend, especially with confused patients, is recommended.

With the patient recovered, the detailed history should include:

- previous events (including specific questioning for myoclonic jerks and blank spells)

- medication and alcohol details
- past history, including early life events (birth, febrile seizures)
- family history of epilepsy, syncope and sudden death.

Seizure diagnosis has two components:

- 1 Has the patient had a seizure or some other cause of collapse (Table 2)?
- 2 If it was a seizure, was it spontaneous (isolated) or provoked (acute symptomatic)?

Table 3 shows essential history differences between seizures, syncope and pseudoseizures. Minor convulsions are common in syncope⁹ (convulsive syncope), and incontinence can occur. Lateral tongue biting and post-event confusion are important seizure pointers, although they may also follow severe syncope (eg if the patient is held or wedged upright following collapse). Head injury following syncope can also prolong unconsciousness.

Physical examination

Physical examination reveals the cause of a seizure only infrequently.

- *Emergency assessment:* assessing conscious level and airway protection is essential for safe clinical management.
- *Cardiovascular examination* (lying and standing blood pressure, heart auscultation) is important since syncope is commoner than epilepsy, especially in the elderly.

- *Neurological examination* includes searching for head injury, tongue biting, meningism, papilloedema and focal signs (including visual field defects). Upgoing plantars are common post-ictally.
- *General examination:* epilepsy specialists also habitually examine for skin stigmata (neurofibromata, tuberous sclerosis), dysmorphic features, body size asymmetry (eg nail size) and cerebral bruit.

Investigations

The statement ‘everyone is allowed one seizure’ is nonsense and potentially dangerous: all first seizures must be investigated and explained. The Scottish Intercollegiate Guidelines Network (SIGN) gives helpful advice.¹⁰

- *Blood tests* other than glucose are rarely necessary following an isolated seizure. With pre-existing epilepsy, serum antiepileptic drug level measurement may help in confirming poor compliance, and blood alcohol and liver function tests may be relevant. Serum prolactin (often normal following a non-epileptic seizure) is not sufficiently reliable or available out-of-hours to be useful.
- An *EEG* is especially useful in children and young adults following a first seizure. EEGs show ‘epileptiform’ changes in 34% of people following a first seizure,¹¹

Key Points

A first seizure must be investigated and explained

An accurate and detailed history with witness account and previous documentation may not be readily available in the emergency unit

Minor convulsions are a common manifestation of syncope

The best pointers to a seizure are lateral tongue biting and post-event confusion

Emergency units require fast-track links to local epilepsy specialist services, often avoiding the need for hospital admission following a first seizure

Long-term antiepileptic medication should usually be prescribed only by a specialist

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rising to 51% with EEGs performed within 24 hours. If an EEG is considered necessary, it should therefore be performed as soon as practicable after a first seizure. It must be interpreted in the light of the history; it can support (but never exclude) a diagnosis of epilepsy, help with classification and exclude photosensitivity. Overinterpreting minor EEG

anomalies encourages misdiagnosis of epilepsy.

- *Imaging:* computed tomography is the most practical method of emergency cerebral imaging, being readily available and allowing close monitoring if necessary. However, many patients presenting with a spontaneous seizure will require magnetic resonance (MR) brain scanning at some stage. Only MR

imaging can identify many of the major causes of focal epilepsy (eg mesial temporal sclerosis or cortical dysplasia). It is therefore indicated following a spontaneous seizure, unless confidently diagnosed as a primarily generalised seizure.

- An ECG is indicated following all blackouts and first seizures – this is particularly relevant if first seizures or syncope occur in the elderly or on exertion. Although significantly abnormal in only about 5% of patients with syncope, emergency unit clinicians must recognise potentially fatal conditions diagnosable on ECG that commonly present as blackouts (eg long QT syndrome).¹²
- *Other cardiovascular tests:* echocardiogram, tilt table and exercise tests may be useful to investigate syncope, following standard consensus guidelines.¹³

Table 2. Differential diagnosis of acute seizures.

Neurocardiogenic syncope	vasovagal syncope carotid sinus syncope cough and micturition syncope
Orthostatic syncope	autonomic failure age-related autonomic dysfunction medications, especially vasodilator
Cardiogenic syncope	tachyarrhythmia bradyarrhythmia structural cardiac disease
Cerebral syncope	ictal bradycardic syncope (seizure with bradycardia) migraine (especially hemiplegic and basilar artery migraine) brainstem TIA Chiari malformation colloid cyst
Psychogenic	panic disorder dissociative non-epileptic attack disorder ('pseudo seizures')
Sleep disorders	parasomnia
Acute vertigo	acute labyrinthitis, Ménière's disease
Paroxysmal movement disorders	familial kinesigenic dystonia
Endocrine, metabolic, toxic causes	see Table 1

TIA = transient ischaemic attack.

Subsequent management

In practice, junior physicians with little neurology experience are the first to assess patients with seizures in the emergency unit. Following suspected spontaneous seizures, however, patients need rapid specialist access for confirmation of diagnosis, relevant investigations, consideration of treatment, informed lifestyle advice and appropriate follow-up.

Table 3. Clinical distinction between seizures, syncope and pseudoseizures.

	Seizure	Syncope	Pseudoseizure
Trigger	rare (unless photosensitive)	common (upright, bathroom, blood)	common (stress)
Prodrome	common (<i>déjà vu</i> , epigastric), often brief	almost always (vision, nausea, hot), 2–10 min	common (anxiety symptoms), often prolonged
Duration	2–5 min	30 sec–2 min	1–60 min
Jerking	common (1–2 min)	common (secs)	common (prolonged, erratic, variable)
Eyes	open	open, elevated	closed, resists eye contact
Colour	pale (partial seizure), red/blue (tonic-clonic seizure)	very pale	normal, red, occasionally blue
Breathing	apnoea in expiration	apnoea in expiration	hyperventilation, coughing, apnoea in inspiration
Incontinence	common	uncommon	uncommon
Injury	common (can be severe)	uncommon (can be severe)	common (trivial)
Tongue biting	common (side)	rare	occasional (tip tongue, cheek, lip)
Afterwards	confused (wakes in ambulance)	rapidly orientated (wakes on floor)	orientated, often tearful

Ideally, emergency units should make fast-track links to local epilepsy specialist services, thereby often avoiding the need for hospital admission. Figure 1 shows example advice cards for patients discharged from emergency units and their carers.¹⁴

Antiepileptic drug treatment

Should medication be started? In the Multicentre Study of Early Epilepsy and Single Seizures,¹⁵ following a single spontaneous seizure 14 patients had to be treated to prevent one patient experiencing seizure recurrence at two years. Most patients therefore prefer not to start long-term medication following a single spontaneous seizure. The need to regain a driving licence may influence patient preference in adults. Recurrence risk following all untreated first seizures (isolated and acute symptomatic combined) is 67% and 79% at one and three years, respectively.¹⁶ The risk is highest with a structural basis for the seizure and lowest

with an acute precipitant such as alcohol. *Which medication?* There is a wide choice of antiepileptic drugs, with similar efficacy but varying side effects and interactions. Current guidelines (SIGN)¹⁰ favour carbamazepine, valproate, lamotrigine or oxcarbazepine monotherapy for focal epilepsies, and valproate or lamotrigine monotherapy for generalised or unclassified epilepsies. However, because of potential teratogenicity, only a neurological specialist should prescribe valproate to young women of childbearing potential.¹⁷

Information

Patients and carers require accurate and authoritative information following a first seizure. Particular needs relate to:

- driving ability (individuals should stop driving and inform the Driver and Vehicle Licensing Agency)
- acute seizure management (Fig 1)
- alcohol limitation (a little is fine, but

more promotes seizures through sleep loss and medication interaction)

- flashing lights (often unnecessarily avoided)
- work and school (normal life as far as possible), and
- medication problems (side effects, contraceptive pill interactions and teratogenic potential).

Recommended websites for patient and carer information are:

- Epilepsy Action (www.epilepsy.org.uk)
- The National Society for Epilepsy (www.epilepsynse.org.uk).

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Fig 1. Examples of cards for patients and carers following an epileptic seizure.¹⁴

Patient

You have had an epileptic fit

- The doctor has examined you. You do not require admission to hospital.
- It is necessary that a responsible adult observe you for 24 hours.
- Please rest, take your usual medication and do not drink alcohol.
- Arrange to see your family doctor as soon as convenient and give him/her the letter describing what has happened to you.
- Do not drive until you have discussed the fit with your doctor.

Carer

Please bring the patient back to the hospital if he or she should

- Become increasingly sleepy.
- Have another fit.

What to do if another fit occurs

- Lie the patient down on one side (the recovery position).
- Try to ensure that he/she can breathe easily. This means that their airway must be clear.
- Do not insert objects or fingers into the mouth.

Usually the fit will subside in a few minutes. Stay with the patient. If the attack lasts for many minutes or you feel unable to cope, then seek urgent medical help or dial 999 and ask for an ambulance. The ambulance personnel will know what to do.