Transient loss of consciousness: syncope versus seizures

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Discuss the approach to a patient with transient loss of consciousness
Describe the terminology and types of syncope and seizures
Describe techniques to distinguish between syncope and seizures.
Discuss the initial management of syncope and seizures
Differential diagnosis of transient loss of consciousness (TLOC)

**Traumatic**
- Concussion
- Severe TBI

**Non-traumatic**
- *Syncope*
  - Seizure
- TIA (vertebrobasilar)
- Intoxications
- Metabolic

**Pseudo-TLOC**
- Psychogenic
- Drop attacks
- Cataplexy
- Carotid TIAs
Syncope - general features

- TLOC due to a period of inadequate cerebral blood flow, most often from an abrupt drop of systemic blood pressure
- Typically, brief duration (8 to 10 seconds) with spontaneous resolution
- Loss of postural tone associated with collapse may result in a fall and injury
- Pre-/near-syncope: feeling as though one might blackout, but consciousness is preserved. May or may not lead to syncope
- Prodromal symptoms: may or may not be present
Classic prodromal symptoms

- Lightheadedness
- A feeling of being warm or cold
- Sweating
- Palpitations
- Nausea or abdominal discomfort
- Visual "blurring“, temporary darkening or "white-out" of vision
- Decreased hearing and/or hearing unusual sounds ("whooshing" noise)
- Pallor witnessed by others

-UpToDate
Types/causes of syncope

- Reflex syncope (neurally-mediated)
- Orthostatic syncope
- Cardiogenic: no prodromal symptoms
  - Cardiac arrhythmias
  - Cardiopulmonary disease
Reflex syncope

“Common faint”: lifetime incidence ~50%

Triggering events

Subtypes:

- Vasovagal syncope: emotional stress, trauma, the sight of blood or needles, prolonged standing, fear.
- Carotid sinus syncope: due to constriction of the carotid artery in the neck; can occur after turning the head, while shaving, or when wearing a tight collar.
- Situational syncope: occurs during or immediately after urination, defecation, coughing, laughing, or as a result of gastrointestinal stimulation
Orthostatic

- Common, from postural hypotension
- Typically occurs on standing up from a sitting or lying down position
- Symptoms: presyncope or syncope
- Causes:
  - Dehydration, inadequate fluid intake
  - Drugs: diuretics, beta-blockers, anti-hypertensive drugs
  - Autonomic neuropathy-diabetes, Parkinson’s disease, POTS
Cardiovascular syncope

- Presence of definite structural heart disease: MI, cardiomyopathy etc.
- Family history of unexplained sudden death or channelopathy
- During exertion, or supine
- Sudden onset palpitation immediately followed by syncope
- Abnormal EKG
- EKG findings suggesting arrhythmic syncope: AV or bundle branch block, sinus bradycardia (<40), VT, long and short QT intervals etc.
Definitions

- **Seizures**: Transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal brain activity.

- **Convulsions**: Seizures with prominent muscle activity. Seizures may also be **non-convulsive**.

- **Epilepsy** is a *disease* of the brain defined by:
  - At least two unprovoked (or reflex) seizures occurring >24 hours apart
  - 1 unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after 2 unprovoked seizures, over the next 10 years
  - Diagnosis of an epilepsy syndrome

- **Epilepsy syndromes**: Groups of epileptic patterns of varying causes but similar course and response to treatment

  Fisher et al 2014
Provoked (situation-related) seizures

- In people without epilepsy:
  - Sleep deprivation
  - Febrile illness
  - Drug/alcohol use or withdrawal
  - Metabolic abnormalities: Hypoglycemia, hyponatremia etc.
  - Stress?

- In people with epilepsy:
  - All of the above
  - Missing dose/change in antiepileptic drugs
ILAE classification of seizures (1981)

Seizures
- Partial
  - Simple
  - Complex
  - Secondarily gen
- Generalized
  - Tonic-clonic
  - Absence
  - Myoclonic
  - Clonic
  - Tonic
  - Atonic
- Unclassified

-ICES, Epilepsia, 1981
Simple partial seizures

- Consciousness preserved
- Signs/symptoms variable
  - Motor: clonic, tonic
  - Sensory: somatic, special-smell, taste etc
  - Autonomic: change in pulse, BP, color etc
  - Psychic: déjà vu, fear
Complex partial seizures

- Impaired consciousness (loss of awareness and/or responsiveness)
- Blank stare
- Automatisms: ~50%
- Ictus duration ~1 min
- Postictal confusion present
Partial seizure evolution

Simple ➔ Secondarily generalized ➔ Complex
Absence seizures

- Brief loss of consciousness (10-20 seconds)
- Staring
- May have blinking, but no prominent automatisms
- No postictal confusion
Atonic seizures

- Loss of muscle tone
  - Head drop
  - Fall (“drop attacks”)
- Impaired consciousness
- Brief duration
- Injury common
Myoclonic seizures

- Brief, shock-like muscle contractions
  - Head, upper extremities, whole body
- Usually bilaterally symmetrical
- Consciousness preserved
- May be most prominent on awakening
- May progress to tonic-clonic seizures
Generalized tonic-clonic seizures

- Loss of consciousness
- Ictus
  - Fall, cry
  - Muscular rigidity (tonic)
  - Rhythmic jerking (clonic)
  - Respiration inhibited
  - Tongue bite/incontinence/injury can occur
- Postictal confusion
ILAE 2017 Classification of Seizure Types Basic Version ¹

Focal Onset
- Aware
- Impaired Awareness
- Motor
- Non-Motor
- Focal to bilateral tonic-clonic

Generalized Onset
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor (Absence)

Unknown Onset
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor
- Unclassified ²

1 Definitions, other seizure types and descriptors are listed in the accompanying paper & glossary of terms

2 Due to inadequate information or inability to place in other categories

Initial evaluation - comprehensive history

- Number, frequency, duration and course
- Onset: abrupt, gradual
- Position: standing, supine
- Provoking/triggering factors
- Symptoms before and after the event
- Witnessed signs
- Preexisting medical conditions
- Medications
- Family history
Initial evaluation – physical examination

- **Vital signs:**
  - Heart rate and rhythm
  - Orthostatic BP

- **General:** injuries, tongue bite, incontinence

- **Cardiovascular:** murmurs, carotid and peripheral pulses

- **Neurologic:** focal deficits, Parkinsonian features

- **Blood glucose, ECG, oxygen saturation**
Seizures versus syncope

**Seizure**
- Any position
- No pallor at onset
- Abrupt onset
- May have tonic, clonic activity, tongue biting, incontinence
- Injury more common
- Postictal confusion

**Syncope**
- Usually standing
- Pallor at onset
- More gradual onset
- Tonic-clonic activity, tongue-biting, incontinence rare
- Injury less common
- No postictal confusion
## Calgary Syncope Seizures Score

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waking with cut tongue</td>
<td>2</td>
</tr>
<tr>
<td>Abnormal behavior noted</td>
<td>1</td>
</tr>
<tr>
<td>Loss of consciousness with emotional stress</td>
<td>1</td>
</tr>
<tr>
<td>Postictal confusion</td>
<td>1</td>
</tr>
<tr>
<td>Head turning to one side</td>
<td>1</td>
</tr>
<tr>
<td>Prodromal déjà vu or jamais vu</td>
<td>1</td>
</tr>
<tr>
<td>Any presyncope</td>
<td>-2</td>
</tr>
<tr>
<td>LOC with prolonged standing or sitting</td>
<td>-2</td>
</tr>
<tr>
<td>Sweating before spell</td>
<td>-2</td>
</tr>
</tbody>
</table>

**Score \( \geq 1 \): seizure, \(< 1\): syncope**

94% sensitivity and specificity

Sheldon R et al 2002
Convulsive syncope

- Upto 12% of patients with syncope may have abnormal movements
- Due to global cerebral hypoperfusion
- Usually tonic posturing or myoclonic jerks
- Video-EEG recording with tilt-table and EKG helpful to distinguish between them
- Shmuely et al 2018:
  - <10 jerks - syncope, >20 jerks - seizure
  - Loss of tone – only syncope, not seizures
### Epileptic versus psychogenic seizures

<table>
<thead>
<tr>
<th>Epileptic</th>
<th>Psychogenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day or night, any place</td>
<td>Daytime with observers</td>
</tr>
<tr>
<td>Bizarre behavior uncommon</td>
<td>Bizarre behavior common</td>
</tr>
<tr>
<td>Short, 1-2 minutes</td>
<td>Often prolonged</td>
</tr>
<tr>
<td>Abuse history less common</td>
<td>Abuse history more common (80%)</td>
</tr>
<tr>
<td>Respond to AED</td>
<td>Minimal or no response to AED</td>
</tr>
</tbody>
</table>
Epileptic vs psychogenic seizures - observation

Psychogenic seizures:

Convulsive: More common
- Side-to-side movement rather than true clonic jerking
- Pelvic thrusting, opisthotonic arching of the back
- Usually no tongue biting (if present, tip rather than side of tongue), incontinence (except stress, malingering) or significant injury (except accidental)

Nonconvulsive: Harder to distinguish from epileptic
- Eyes *fully* closed with resistance to passive eye opening during apparent unresponsiveness
- Automatisms less common
- Vocalization – moaning, crying may occur

Several caveats, best way to distinguish from epileptic seizures is with EEG during an event
## Seizures versus TIA

<table>
<thead>
<tr>
<th>Seizure</th>
<th>TIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shorter duration: 1-2 min</td>
<td>Longer duration: min to hr</td>
</tr>
<tr>
<td>Positive motor/sensory symptoms</td>
<td>Negative motor/sensory symptoms</td>
</tr>
<tr>
<td>May have tonic, clonic activity, incontinence</td>
<td>Focal neurodeficits</td>
</tr>
<tr>
<td>Motor: may have Jacksonian march</td>
<td>Motor activity, incontinence rare</td>
</tr>
<tr>
<td>LOC, injury more common</td>
<td>LOC with VB TIAs</td>
</tr>
<tr>
<td>Postictal confusion</td>
<td>LOC, injury less common with carotid TIAs</td>
</tr>
<tr>
<td></td>
<td>No postictal confusion</td>
</tr>
</tbody>
</table>
Acute management
Acute management of syncope

- Assist the patient to the ground, chair, or stretcher to avoid traumatic injury. If necessary, remove the patient from any potential external dangers (high places, water, electrical wires).
- Lay the patient supine, with legs elevated if possible, to restore adequate cerebral perfusion.
- Assess vital signs: pulse, respiration, to distinguish cardiac arrest from syncope.
- Observe for other signs (pallor, diaphoresis, seizure activity, etc.) that may assist in establishing the etiology.
- Call for additional assistance if needed.
- Attempt to arouse the patient. Do not try to raise the patient up until the patient indicates readiness to do so. Raising the patient too soon may trigger recurrent transient loss of consciousness.
- Spinal precautions if there is trauma

-UpToDate
Acute management of syncope

- Establish IV access
- Hypotension without bradycardia:
  - Fluid resuscitation: IV bolus
- Oxygen: non-rebreather or nasal cannula based on presentation and O₂ saturation readings.
- Symptomatic bradycardia or AV block:
  - If hypotensive: atropine, isoproterenol, dobutamine, pacing, defibrillation
Syncope risk stratification

Concerning findings:
- Syncope with chest pain or shortness of breath
- Exertional syncope
- Abnormal vital signs: persistently low BP
- Abnormal findings on cardiac, pulmonary, or neurologic examination
- History of structural heart disease or clinical findings suggestive of heart failure
- Older age and associated comorbidities
- Family history of sudden cardiac death
- Abnormal ECG
First aid for generalized tonic-clonic

**DO:**
- Attempt to time the duration of the seizure
- Help patient lie down and roll onto side to help avoid aspiration
- Try to loosen clothing and remove glasses

**DON’T:**
- Place anything in the patient’s mouth, including medication and water
- Leave patient lying on back
- Restrain patient during or after seizure
Acute management of seizure

After convulsions stop – BLS care

- Protect airway. Provide proper positioning dependent upon suspected trauma and suction
- Provide oxygen and ventilation as needed
- Treat injuries and provide immobilization as needed
Acute management of seizures

- Transport to ER if:
  - Seizure lasts more than 5 minutes
  - Patient has recurrent seizures
  - Patient does not begin to regain consciousness soon after seizure
  - Patient has major injuries or medical complications from the seizure
  - Seizure occurs in the setting of water
  - First seizure
Transport considerations

- Immobilize cervical spine if injury cannot be ruled out
- Pad the rails of the stretcher
- Place padding between the patient and hard/sharp objects
- Establish an IV, make sure it is secure
Many people with epilepsy have multiple seizures, sometimes daily.

On some occasions, (if they are not actively seizing upon EMS arrival) they may not need transportation to the hospital.

Important information to know BEFORE accepting no transport to ER:

- Current meds and current history (number and type of seizures per day/week)
- Recent changes to prescriptions and medication compliance.
- Utilize family and caregivers who may be with the patient to gain this information.
- Tell patients to contact PCP or Neurologist
# Antiepileptic drugs (AED)

<table>
<thead>
<tr>
<th>Standard AED</th>
<th>New AED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenytoin (Dilantin)</td>
<td>Gabapentin (Neurontin)</td>
</tr>
<tr>
<td>Fosphenytoin (Cerebyx)</td>
<td>Lamotrigine (Lamictal)</td>
</tr>
<tr>
<td>Carbamazepine (Tegretol)</td>
<td>Topiramate (Topamax)</td>
</tr>
<tr>
<td>Valproic acid (Depakote)</td>
<td>Levetiracetam (Keppra)</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>Oxcarbazepine (Trileptal)</td>
</tr>
<tr>
<td>Primidone (Mysoline)</td>
<td>Zonisamide (Zonegran)</td>
</tr>
<tr>
<td>Ethosuximide (Zarontin)</td>
<td>Felbamate (Felbatol)</td>
</tr>
<tr>
<td>Benzodiazepines:</td>
<td>Pregabalin (Lyrica)</td>
</tr>
<tr>
<td>Diazepam (Valium)</td>
<td>Tiagabine (Gabitril)</td>
</tr>
<tr>
<td>Lorazepam (Ativan)</td>
<td></td>
</tr>
<tr>
<td>Clonazepam (Klonopin)</td>
<td></td>
</tr>
</tbody>
</table>

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**Note:** The table provides a list of standard and new antiepileptic drugs (AED). The standard AEDs include phenytoin, fosphenytoin, carbamazepine, valproic acid, phenobarbital, primidone, ethosuximide, and various benzodiazepines. The new AEDs include gabapentin, lamotrigine, topiramate, levetiracetam, oxcarbazepine, zonisamide, felbamate, pregabalin, and tiagabine.
Newer AED (3rd generation)

- Rufinamide (Banzel)
- Lacosamide (Vimpat)
- Perampanel (Fycompa)
- Clobazam (Onfi)
- Eslicarbazepine (Aptiom)
- Brivaracetam (Briviact)
- Cannabidiol (Epidiolex)
Seizure Management

Dextrose Administration – Adult

IV Thiamine 100 mg

Dextrose – 50 ml D50W IV
Seizure Management

Actively Seizing Pregnant Patient

Suspected Eclampsia

Magnesium Sulfate – 1 gram / min until the seizure stops (maximum of 4 gram)

Use a Benzodiazepine if the mag Sulfate is not successful in terminating the seizure
First-line (emergent) treatment

- Lorazepam is the drug of choice for IV administration
- Midazolam is the drug of choice for IM administration
- Rectal diazepam can be given when there is no IV access and IM administration of midazolam is contraindicated

<table>
<thead>
<tr>
<th>Drug</th>
<th>Loading Dose</th>
<th>Maintenance Dose</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First-Line Agents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorazepam</td>
<td>0.1 mg/kg up to 4 mg IV at 2 mg/min</td>
<td>n/a; repeat loading dose once if needed</td>
<td>n/a</td>
</tr>
<tr>
<td>Midazolam</td>
<td>0.2 mg/kg up to 10 mg IM</td>
<td>n/a; repeat loading dose once if needed</td>
<td>n/a</td>
</tr>
<tr>
<td>Diazepam</td>
<td>0.2 mg/kg up to 20 mg rectally or 0.1 mg/kg up to 10 mg IV</td>
<td>n/a; repeat loading dose once if needed</td>
<td>n/a</td>
</tr>
</tbody>
</table>
First-line (emergent) treatment

- Efficacy of lorazepam confirmed in 3 trials
  - IV lorazepam superior to IV diazepam

- RAMPART (Rapid anticonvulsant medications prior to arrival trial) (Silbergleit et al NEJM 2012)
  - IM midazolam superior to IV lorazepam for prehospital treatment by paramedics
  - 79 hospitals, >4000 paramedics
  - 893 patients with convulsive seizures > 5 min
  - IV lorazepam 2-4 mg versus IM midazolam 5-10 mg
  - Successful seizure termination: 73.4% (IM) versus 63.4% (IV)
  - More rapid administration of IM vs IV (1.2 min vs. 4.8 min)
  - Rate of hospitalization lower with IM vs IV (57.6%, vs. 65.6%)
Seizure Management - other non-IV treatments

Diastat – Rectal Valium (Diazepam) Gel
Used by family members of patients with frequent seizures.
May see this when arriving on scene.
MAD DEVICE
Mucosal atomization device
Used for Intranasal (IN) med administration of midazolam or lorazepam
SEIZURE
STATEWIDE ALS PROTOCOL

Initial Patient Contact - See Protocol #201
If history/evidence of trauma, maintain c-spine stabilization
(Follow C-Spine Immobilization Protocol if indicated)
Administer Oxygen
Manage Airway/Ventilate, if needed
Monitor ECG/Pulse Oximetry, if seizure permits
Initiate IV/IO NSS, if possible

Ongoing seizure activity

YES

Prior history of seizure disorder

YES

Check Glucose Meter
If glucose < 60 mg/dL, Administer Dextrose

Adult Patient
Dextrose 25 gm IV (10-50%)
OR Glucagon 1mg IM, if available

Pediatric Patient ≤ 14 yr
25% Dextrose 2 mL/kg IV
(OR 10% Dextrose 5 mL/kg)
If no access, give Glucagon IM

Seizure Continues

YES

Administer Anticonvulsant

Pregnant Patient (Eclampsia)
Magnesium SO₄, if available
1 g/min IV until seizure stops (maximum 4 g)

Adult Patient Options:
(Choose one)
TITRATE UNTIL SEIZURE STOPS
Lorazepam 2 mg IV/IO/IN
(0.1 mg/kg, max 2 mg/dose); may repeat every 5 minutes until maximum of 4 mg
Diazepam 5-10 mg IV/IO
(0.1 mg/kg); may repeat every 5 minutes until maximum of 0.3 mg/kg
Midazolam 5 mg IM
Or 1-5 mg IV/IO/IN/IM
(0.05 mg/kg); may repeat every 5 minutes until maximum of 0.1 mg/kg

Pediatric Patient Options:
(Choose one)
TITRATE UNTIL SEIZURE STOPS
Lorazepam 0.1 mg/kg IV/IO/IN
(maximum 2 mg/dose)
may repeat every 5 minutes until maximum of 4 mg
Diazepam 0.3 mg/kg IV
(0.5 mg/kg PR)
may repeat every 5 minutes until maximum of 0.6 mg/kg
Midazolam 0.15 mg/kg IM
Or 0.1 mg/kg IV/IO/IN
may repeat every 5 minutes until maximum of 0.2 mg/kg IV
Assess for Fever

Contact Medical Command
Vagus nerve stimulation

Traditional magnet-manual

New model with autostimulator
VNS and acute seizure management

- Find out if the patient has a VNS implanted: history, card, feel chest
- Find the magnet
- Give a magnet stimulation if the patient is having an aura or a seizure: swipe across chest (generator) for 1s
- Stop stimulation: hold magnet for longer period or tape it over generator
Further work-up (usually in hospital or as outpatient)

- **Syncope:**
  - Echocardiography
  - Ambulatory ECG monitoring
  - Carotid sinus massage: controversial
  - Cardiac electrophysiology studies

- **Seizure:**
  - EEG: routine, ambulatory, video-EEG monitoring
  - Neuroimaging: CT, MRI
Conclusions

- Transient loss of consciousness can occur due to various causes, with syncope and seizures being the most common. It is important to distinguish between these two conditions as the management is different.

- Although a variety of tests can help establish a definitive diagnosis in most patients, several clinical clues are helpful in making this distinction in the prehospital setting.

- Emergency medical service providers should be aware of the clinical differences between syncope and epileptic seizures, as well as the initial management of both conditions in order to provide appropriate care and avoid harming the patient.