

Chapter 18, Neurologic Emergencies

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1. Introduction to Neurologic Emergencies

- neurologic emergencies include strokes, seizures, headaches, and altered mental status [\[2\]](#).
- Understanding the nervous system is important [\[2\]](#).
- Stroke is a major cause of death and disability [\[3\]](#).
- New treatments are available for stroke [\[5\]](#).
- Seizures and altered mental status can indicate brain disorders [\[6\]](#).

2. Anatomy and Physiology of the Nervous System

- The brain controls body functions like breathing and speech [\[11\]](#).
- There are three main brain parts: the brain stem, cerebellum, and cerebrum [\[13\]](#).
- The cerebrum is the largest part [\[14\]](#).
- The brain stem manages basic functions like breathing and blood pressure [\[15\]](#).
- The cerebellum coordinates muscle and body movements [\[15\]](#).

- Messages travel through nerves and the spinal cord [21].

Brain Part	Location	Functions
Brain Stem	Located below the cerebrum	Blood pressure, breathing, swallowing, pupil size
Cerebellum	Located below the cerebrum	Muscle and body coordination
Cerebrum	Largest part, above cerebellum	Emotion, thought, sensation, movement, sight, speech

3. Common Neurologic Conditions: Headaches

- Headaches are a frequent complaint [30].
- They can be a symptom or a condition itself [31].
- Most headaches are not caused by serious issues [32].
- tension headaches are caused by muscle contractions from stress [34].
- migraine headaches involve changes in blood vessels [36].
- Migraines can cause pounding pain, nausea, and visual changes [37].
- sinus headaches result from fluid in sinus cavities [40].
- Serious conditions like hemorrhagic stroke or brain tumors can cause headaches [42].

Headache Type	Cause	Pain Description	Associated Symptoms	Emergency Care Needed
Tension	Muscle contractions (stress)	Squeezing, dull, ache	Usually none	Usually no
Migraine	Blood vessel size changes	Pounding, throbbing, pulsating	Nausea, vomiting, visual warning signs	Yes

Sinus	Fluid in sinus cavities	Pressure	Nasal congestion, cough, fever (cold-like)	Usually no
Serious (e.g., Hemorrhagic Stroke, Brain Tumor, Meningitis)	Various, serious conditions	Severe	Varies, can include fever, seizures, altered mental status	Yes

4. Common Neurologic Conditions: Stroke (CVA)

- A stroke is when blood flow to the brain is interrupted [\[43\]](#).
- This interruption causes loss of brain function [\[43\]](#).
- There are two types of stroke: ischemic and hemorrhagic [\[44\]](#).
- ischemic stroke is most common, accounting for 87% [\[45\]](#).
- ischemic strokes are caused by a thrombus or emboli [\[47\]](#).
- atherosclerosis often causes ischemic strokes [\[48\]](#).
- hemorrhagic stroke accounts for 13% of strokes [\[48\]](#).
- hemorrhagic strokes result from bleeding in the brain [\[49\]](#).
- High blood pressure increases the risk of hemorrhagic stroke [\[50\]](#).
- TIAs (transient ischemic attacks) are temporary stroke symptoms [\[52\]](#).
- TIAs are warning signs for a larger stroke [\[53\]](#).

Stroke Type	Cause	Percentage of Strokes	Description
Ischemic	Thrombus or emboli	87%	Blood flow blocked by a clot
Hemorrhagic	Bleeding inside the brain	13%	Blood vessel ruptures and bleeds into brain tissue

5. Signs and Symptoms of Stroke

- General stroke signs include facial drooping [56].
- Sudden weakness or numbness on one side is common [56].
- Decreased movement or sensation can occur [57].
- Lack of coordination or balance may be present [57].
- Vision problems like sudden loss or double vision can happen [57].
- Difficulty swallowing may occur [58].
- Patients may have a decreased level of responsiveness [58].
- Speech disorders, including aphasia, are possible [58].
- aphasia is difficulty speaking or understanding words [58].
- Slurred speech can be a symptom [58].
- Sudden and severe headache can occur [58].
- Confusion or dizziness may be present [58].
- Weakness, combativeness, or restlessness can happen [58].
- Tongue deviation is a possible sign [58].
- Coma can occur [58].
- Left hemisphere strokes may cause aphasia and right-side paralysis [59].
- Right hemisphere strokes may cause left-side paralysis [62].
- Patients with right hemisphere strokes may neglect problems or lack pain sensation [62].

6. Conditions Mimicking Stroke and Intracranial Bleeding

- Some conditions can look like a stroke [64].
- Hypoglycemia (low blood sugar) can mimic stroke [64].
- The post-ictal state after a seizure can also look like stroke [64].
- Subdural or epidural bleeding can present similarly [64].
- Trauma to the head can cause intracranial bleeding [66].
- Epidural bleeding is outside the dura and under the skull [66].
- Subdural bleeding is beneath the dura but outside the brain [66].

Condition Mimicking Stroke	Description
Hypoglycemia	Low blood sugar levels

Postictal State	The state immediately following a seizure
Subdural Bleeding	Bleeding beneath the dura, outside the brain
Epidural Bleeding	Bleeding outside the dura and under the skull

7. Common Neurologic Conditions: Seizures

- A seizure is a neurologic event from abnormal electrical brain activity [67].
- Epilepsy affects 3.5 million people in the US [67].
- Seizures fall into two groups: generalized and partial [68].
- Partial seizures are also called focal seizures [69].
- Generalized seizures, or tonic-clonic seizures, affect both brain hemispheres [70].
- They involve unconsciousness and severe muscle twitching [70].
- Generalized seizures typically last several minutes [70].
- Absence seizures involve brief loss of consciousness without motor changes [71].
- Focal seizures can have impaired awareness [73].
- Focal seizures may cause numbness, weakness, or visual problems [74].
- They can also cause twitching or brief paralysis [74].
- Focal seizures with impaired awareness affect the patient's interaction with the environment [75].
- Lip smacking, eye blinking, or jerking may occur [76].
- Patients may smell unusual odors or see hallucinations [77].
- An aura is a warning sign before a seizure [78].
- Auras can include visual changes or hallucinations [78].
- Not all seizures are preceded by an aura [80].
- status epilepticus is a seizure lasting over five minutes or recurring without regaining consciousness [84].

Seizure Group	Type	Description	Consciousness Affected	Motor Activity
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Generalized	Tonic-Clonic	Abnormal electrical discharges in both hemispheres	Yes	Severe muscle twitching
Generalized	Absence	Brief lapse of consciousness, seems to stare	Yes	No change
Partial/Focal	Focal (Aware)	Abnormal discharges from temporal lobe	No	Twitching, brief paralysis
Partial/Focal	Focal (Impaired Awareness)	Altered mental status, does not interact normally with environment	Yes	Varies

8. Causes and Management of Seizures

- Common seizure causes include congenital, metabolic, or febrile conditions [\[86\]](#).
- Epileptic seizures are often controlled with medication [\[87\]](#).
- Medications include Keppra, Dilantin, and phenobarbital [\[88\]](#).
- Recognizing a seizure and the post-ictal state is important [\[89\]](#).
- The post-ictal state occurs after the seizure stops [\[90\]](#).
- Muscles relax and breathing may be labored during the post-ictal state [\[90\]](#).
- Weakness on one side (hemiparesis) can resemble a stroke [\[90\]](#).
- Lethargy and confusion are common in the post-ictal state [\[91\]](#).
- Seizures can be mistaken for syncope (fainting) [\[92\]](#).
- Fainting typically happens when standing and lacks a post-ictal state [\[92\]](#).
- Prolonged or recurring seizures are life-threatening [\[85\]](#).

9. Common Neurologic Conditions: Altered Mental Status

- Altered mental status is a common neurologic emergency besides stroke and seizure [93].
- Many things can cause altered mental status [94].
- Causes include hypoglycemia (low sugar) and hypoxia [94].
- Intoxication and delirium are possible causes [94].
- Drug overdose can lead to altered mental status [94].
- An unrecognized head injury can be a cause [94].
- Brain infection or tumors can cause it [94].
- Body temperature abnormalities may lead to altered mental status [94].
- Poisoning is also a possible cause [94].

Causes of Altered Mental Status
Hypoglycemia (Low blood sugar)
Hypoxia
Intoxication
Delirium
Drug overdose
Unrecognized head injury
Brain infection
Body temperature abnormalities
Brain tumor
Poisoning

10. Patient Assessment in Neurologic Emergencies

- Patient assessment starts with scene size-up [96].

- Determine if it's a medical or trauma situation [96].
- Perform a rapid primary assessment for life threats [98].
- Gather history from family or bystanders if the patient is unresponsive [99].
- Look for clues explaining altered mental status [99].
- Obtain vital signs, including blood glucose levels [102].
- High blood pressure or erratic respirations can indicate intracranial pressure [102].
- Unequal pupil size suggests pressure in the brain [104].
- Stroke assessment scales are used [107].
- BE FAST is a stroke mnemonic [108].
- The Cincinnati and Los Angeles Pre-hospital Stroke Scales are common [109].
- The glasgow coma scale (GCS) assesses neurologic status [111].
- The GCS includes eye opening, verbal response, and motor response [117].
- GCS scores range from 3 to 15 [118].

Assessment Scale	Components
BE FAST Mnemonic	Balance, Eyes, Facial droop, Arm drift, Speech, Time
Cincinnati Pre-hospital Stroke Scale	Facial droop, Arm drift, Speech
Los Angeles Pre-hospital Stroke Screen	Various criteria assessing stroke probability
Three-Item Stroke Severity Scale	LAG
Los Angeles Motor Scale	LAMS
Glasgow Coma Scale (GCS)	Eye opening, Best verbal response, Best motor response

11. Reassessment and Treatment Principles

- Reassessment includes checking ABCs and vital signs [119].
- Compare current findings to the initial assessment [120].
- Watch for changes in pulse, blood pressure, respirations, and GCS score [121].
- Notify the hospital of the patient's condition [121].
- For suspected stroke, doctors need to check for bleeding [122].
- Clot-dissolving medicine may be given if no bleeding is present [123].
- Notify the hospital about the last normal time for a stroke patient [124].
- Seizure patients need hospital evaluation [125].
- Protect seizing patients from harm [126].
- Maintain an open airway and provide oxygen for seizures [126].
- Consider spinal immobilization for head or neck trauma [126].
- For status epilepticus, provide ventilations and transport quickly [127].
- Sudden severe headaches, especially with fever or altered mental status, are concerning [128].
- For migraines, assess for serious conditions [129].
- Provide high-flow oxygen if tolerated for migraines [130].
- Keep the environment dark and quiet for migraine transport [131].
- Avoid using sirens or lights during migraine transport [131].
- For stroke care, support ABCs and transport to a stroke center [132].
- Maintain oxygen saturation of at least 94% [133].
- Fibrinolytic therapy can reverse stroke symptoms if given early [135].
- For seizures, assess and treat ABCs [136].
- Protect seizing patients from harm [137].
- For altered mental status, determine the cause [138].
- Spinal immobilization and airway support may be needed [138].
- Transport patients to the correct facility [139].

12. Review Questions and Key Takeaways

- Dysfunction causing slow pulse, irregular breathing, and dilated pupils likely indicates brain stem issues [142]. The brain stem controls these basic functions [145].
- An acute ischemic stroke is caused by a blocked cerebral artery [146]. This block is from a thrombus or emboli [147].

- Sudden severe headache with high blood pressure and unresponsiveness suggests a hemorrhagic stroke [148]. This is often due to a ruptured cerebral artery [151].
- TIA symptoms resolve within 24 hours, unlike some ischemic stroke symptoms [151].
- Slurred speech difficult to understand is called dysarthria [152].
- Severe twitching of all muscles lasting minutes or longer is a generalized seizure [154].
- Prompt transport for stroke patients is crucial for potential clot-busting medication [156].
- The Cincinnati pre-hospital stroke scale includes facial symmetry, arm drift, and speech assessment [157].
- A patient opening eyes to name, making incomprehensible sounds, and withdrawing from pain has a GCS of 9 [158].
- Patients with severe migraines should be transported without lights and sirens [160]. Oxygen can be given if tolerated [162].