Stroke

Pea Ridge Fire Department
EMS refresher

Introduction

- Two of the top 10 causes of death in 2015 were neurologic.
  - Stroke is fifth leading cause of death in the United States.
  - Alzheimer disease is sixth leading cause of death.

Introduction

- Signs and symptoms found during assessment may indicate possible conditions.
- Consider the likelihood of those conditions to ground your conclusions.

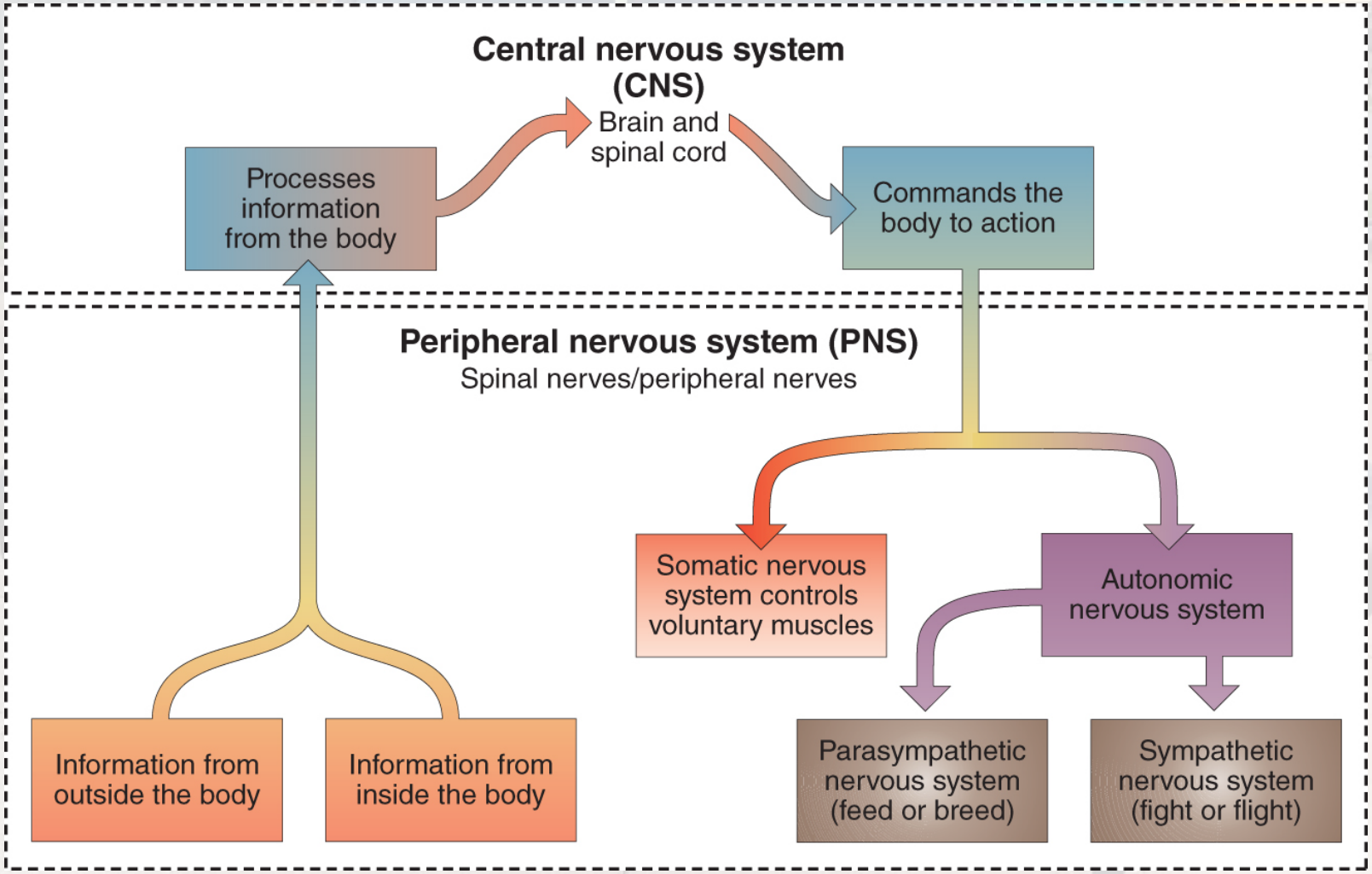
Introduction

- Patients may be in danger.
  - Eyelids do not blink.
  - Larynx does not cause gagging and coughing.
  - Body does not seek a position of comfort.
  - Tongue goes slack.
  - Airway is at risk.

Structure of the Nervous System

- Major structure divided into two categories:
  - Central nervous system (CNS)
    - Thought
    - Perception
    - Feeling
    - Autonomic body functions
  - Peripheral nervous system (PNS)
    - Communication between the brain and the body

Structure of the Nervous System



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The Brain

- Lobes
  - Occipital lobe: scans through images
  - Temporal lobe: attaches name to image
  - Frontal lobe: controls voluntary motion
  - Parietal lobe: perceives touch and pain

The Brain

- Diencephalon and brainstem
  - Diencephalon
    - Filters out unneeded information
  - Brainstem
    - Midbrain: regulates level of consciousness (LOC)
    - Frees the cerebral cortex for higher activities

The Brain

- Hypothalamus and pituitary gland
  - Limbic system: generates rage and anger
  - Hypothalamus: Controls pleasure, thirst, hunger
  - Prefrontal cortex: mediates all emotions

The Brain

- Cerebellum
  - Located in posterior, inferior area of the skull
  - Manages complex motor activity
  - Learned behaviors transferred from the frontal lobe

Patient Assessment

- Brain is sensitive to change in temperatures and levels of oxygen and glucose.
  - Small alterations can affect its function.
  - Brain is resilient to internal environmental changes.

Patient Assessment

- Perform all the general steps, including:
  - Scene safety
  - Taking standard precautions
  - Considering the mechanism of injury
  - Determining whether medications, alcohol, or other substances were taken
    - How much and when

Patient Assessment

- A good assessment provides the backbone to excellent patient care.
  - Be curious.
  - Be inquisitive.
  - Be adaptable.
  - Avoid tunnel vision.

Scene Size-up

- Take standard precautions.
  - Assessment of physical environment begins at dispatch.
  - The patient's location may place you in a dangerous environmental situation.

Scene Size-up

- Take patient symptoms into account when assessing scene safety.
  - If an entire family is complaining of headaches, consider carbon monoxide poisoning.
- If the nearest stroke center is more than 1 hour away, request air medical transport early.

Primary Survey

- Form a general impression.
  - Where is the patient?
  - In distress or pain?
  - Position?
  - Inside or outside?
  - Obvious injuries?
  - Environment?
  - Drug paraphernalia?
  - Living conditions?
  - Able to walk?
  - Awake and alert?
  - Stable or unstable?

Primary Survey

- Assessing level of consciousness
  - AVPU mnemonic
  - Assessment of orientation
  - Glasgow Coma Scale (GCS)

Primary Survey

- GCS can help determine:
  - How to proceed with patient care
  - What care to give
  - Where to transport patient

Primary Survey

- Measuring response to pain
  - Do not cause harm.
  - Methods of painful stimuli include:
    - Pressure to fingernail
    - Pressure to the supraorbital foramen

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Primary Survey

- Pain response
  - Does patient wake up?
  - Abnormal movement?
    - Decorticate posturing
    - Decerebrate posturing

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Courtesy of Chuck Sowerbrower, MED, NREMT-P.

Primary Survey

- Airway, breathing, and circulation
  - Nerves responsible for airway control include:
    - Trigeminal, glossopharyngeal, vagus, and hypoglossal
  - Allow for:
    - Swallowing
    - Controlling the tongue
    - Slightly contracted muscles in hypopharynx

Primary Survey

- Airway, breathing, and circulation (cont'd)
  - If the patient is unresponsive, assess the airway.
  - A common presentation is trismus (clenched teeth).
  - Trismus may indicate:
    - A seizure in progress
    - Severe head injury
    - Cerebral hypoxia

Primary Survey

- Airway, breathing, and circulation (cont'd)
  - If trismus is noted:
    - Determine if the patient can be ventilated.
    - If ventilation is poor and the patient is breathing on his or her own, attempt a nasotracheal airway.
    - If you are unsuccessful, consider a sedative/paralytic agent.
    - If paralytics are unavailable, transtracheal airway management is the only option.

Primary Survey

- Airway, breathing, and circulation (cont'd)
  - Provide routine hyperventilation only to patients with both:
    - Documented unconsciousness
    - Signs of increased intracranial pressure (ICP)
  - Check rate and rhythm of breathing.

Primary Survey

Table 18-3 Respiratory Patterns

Waveform	Pattern	Description	Causes
	Eupnea	Regular rate and pattern; inspiration and expiration are equal	Normal
	Tachypnea	Increased respiratory rate Regular pattern	Stimulants Exercise Excitement
	Bradypnea	Decreased respiratory rate Regular pattern	Narcotics
	Apnea	Absence of breathing	Severe hypoxia Depressants
	Hyperpnea	Rapid, regular, deep respirations	Stimulants Overdose Exercise
	Cheyne-Stokes respirations	Gradual increases and decreases in respirations with periods of apnea	Pre-death pattern Brainstem injury
	Biot/ataxic respirations	Irregular respirations with periods of apnea; unpredictable	Brainstem injury
	Kussmaul respirations	Extreme tachypnea and hyperpnea	Acidosis Diabetic ketoacidosis
	Apneustic respirations	Prolonged inspiratory phase with shortened expiratory phase and bradypnea	Brainstem injury

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Primary Survey

- Circulation
  - Look for signs of increased intracranial pressure
    - Cushing reflex
    - Decorticate posturing
    - Decerebrate posturing
    - Biot respirations
    - Apneustic respirations
    - Cheyne-Stokes respirations
    - Unresponsive and dilated pupils or anisocoria

Primary Survey

- Circulation (cont'd)
  - As the ICP rises:
    - Blood flow to the brain diminishes.
    - The heart increases contraction force.
    - Systolic pressure rises.
    - The ability to send signals is damaged.
    - Diastole falls.
    - The ability to control respiratory and pulse rates is damaged; both are decreased.

Primary Survey

- Transport decision
  - Consider how to transport:
    - Complete a rapid, full-body scan *or*
    - Complete a secondary assessment and evaluate only the area of patient complaint.

Primary Survey

- Transport decision (cont'd)
  - A rapid, full-body exam should be performed with:
    - Abnormal assessment
    - Significant MOI/NOI
    - Any patient you suspect may have a major problem
  - A secondary assessment is appropriate if the patient is stable.

History Taking

- If the patient is stable, obtain history.
  - Look for signs and symptoms of altered mental status or seizure.
  - Evaluate the patient's speech.
  - Ask about over-the-counter medications.

History Taking

- If patient has had a seizure:
  - Look for obvious explanations.
- For headache, determine:
  - Patient's level of stress
  - Likelihood of infection
  - History of headaches
- Talk to the patient's family or friends.

History Taking

- If the patient is responsive, obtain a SAMPLE history.
  - History of seizures
  - For first seizure:
    - Suspect a grave condition.
    - Determine whether the patient takes medications that lower the blood glucose level.
    - Inquire about drug use and exposure to toxins.

Secondary Assessment

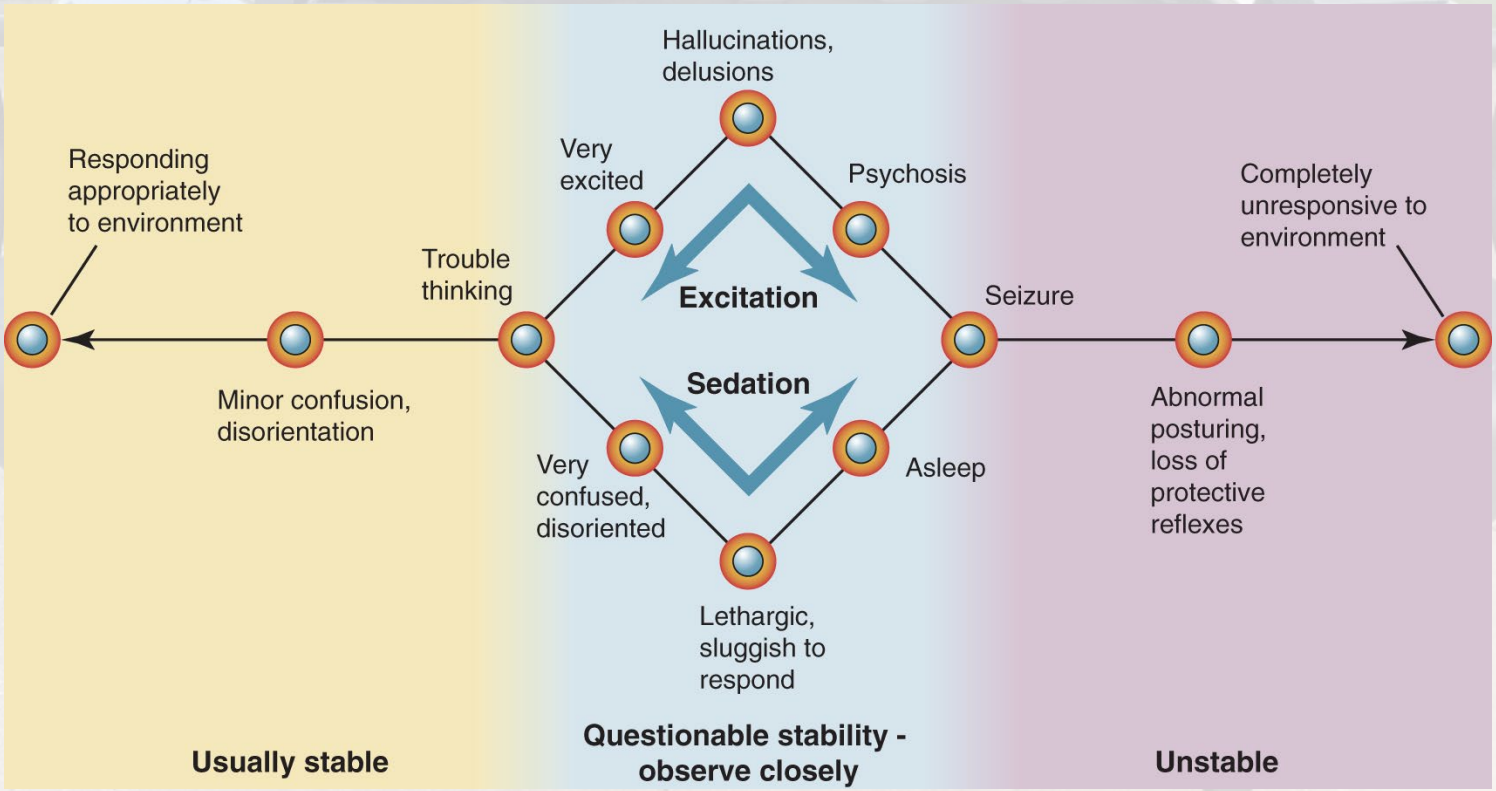
- Assess the head first.
- Note the symmetry of the face.
  - Ptosis: drooping or sagging of eyelids
  - Bell palsy or stroke

Secondary Assessment

- Notable neurologic exam findings:
  - Nausea and vomiting
  - Urinary and/or fecal incontinence
  - Signs of recent venipuncture marks

Secondary Assessment

- Level of consciousness
  - There can be many variations.



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Secondary Assessment

- Common reality
  - Senses determine what is real
  - Hallucinations: Feelings of sound, sight, touch, and taste that are entirely within patient's mind
  - Delusions: Thoughts or perceived abilities that are not based in a common reality

Secondary Assessment

- Common reality (cont'd)
  - Psychosis is an inability to determine what is real and what is inside one's mind.
    - Patients may be unpredictable.
    - Ensure your safety.
  - Medication may be needed to help manage psychosis.

Secondary Assessment

- Changes in mood or tempo of nervous system should alert you to changes in the patient's neurologic system.
  - Ask the patient how he or she feels.
  - Ask the patient how easy it is for him or her to think.

Secondary Assessment

- Corneal reflex
  - This reflex determines intact cough and gag reflexes.
  - Tap between the patient's eyes.
    - Patients with reflexes will blink reflexively.
    - If patient does not blink or twitch, assume cough or gag reflex is not intact.
- Pupillary response
  - Examine for shape, size, and response.

Secondary Assessment

- Blood glucose level
  - Check for all patients with altered LOC.
  - Normal reading is 60 to 120 mg/dL.
  - Below 10 mg/dL is usually fatal.
  - Below 30 mg/dL or above 300 mg/dL will cause confusion.

Secondary Assessment

- Cranial nerve functioning
  - Abnormal functioning may occur with
    - Stroke
    - Trigeminal neuralgia
    - Myasthenia gravis

Secondary Assessment

- Speech
  - Listen to the quality of the patient's speech.
    - Slurring
    - Word choice
    - Ability to recognize objects

Secondary Assessment

- There are three main forms of aphasia.
  - Inability to understand speech with ability to speak clearly
  - Inability to speak clearly with ability to understand speech
  - Inability to follow commands or answer questions
- Note if the patient speaks clearly but gives you incorrect answers.

Secondary Assessment

- Hemiparesis and hemiplegia
  - Hemiparesis is weakness of one side of the body.
  - Hemiplegia is paralysis of one side of the body.
  - The patient may have weakness on one side of the body and facial droop on the other side.

Secondary Assessment

- Examine the function of the cerebellum.
  - Have patient close eyes and hold out arms.
  - If stroke, one arm may drift away from the other.

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Secondary Assessment

- Gait and posture
  - Gait refers to walking patterns.
  - Ataxia is an alteration of ability to perform coordinated motions.
  - Assess by asking the patient to walk several steps.
    - Posture may become rigid.

Secondary Assessment

- Bizarre movement
  - Myoclonus: rapid, jerky muscle contraction that occurs involuntarily
  - Dystonia: a part of the body contracts and remains contracted

Secondary Assessment

- Alterations in smooth motion
  - Rigidity: stiffness of motion
  - Tremors: fine, oscillating movement
    - Rest tremor
    - Intention tremor
    - Postural tremor

Secondary Assessment

- Alterations in smooth motion (cont'd)
  - Seizure: larger, less focused movement
    - Tonic activity
    - Clonic activity

Secondary Assessment

- Sensation
  - Nervous system conditions can alter the ability to feel pain, temperature, pressure, or light touch.
  - Paresthesia is the sensation of numbness or tingling.
  - In anesthesia, the patient has no feeling within a body part.

Secondary Assessment

- Vital signs
  - Document:
    - Pulse rate, rhythm, and quality
    - Respiratory rate, rhythm, and quality
    - Blood pressure
    - Skin temperature, color, and condition
    - Pupil size and reactivity

Secondary Assessment

- Vital signs (cont'd)
  - Ensure maintenance of a systolic blood pressure of at least 110 to 120 mm Hg.
  - Ensure adequate respiratory rate and pattern.
  - Ensure effective pulse rate and rhythm.
  - If hypothermia or hyperthermia is suspected, use a thermometer to establish temperature.

Reassessment

- Communication and documentation
  - Notify the receiving facility of:
    - Chief complaint and assessment findings
    - Time the patient was last seen healthy
    - Findings of neurologic examination
    - Anticipated time of arrival at the hospital

Reassessment

- Document:
  - Time of the onset
  - Findings from stroke scale and GCS score
  - Any interventions performed
  - Any change in patient during transport
  - Reason for choice of hospital

Reassessment

- For patients who have had a seizure, document:
  - Description of seizure activity
  - Bystanders' comments
  - Onset and duration
  - Noticing an aura
  - Evidence of trauma
  - Interventions performed
  - History of seizures

Reassessment

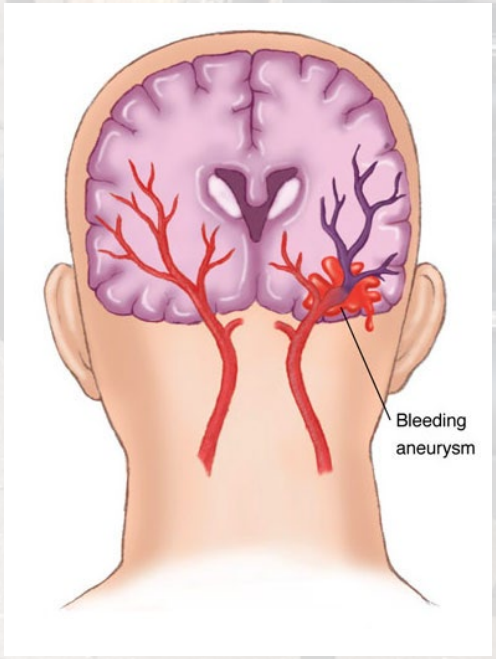
- When documenting interventions, include:
  - Time of each intervention
  - How the patient responded
  - What the findings showed

Stroke

- Blood supply to areas of the brain is interrupted, causing ischemia.
- The goal of treatment is early recognition and rapid, appropriate intervention.
  - “Time is brain.”

Pathophysiology of Stroke

- Neurologic conditions can have a vascular origin.
  - Typically result of emboli or aneurysms



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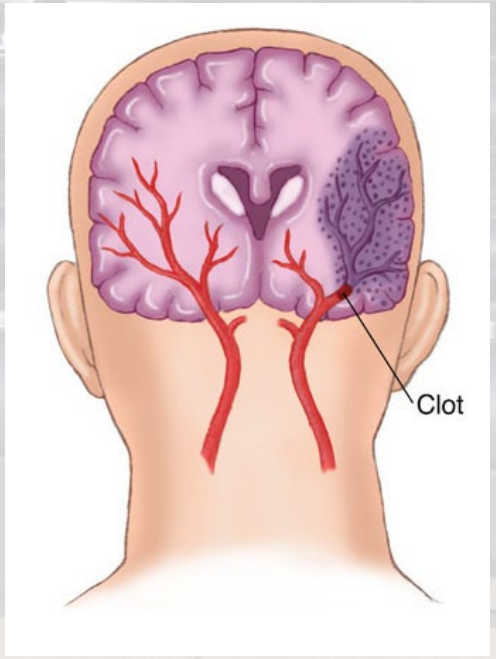

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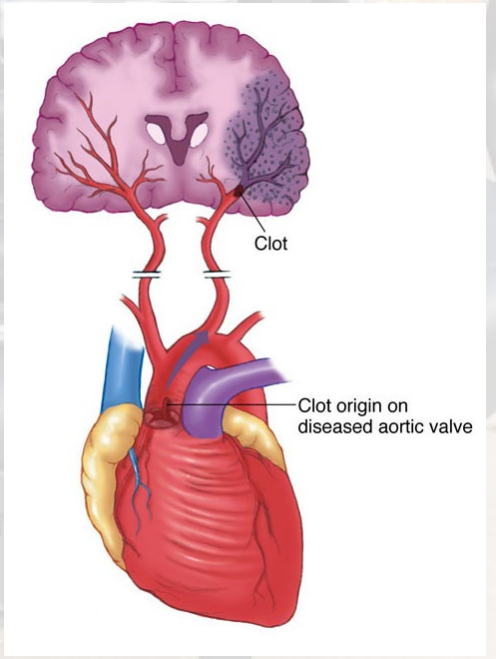

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Pathophysiology of Stroke

- Aneurysm development process:
  - Small tears occur within the arterial wall.
  - Blood enters between the layers of the artery.
  - Pressure builds up, and the tear increases.
  - If damage is severe, the artery can leak or fail.

Pathophysiology of Stroke

- Ischemic stroke
  - Also called an occlusive stroke.
  - A blood vessel becomes blocked, causing tissue beyond it to become ischemic.
  - The severity is dictated by:
    - Artery involved
    - Portion of the brain being denied oxygen

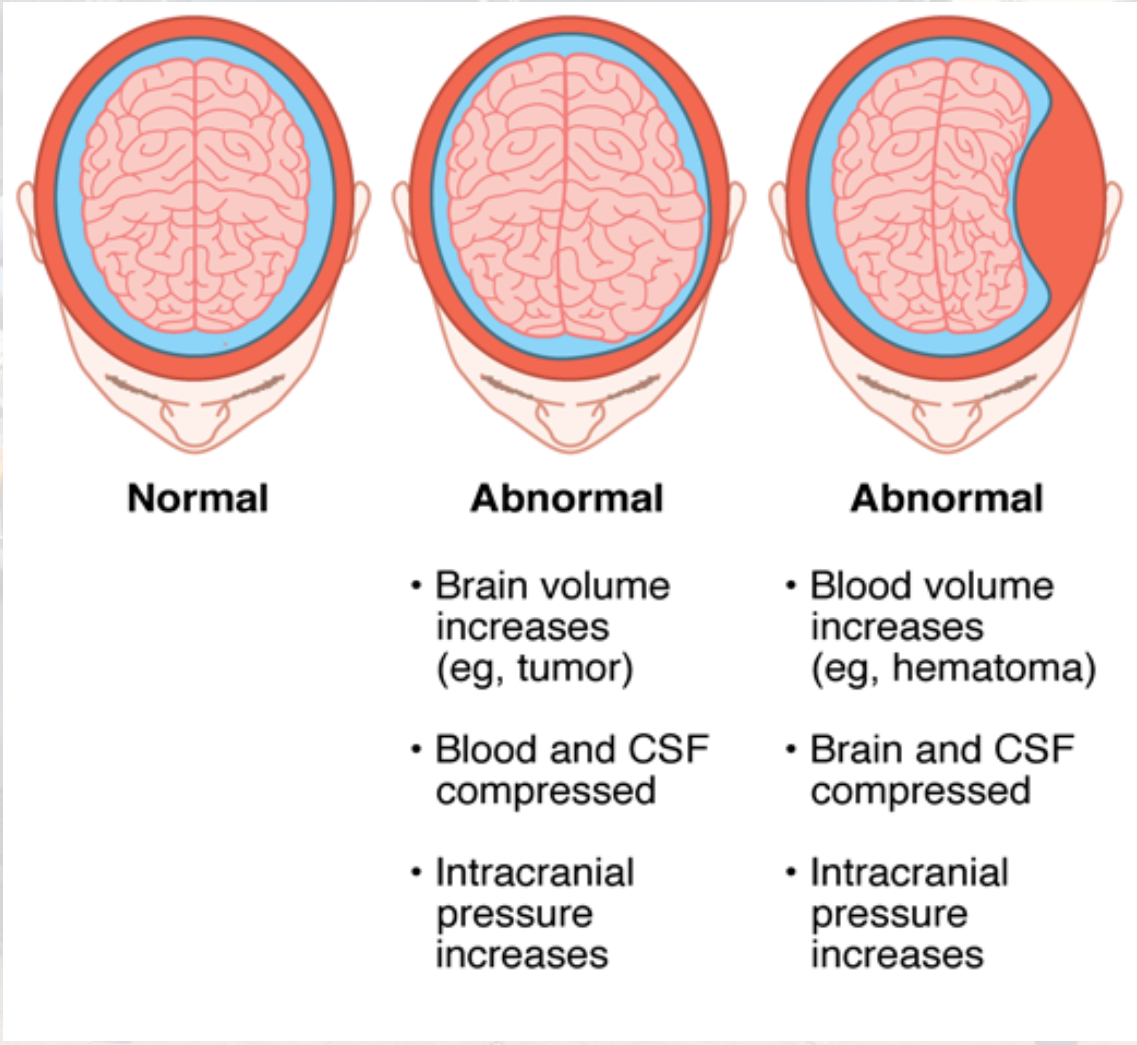
Pathophysiology of Stroke

- Hemorrhagic stroke
  - Tend to get worse over time.
  - Bleeding within the cranium causes increased ICP and brainstem herniation.
  - The patient will describe the primary symptom as the “worst headache of my life.”

Pathophysiology of Stroke

- When ICP climbs and remains high:
  - The brain may become ischemic because of a lack of blood supply.
  - Cerebral perfusion pressure begins to fall.
  - CPP = MAP – ICP.
    - MAP: mean arterial pressure
    - MAP typically 80 to 90 mm Hg

Pathophysiology of Stroke



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Pathophysiology of Stroke

- When ICP climbs and remains high (cont'd):
  - Herniation may occur.
    - A shift or displacement of intracranial contents.
    - The brainstem will eventually become compressed.
    - The patient will lose control of his/her functions.

Assessment of Stroke

- Language effects
  - Slurred speech
  - Aphasia
  - Agnosia
  - Apraxia
- Movement effects
  - Hemiparesis
  - Hemiplegia
  - Arm drifting
  - Facial droop
  - Tongue deviation
  - Swallowing difficulties
  - Ptosis
  - Ataxia

Assessment of Stroke

- Sensory effects
  - Headache (hemorrhagic)
  - Sudden blindness
  - Sudden unilateral paresthesia
- Cognitive effects
  - Decreased LOC
  - Difficulty thinking
  - Seizures
  - Coma
- Cardiac effects
  - Hypertension

Assessment of Stroke

- Use FAST mnemonic to assess for stroke:
  - Facial droop
  - Arm drift
  - Speech impairment
  - Time is critical

Management of Stroke

- Begin with the standard care guideline.
- Monitor the patient with an ECG.
- Draw blood for later evaluation.
- Contact medical control if the patient has a fever.
- Allow the patient to remain supine unless hypoxic.

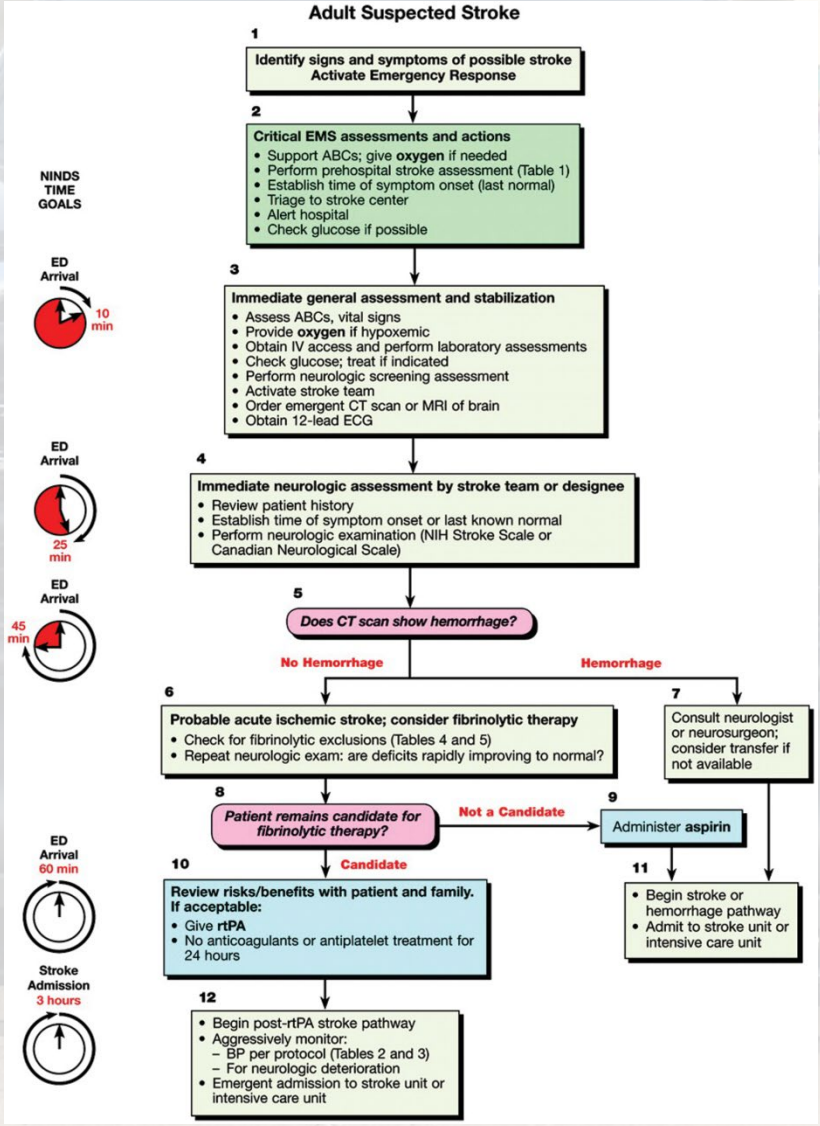
Management of Stroke

- Administer fluids as needed.
- Elevate the patient's head 30°.
- Ensure airway is clear.
- Watch for seizures.
- Monitor blood pressure closely.

Management of Stroke

- High CO_2 level causes vasodilation of cerebral arteries.
- Diminished carbon dioxide lowers ICP.
  - Ventilation decreases ICP by decreasing blood supply.
    - Provide ventilatory support at 20 breaths/min.
    - Maintain an $ETCO_2$ at 30 to 35 mm Hg.

Management of Stroke



Management of Stroke

- EMS providers need to be involved in educating the community about strokes.
- All levels should recognize stroke signs and symptoms.
  - Patient evaluation is needed.
  - Talk with the family or caregivers to gather medical history, discharge instructions, all medications, etc.

Management of Stroke

- Standard stroke care includes:
  - Titrating oxygen therapy to the patient's need
    - Maintain an SpO_2 reading of 94% to 99%.
    - Use other techniques to assess need for oxygen.
- Complete a fibrinolytic checklist.

Management of Stroke

Table 18-8 Sample Prehospital Fibrinolytic Checklist for Stroke

Use this checklist for all patients suspected of having a stroke.

DATE: _____ TIME: _____		Time signs and symptoms began (record time). If unknown, answer the next question.
DATE: _____ TIME: _____		Time patient was last seen to be normal (record time)
_____ mg/dL		Blood glucose level (record number)
_____/_____ Manual Automatic Right arm Left arm		Blood pressure (record readings, circle method and location)
Yes	No	(Check Yes or No for each item.)
❑	❑	Facial droop?
❑	❑	Slurred speech?
❑	❑	Arm drift (eyes closed and held for 10 seconds)?
❑	❑	In the past 7 days, has the patient had a procedure in which an artery was punctured?
❑	❑	In the past 14 days, has the patient had a major operation or serious trauma?
❑	❑	In the past 21 days, has the patient had any bleeding from the gastrointestinal or urinary tract?
❑	❑	In the past 3 months, has the patient experienced an MI, stroke, or head trauma?
❑	❑	When the signs and symptoms began, did the patient have a seizure?
❑	❑	Are current bleeding or clotting problems evident?
❑	❑	Is the patient taking anticoagulant medication?
❑	❑	Does the patient have intracranial bleeding either now or in the past?
❑	❑	Are the patient's signs and symptoms of stroke rapidly improving?

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Management of Stroke

- Transport decisions
  - Transport to stroke centers.
  - Consider air transport if the center is more than 1 hour away.
  - Contact the facility to ensure CT/MRI capabilities are operational.
  - If you suspect hemorrhagic stroke, consider a facility that can perform neurosurgery.

Transient Ischemic Attacks

- Pathophysiology
  - Episodes of cerebral ischemia without permanent damage
  - Many resolve within 1 hour
  - May be a sign of a vascular problem

Transient Ischemic Attacks

- Assessment
  - Same as assessment for stroke
- Management
  - Follow the stroke management guidelines.
  - Encourage the patient to be transported and to talk with his/her physician.

Coma

- Pathophysiology
  - AEIOUTIPS
    - Alcohol, acidosis
    - Epilepsy (seizure), endocrine, electrolytes
    - Insulin
    - Opiates, other drugs
    - Uremia
    - Trauma, temperature
    - Infection
    - Poisoning, psychogenic causes
    - Shock, stroke, syncope, space-occupying lesion, subarachnoid hemorrhage

Coma

- Pathophysiology (cont'd)
  - History of present illness is vital to determine the underlying cause.
    - Determine when the patient was last seen normal.
    - Evaluate the speed of onset.

Coma

- Assessment
  - Cognitive effects
    - Decreasing LOC
    - Confusion
    - Hallucinations
    - Delusions
    - Psychosis
    - Difficulty thinking
    - Sleepiness
  - CNS effects
    - Total unresponsiveness
  - Speech effects
    - Slurred speech
    - Agnosia
    - Apraxia
    - Aphasia
  - Movement effects
    - Ataxia
    - Aphagia
    - Seizures
    - Posturing

Coma

- Management
  - Support vital functions.
  - Gather information about the cause.
    - If you do not know what is wrong with the patient, tell the ED staff what is not wrong.
  - Patients may need:
    - Urine and blood analysis
    - Radiography
    - Computed tomography
    - Magnetic resonance imaging

Thank You !

- Please continue to the next section