STROKE 101 IN THE RURAL ED

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DISCLOSURES

- No Disclosures

STROKE

- Stroke is the 5th leading cause of death in the United States and #1 cause of disability
- Up to 80% of strokes are preventable through risk factor modification
  - Smoking
  - HTN
  - High Cholesterol
  - Obesity
  - Drug or Alcohol Abuse
  - Diabetes
  - Previous Stroke/TIA
  - Afib
  - Sedentary Life Style

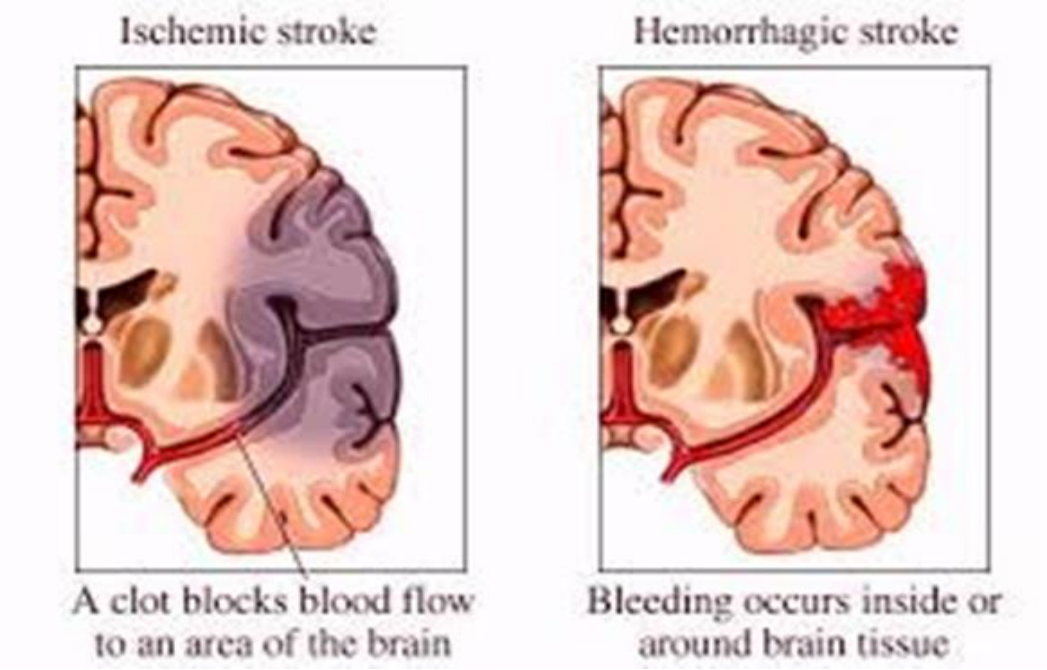
- Strokes can happen at any age (1/3 occur in people under the age of 65)

https://www.strokeassociation.org/en/about-stroke

TYPES OF STROKES

- **Stroke** by definition is classically characterized as a neurological deficit attributed to an acute focal injury of the central nervous system (CNS) by a vascular cause, including cerebral infarction, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH), and is a major cause of disability and death worldwide.

- Hemorrhagic Strokes
- Ischemic Strokes
- Transient Ischemic Attack (TIA)



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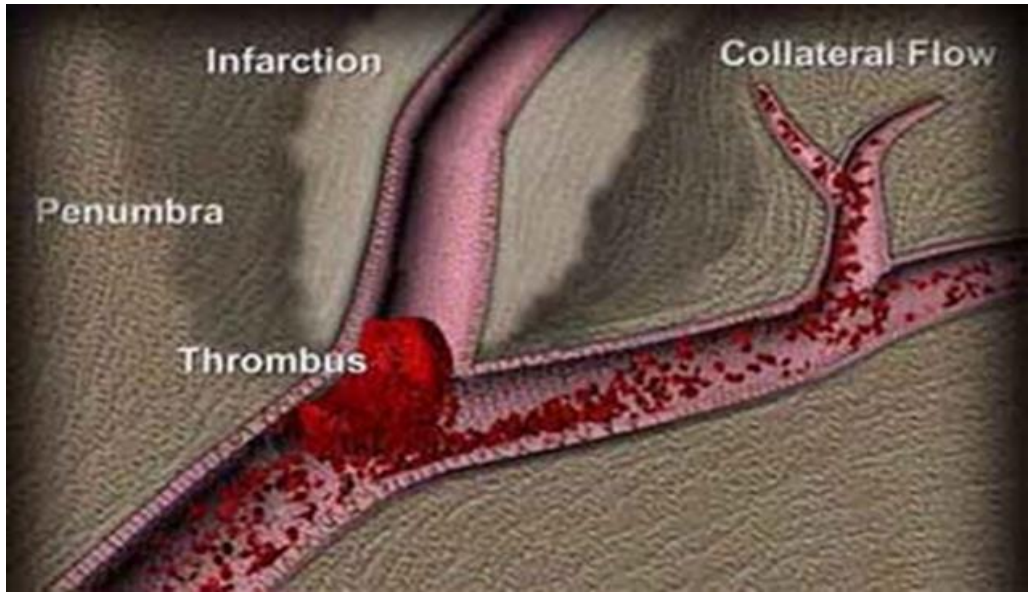
STROKE CLASSIFICATIONS

- Hemorrhagic Stroke
  - Subarachnoid Hemorrhage
  - Intraparenchymal Hemorrhage
- Ischemic Stroke
  - Large Artery Occlusions
  - Lacuna
  - Cardiac Source
  - Undetermined Causes
  - **Treatable if recognized and acted on immediately!!!**



Who knows what the Penumbra is?

HEMORRHAGIC STROKES

- Less common than ischemic strokes with only accounting for 13% of all strokes, however are responsible for about 40% of all stroke deaths

- **Two Types of Hemorrhagic Strokes**
  - ***Intracerebral Hemorrhage***: caused by a blood vessel within the brain bursting and leaking blood into surrounding brain tissue.
    - Causes are typically due to HTN and aging blood vessels
      - Arteriovenous Malformation
  - ***Subarachnoid Hemorrhage***: involves bleeding in the area between the brain and the tissue covering the brain, known as the subarachnoid space
    - Causes are typically due to ruptured aneurysm, bleeding disorders, head injury, and blood thinners.
    - MOST COMMON cause is TRAUMA

SYMPTOMS OF HEMORRHAGIC STROKE

- Severe headache
- Nausea/Vomiting
- Numbness/Tingling
- Abnormal sense of taste
- Change in Alertness
- Difficulty speaking or swallowing
- Difficulty writing or reading
- Loss of coordination/balance
- Weakness or loss of motor skills
- Facial paralysis
- Visual Disturbances

RISK FACTORS FOR HEMORRHAGIC STROKE

- Non-Modifiable
  - Age
  - Ethnicity
  - Family History/Genetics
    - Amyloid angiopathy
      - Form of angiopathy in which amyloid deposits form in the walls of the blood vessels of the central nervous system
    - Vascular Malformations
      - AVM
  - Anticoagulant/Antiplatelet Use
- Modifiable
  - Hypertension
  - Alcohol Abuse
  - Tobacco Abuse
  - Drug Abuse
  - Low LDL
  - Low Triglycerides

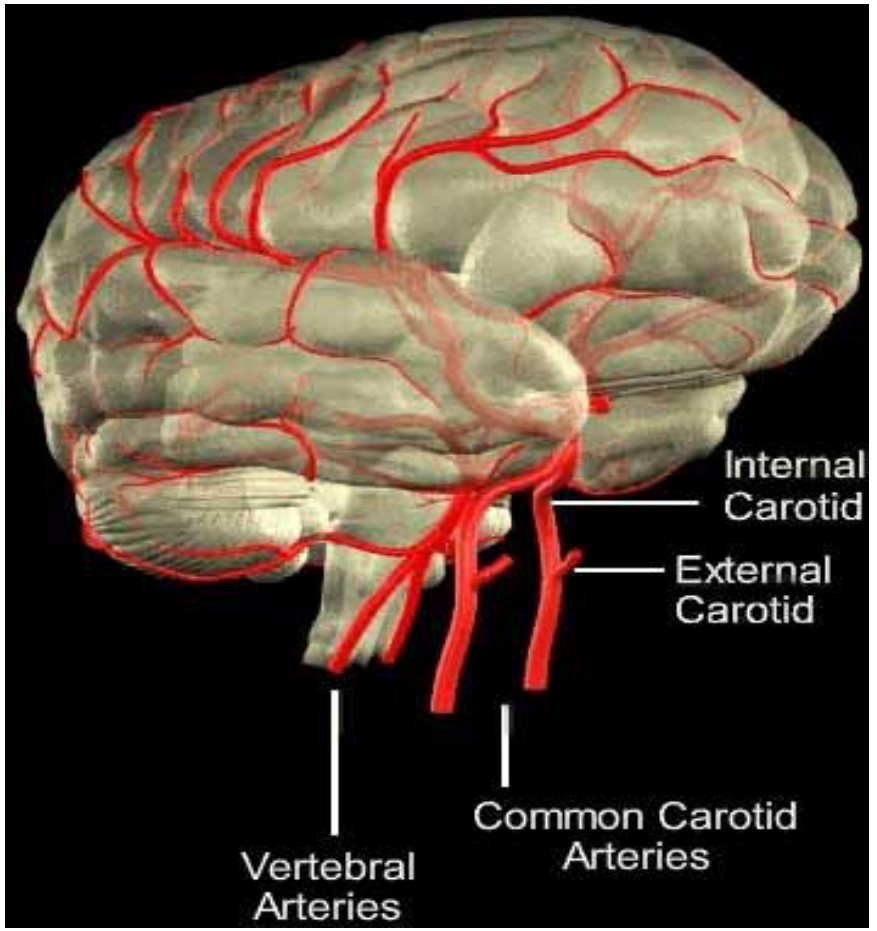
ISCHEMIC STROKES

- Account for about 87% of all stroke cases!!

- Occur as a result of an obstruction within a blood vessel supplying blood to the brain
- Main cause is atherosclerosis
- Two Types of Obstruction
  - Cerebral Thrombosis
    - Blood clot that develops at the clogged part of a vessel
  - Cerebral embolism
    - Blood clot that forms at another location in circulatory system. Piece of the blood clot breaks loose, enters the bloodstream and travels through the brain's blood vessels until it reaches vessels too small to let it pass.
      - Atrial fibrillation is secondary cause

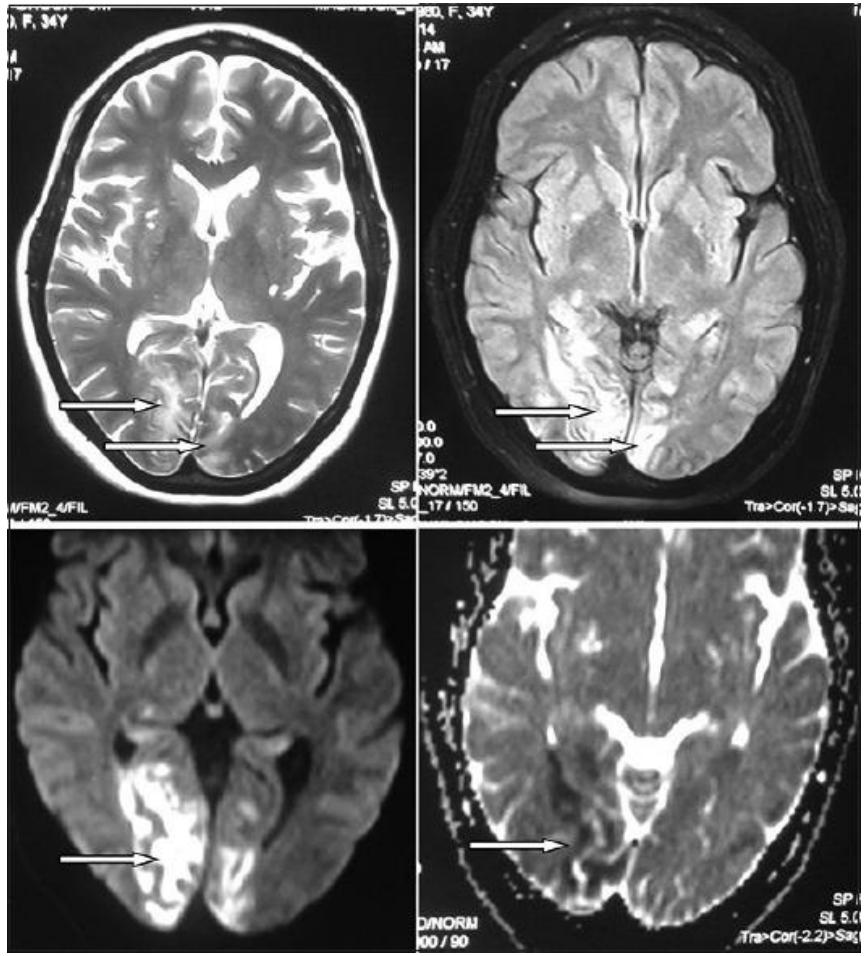
SYMPTOMS OF ISCHEMIC STROKE

- Symptoms vary by the location of the stroke
  - **Anterior Circulation**: internal carotid arteries
    - ACA syndromes
    - MCA syndromes
  - **Posterior Circulation**: vertebral arteries
    - Cerebellar Syndromes
    - Brainstem Syndromes
  - **Lacunar Syndromes**



POSTERIOR CIRCULATION SYNDROMES

- Posterior Cerebral Artery supplies the occipital lobe, the inferior part of the temporal lobe, an various deep structures including the thalamus an the posterior limb of the internal capsule.
- **Clinical clues to posterior circulation strokes**
  - **History**: diplopia, tilt of vision, rotatory or linear vertigo, drunken-type gait, hiccups bilateral or crossed motor or sensory symptoms, decreased level of consciousness and amnesia
  - **Exam**: anisocoric, disconjugate gaze, gaze paresis, nystagmus, skew deviation, Horner's syndrome, ataxia, unilateral deafness, somnolence and amnesia



STROKE MIMICS

- "A stroke mimic is defined as a nonvascular disease that presents with stroke-like symptoms, often indistinguishable from an actual stroke,"(…)
- Stroke mimics account for 5-31 % of patients with focal neurologic deficit
- Seizures:
  - Post ictal Todd's paresis
  - Almost 20% of stroke mimics
- Hypoglycemia
- Sepsis
- Migraine and other headache disorders
- Brain Tumors
- Functional disorders

RISK FACTORS FOR AIS

Non-Modifiable

- Age
- Ethnicity
- Gender
- Family History

Modifiable

- Hypertension
- Diabetes
- Tobacco Use
- Dyslipidemia
- Sedentary Lifestyle
- Obesity
- Unhealthy Diet
- Obstructive Sleep Apnea

STROKE SCREENING TOOLS

Cincinnati Prehospital Stroke Severity Scale (CPSSS)

Conjugate gaze deviation = 2

Level of Consciousness = 1

Incorrectly answers at least one of the following:
- How old are you?
- What month is it?

AND

Does not follow at least one of two commands:
- Close your eyes.
- Open and close your hand (non-paretic)

Motor = 1
Cannot hold arm (right, left or both) for up to 10 s before arm falls onto bed.

LVO is likely if score ≥ 2

Rapid Arterial oCclusion Evaluation (RACE)

Facial palsy - weakness on one side of face with smile.
- Absent = 0
- Mild (some facial movement) = 1
- Moderate to severe (little to no facial movement) = 2

Arm motor function - the same test as Cincinnati and Los Angeles scales.
- Normal to mild = 0
- Moderate (able to lift arm, but unable to hold it for 10 seconds) = 1
- Severe (unable to raise arm) = 2

Leg motor function - ask the patient to lift each leg.
- Normal to mild (able to lift leg and hold for five seconds) = 0
- Moderate (able to lift, but unable to hold for five seconds) = 1
- Severe (unable to lift one leg off of bed at all) = 2

Head and gaze deviation - if the patient's head or eyes are towards one side, ask them to look towards the other side.
- Absent = 0
- Present (unable shift gaze past midline) = 1

If a right-side deficit is found, check for aphasia (inability to say or hear words correctly). Ask the patient to close their eyes and make a fist.
- Performs both tasks correctly = 0
- Performs 1 task correctly = 1
- Performs neither task = 2

If a left-side deficit is found, check for agnosia (an inability to process sensory information). Touch their arm and ask "whose arm is this?" Then ask them to raise both hands and clap.
- Patient recognizes his/her arm = 0
- Does not recognize his/her arm or the impairment = 1
- Does not recognize his/her arm nor the impairment = 2

LVO is likely if the cumulative score is above 5.

Field Assessment Stroke Triage for Emergency Destination (FAST-ED)

Facial palsy - weakness on one side of face with smile.
- Absent or minor paralysis = 0
- Partial or complete paralysis = 1

Arm weakness
- No drift= 0
- Drift or some effort against gravity = 1
- No effort against gravity or no movement = 2

Speech changes
- Absent = 0
- Mild to moderate = 1
- Severe, global aphasia or mute = 2

Eye deviation
- Absent = 0
- Partial = 1
- Forced deviation = 2

Denial/Neglect
- Absent = 0
- Extinction to bilateral simultaneous stimulation in only one sensory modality = 1
- Does not recognize own hand or only orients to one side of the body = 2

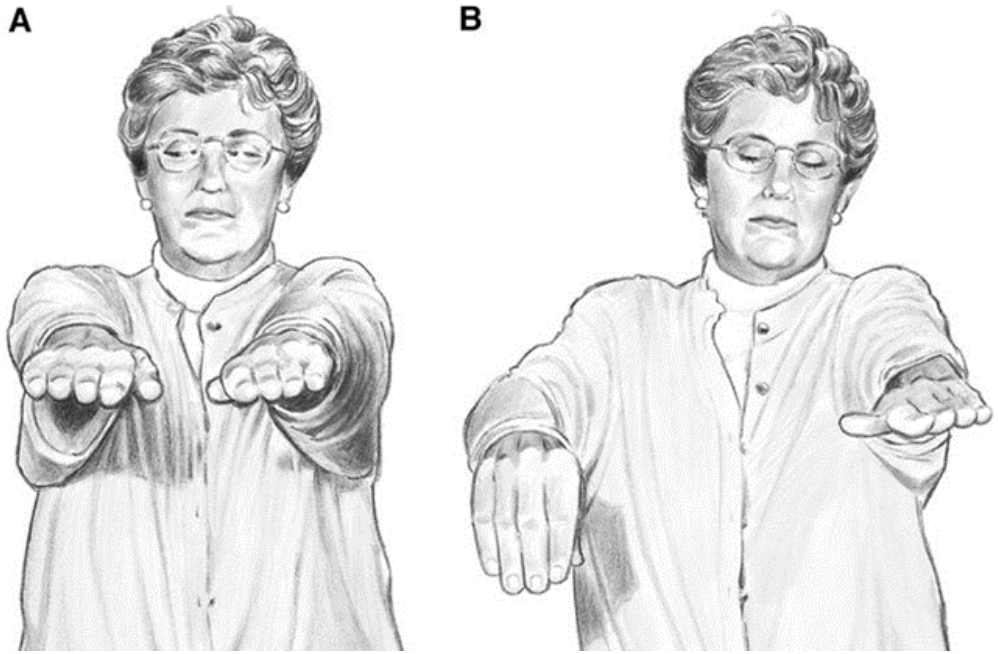
LVO is likely if FAST-ED ≥ 4.

FACIAL PALSY

- Ask the patient to show their teeth or smile

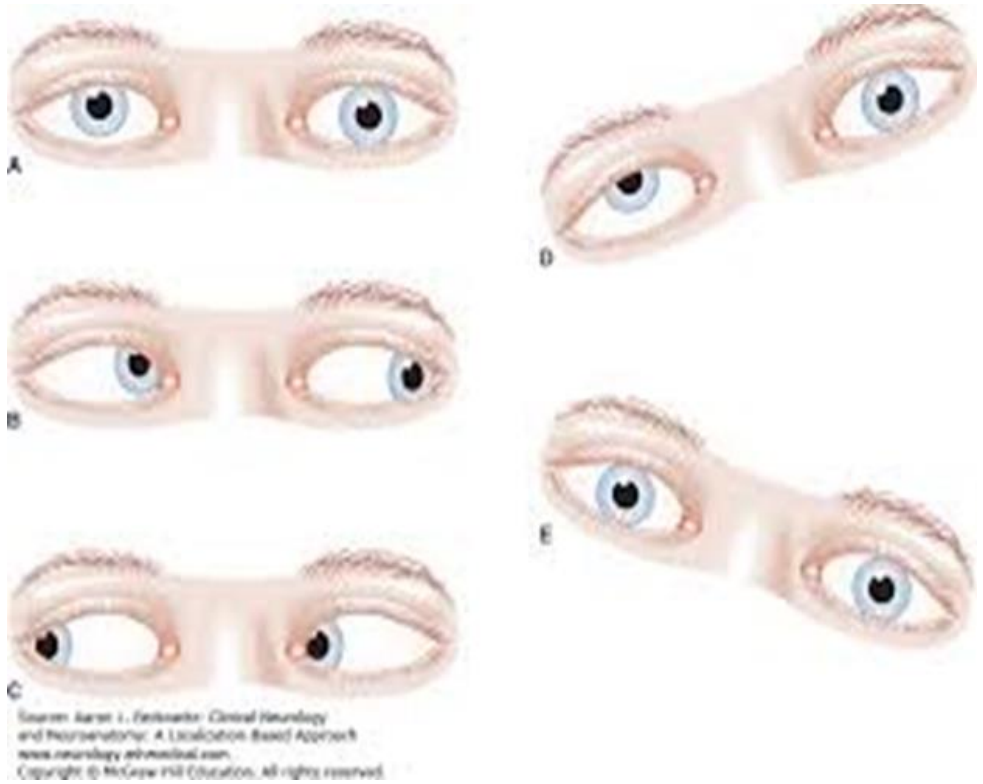
ARM/LEG PARALYSIS OR WEAKNESS

- Extending the arm of the patient 90 degrees (if sitting) or 45 degrees (if supine)



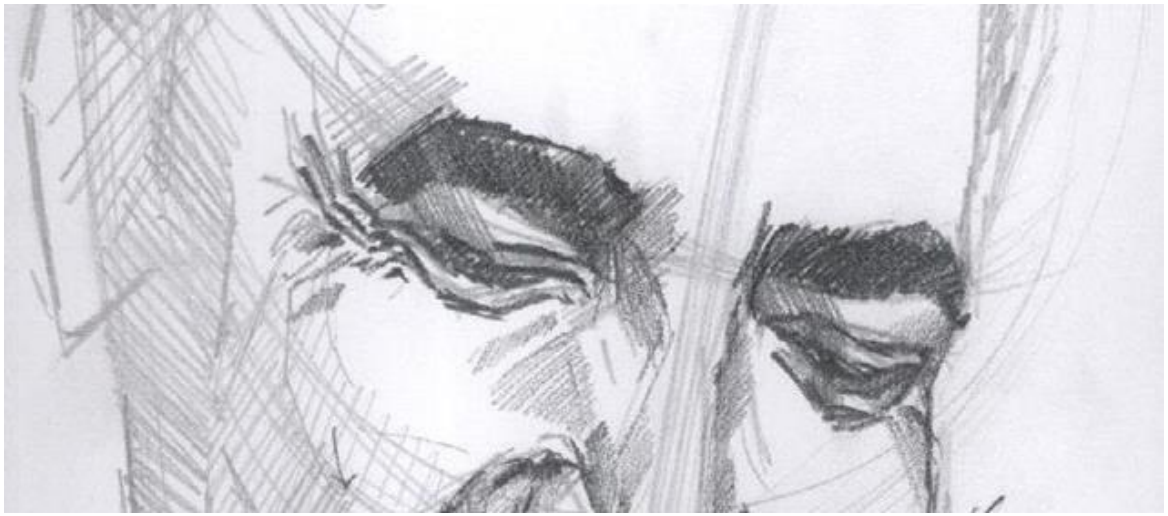
EYE DEVIATION

- Ask the patient to look to opposite side if noted to be looking in only one direction



SPEECH

- Testing the patients understanding with no visual cues
- Speech center is located in the left side of the brain
- Credit is only given if the attempt the command



DENIAL/NEGLECT

- Ask the patient to identify whose arm is next to them
- Use the side that they are neglecting when testing

Normal view

Neglect and Anosognosia

THE MILLION DOLLAR QUESTION???

- Single most important piece of historical information is:

  The ***time of onset*** of symptoms!

  - Current definition: time when patient was last at their baseline or symptom-free state
  - For patients unable to answer or who awoke with symptoms the time of onset is the last time the patient was known to be "normal"

- Question: "When was the patient last known well?"
  - Can be used as the presumed time of onset.
- Question: "What time were the symptoms first observed?"
  - If different from time last known well.
- Question: "Was anyone with the patient when symptoms began? If so, who?"
  - Witnesses can help narrow the time window, even the last person the patient spoke too.

MANAGEMENT OF ACUTE STROKES

- **In the field…**
  - **ABCs, History, Physical Exam**
  - Complete set of vitals
  - Blood Glucose
    - Treat hypoglycemia
  - **Prehospital Stroke Screening Tool**
  - IV access
    - If able to perform
  - Rapid transport to the nearest Stroke Ready Facility
  - **Activate Stroke Alert**

DO NOT DELAY TRANSPORT

- **In the ED setting…**
- Stroke Team Evaluation
- Bedside assessment
  - History and Physical examination
    - ***Last Time Known Well***
    - ABC's, NIHSS
    - Rule Out Stroke Mimics: Seizure, Hypoglycemia
    - Ancillary Testing
      - Bedside Glucose, CBC, PT/PTT, Troponin, EKG
  - Imaging
    - Non-contrast head CT, CT angiography/perfusion studies
  - Goal: Treatment within 60 minutes of arrival to ED

IV THROMBOLYSIS CRITERIA

Inclusion Criteria

- Age >18 years old
- Diagnosis of ischemic stroke causing measurable deficits
  - (NIHSS >4)
- Treatment within 4.5 hours
- Blood pressure <185/100

Exclusion Criteria

- Current intracranial hemorrhage
  - SAH
- Any of the below within 3 months
  - Intracranial/Intraspinal Surgery
  - Serious Head Trauma
  - Presence of intracranial condition that may increase the risk of bleeding
- Bleeding Disorders
  - Platelets <100,000
  - INR >1.7, PTT >40s, PT>15s
  - Use of direct thrombin inhibitors

MECHANICAL THROMBECTOMY

- For patients who have received alteplase and for patients that are outside of the 3-4.5 hour window, but less than 24 hours
  - Two trial were performed DAWN and Diffuse 3 trials
    - DAWN between 6-24 hours
    - Defuse 3 between 6-16 hours
- Must meet specific occlusion criteria just as with IV alteplase
  - Pre-Stroke mRS score 0 to 1
    - Modified Rankin score
  - Occlusion of ICA or M1 segment
    - LVO only
  - Age >18 years
  - NIHSS >6
  - ASPECTS >6
    - Alberta Stroke Program Early CT Score
  - Treatment can be initiated within 6 hours from symptom onset

NIH STROKE SCALE

- 0 (normal)-42
- 1-4 mild
- 5-15 moderate
- 16-20 moderate to severe
- 21-42 severe

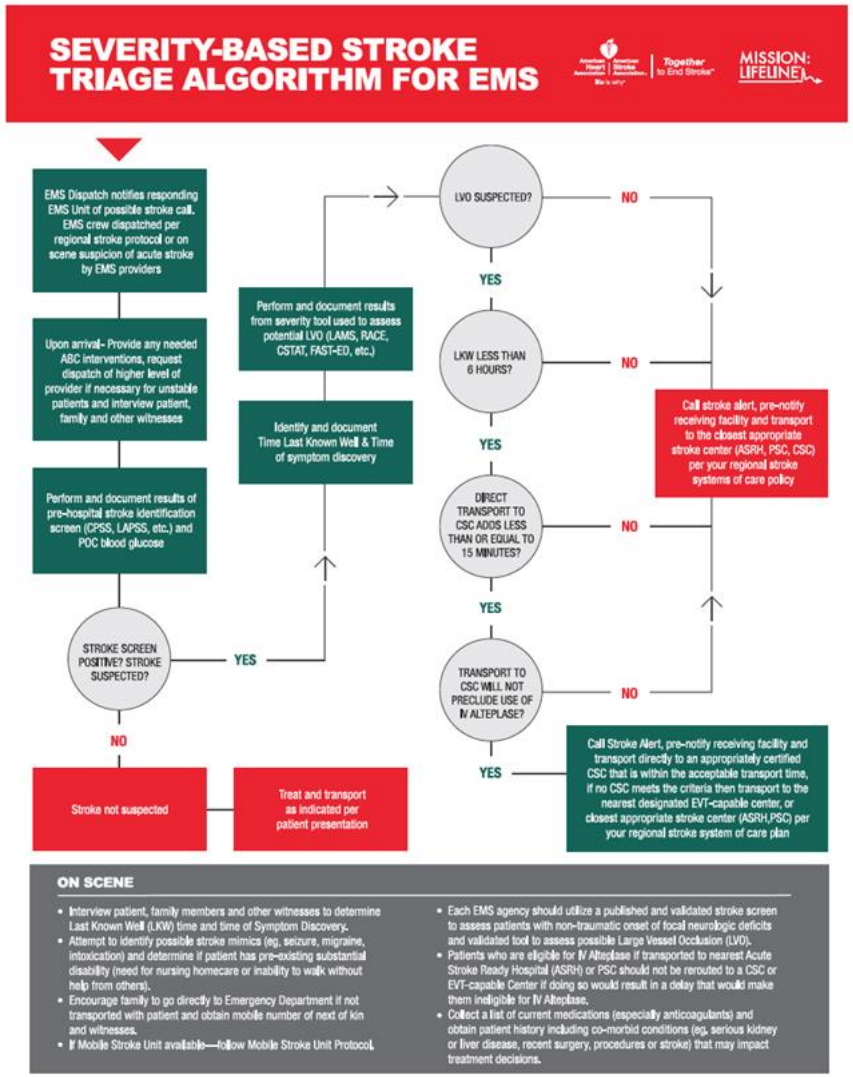
- >= 10 has ~75% probability of LVO

National Institutes of Health Stroke Scale

Score = 0 No stroke
Score = 1-4 Minor stroke
Score = 5-15 Moderate stroke
Score = 15-20 Moderate to severe stroke
Score = 21-42 Severe stroke

National Institutes of Health Stroke Scale score	
1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither question correctly
1c. Level of consciousness commands: Open and close your eyes. Grip and release your hand.	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss
9. Best language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction
Total score = 0–42.	

AMERICAN STROKE ASSOCIATION: MISSION LIFELINE STROKE



Goals

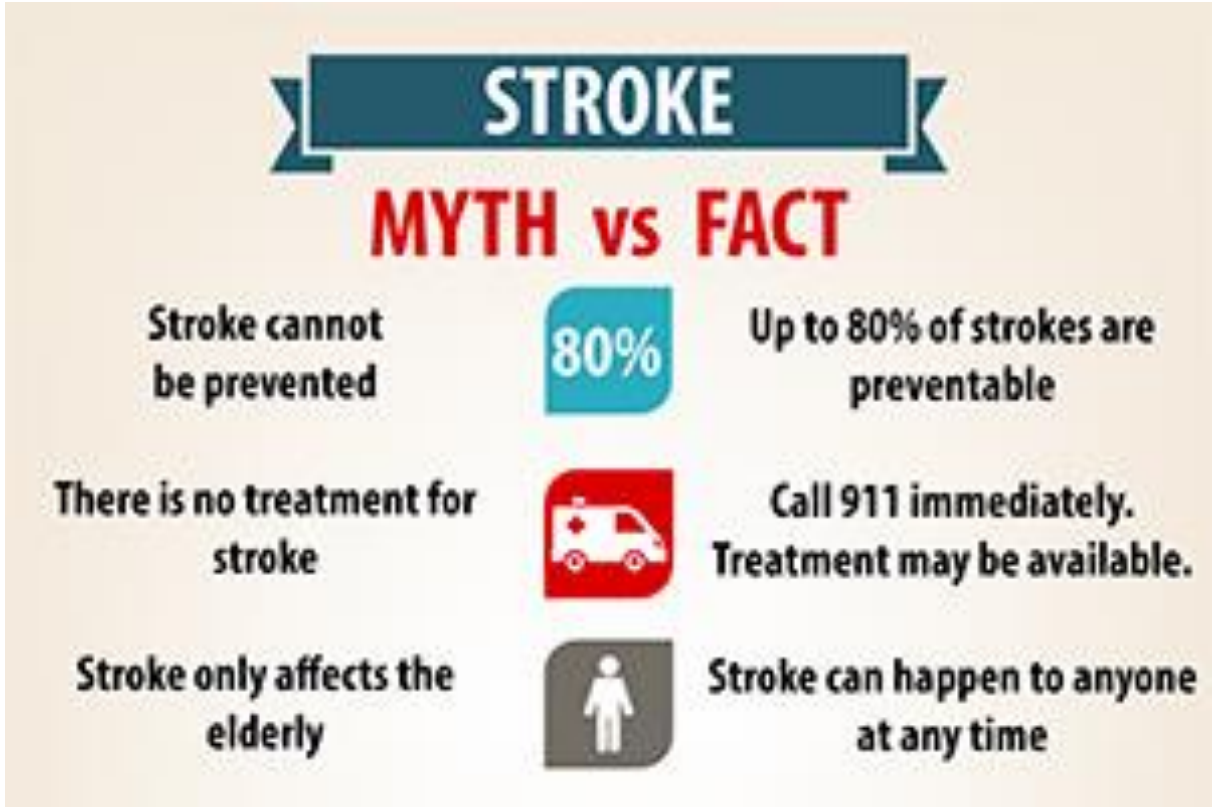
- Rapid assessment and transport of suspected stroke
- Early identification for patients with suspected large vessel occlusion (LVO)
- Standardization tool for possible stroke

mission-lifeline

WHY IS STROKE SO SERIOUS?

- For each minute that a stroke is untreated the typical patient will lose:
  - 1.9 million neurons
  - 14 billion synapses
  - 12Km/7.5 miles of myelinated fibers *Saver, J. Stroke 2006; 37:263-269*
- The faster blood flow can be restored to the brain tissue the greater the chances of full recovery.

PREVENTION AND EDUCATION ARE KEY!



THANK YOU!!

- Questions???