Stroke and Stroke Systems

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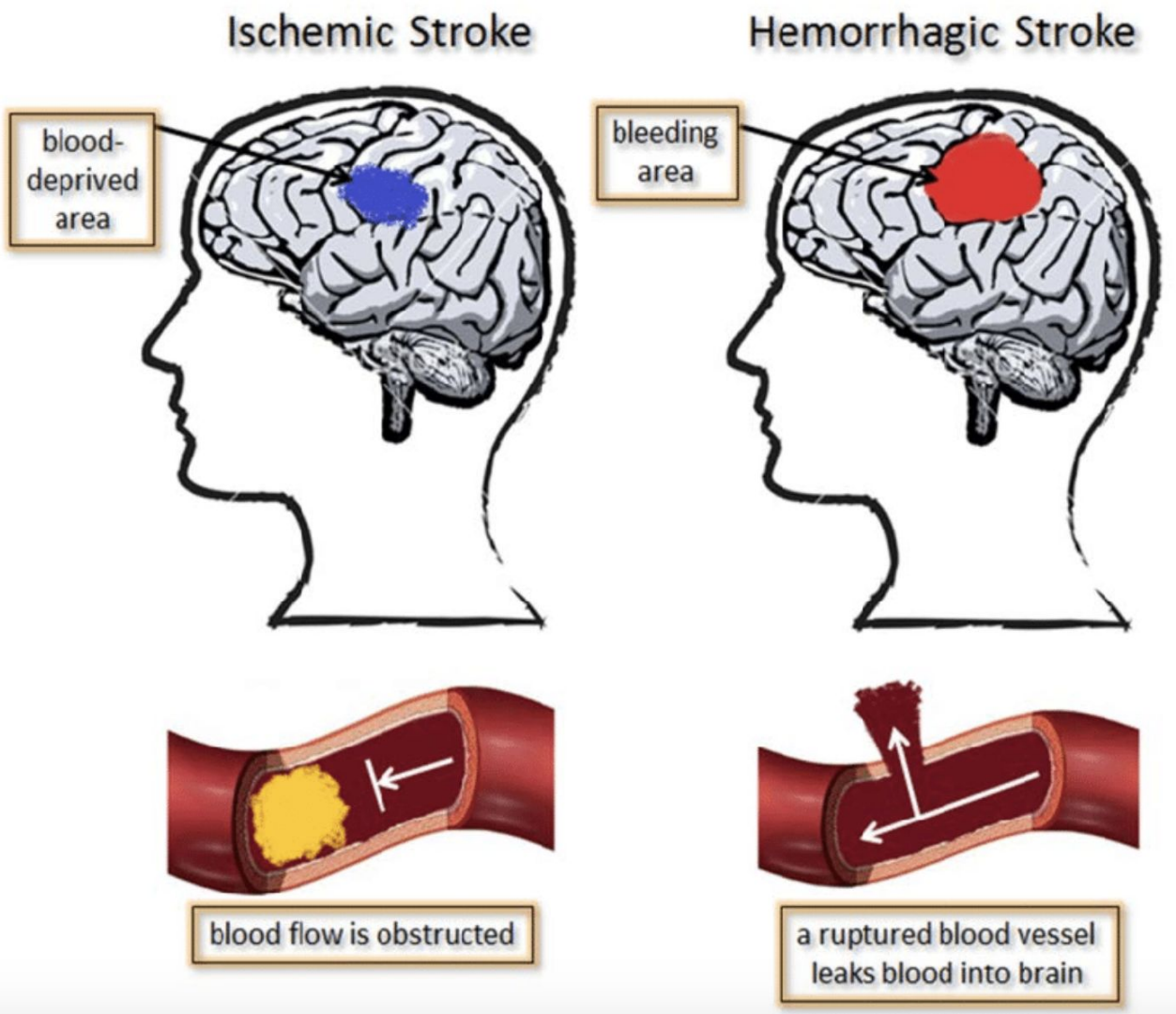
Objectives

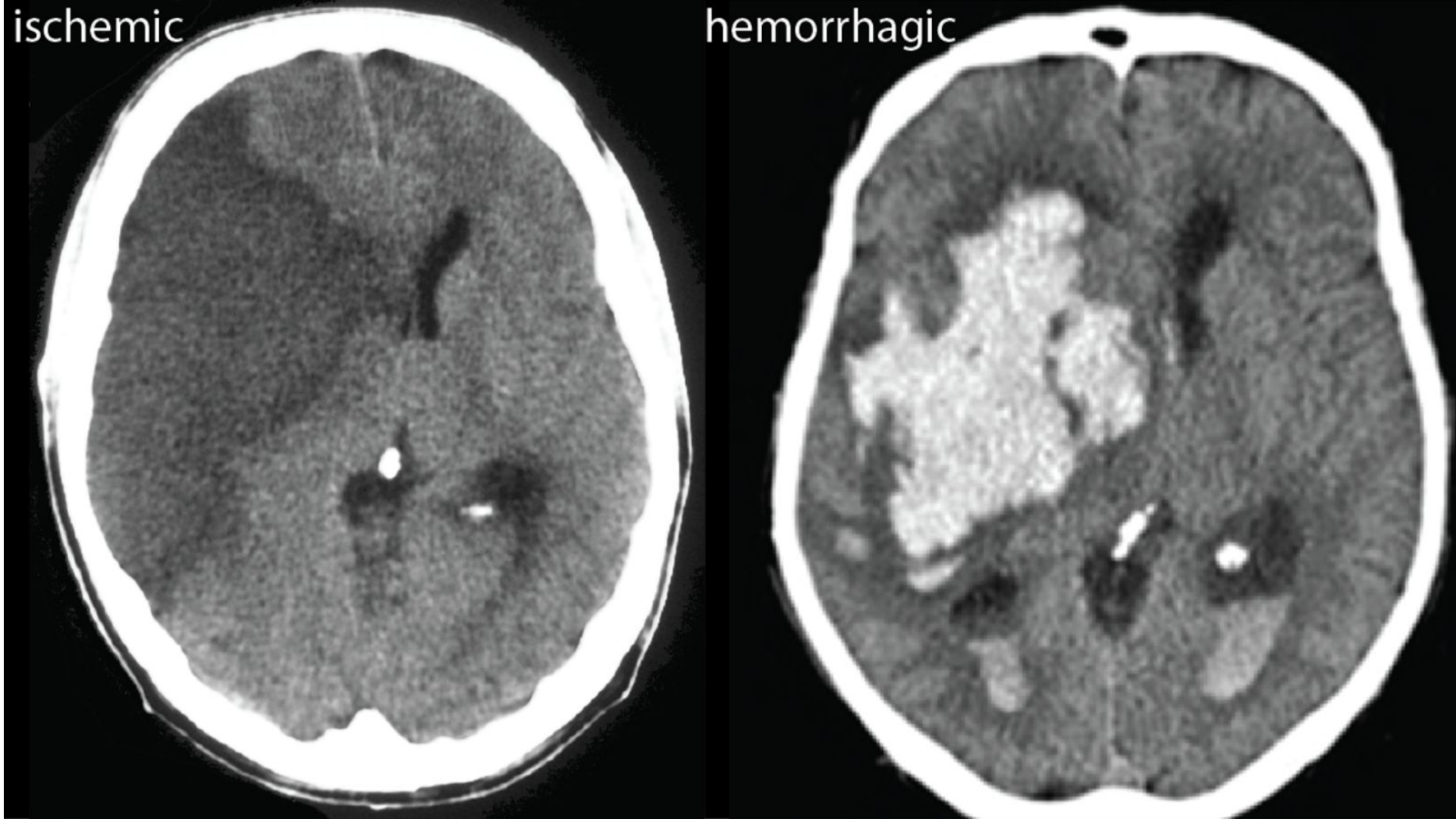
What types of strokes are there?

What are the common causes of each type?

Why does Time matter so much?

Prehospital considerations of Stroke management and system logistics?


Ischemic Stroke
Hemorrhagic Stroke
blood-deprived area
bleeding area
blood flow is obstructed
a ruptured blood vessel leaks blood into brain

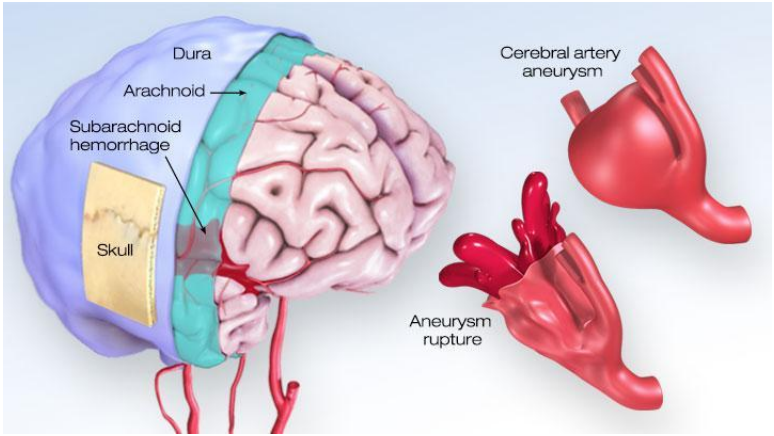

ischemic
hemorrhagic

Intra-Cerebral Hemorrhage

- Gradual progression over minutes to hours
- Risks:
  - Hypertension
  - Tumor
  - Trauma
  - Drugs (cocaine, meth)
  - Vascular malformation
- Reduced alertness

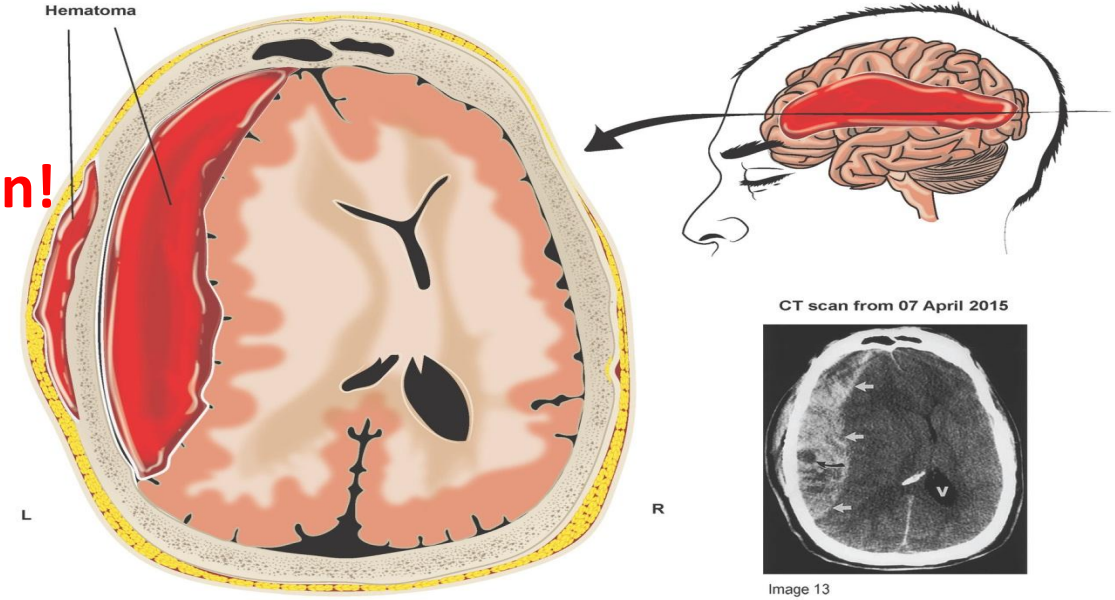
Structural: Subarachnoid Hemorrhage

- Abrupt onset of sudden, severe headache
  - May be precipitated by sex or physical activity
  - Usually non-focal findings
- Risks:
  - Hereditary
  - Smoking
  - HTN
  - Drugs
- Decreased alertness



Structural: Subdural Hemorrhage

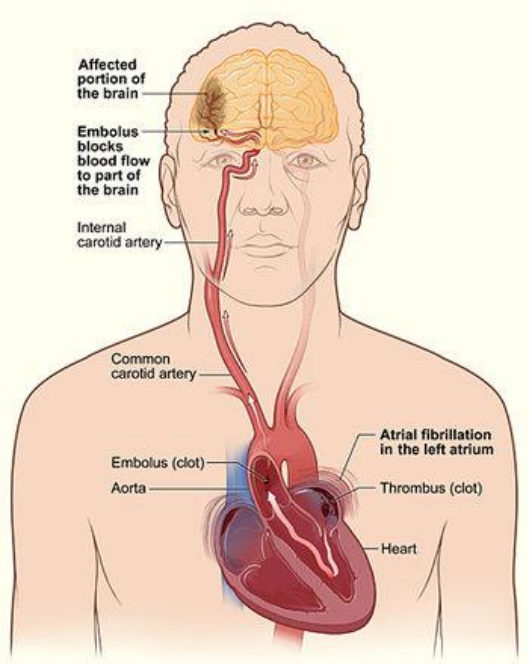
Ask about anticoagulation!



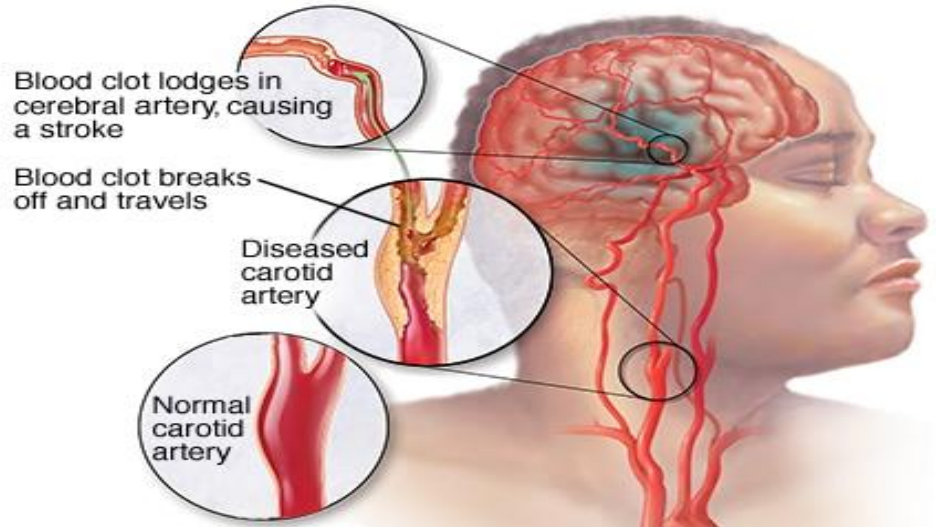
Usually caused by head trauma from fall or direct blow in elderly or alcoholics

Ischemic: Stroke

Embolic



Thrombotic



Ask about last known normal and obtain a family/friend contact number

Ischemic: Stroke

Cincinnati Prehospital Stroke Scale[1]

Facial Droop **(have patient smile)**

Normal: Both sides of face move equally
Abnormal: One side of face does not move as well

Arm Drift **(have patient hold arms out for 10 seconds**

Normal: Both arms move equally or not at all
Abnormal: One arm drifts compared to the other, or does not move at all

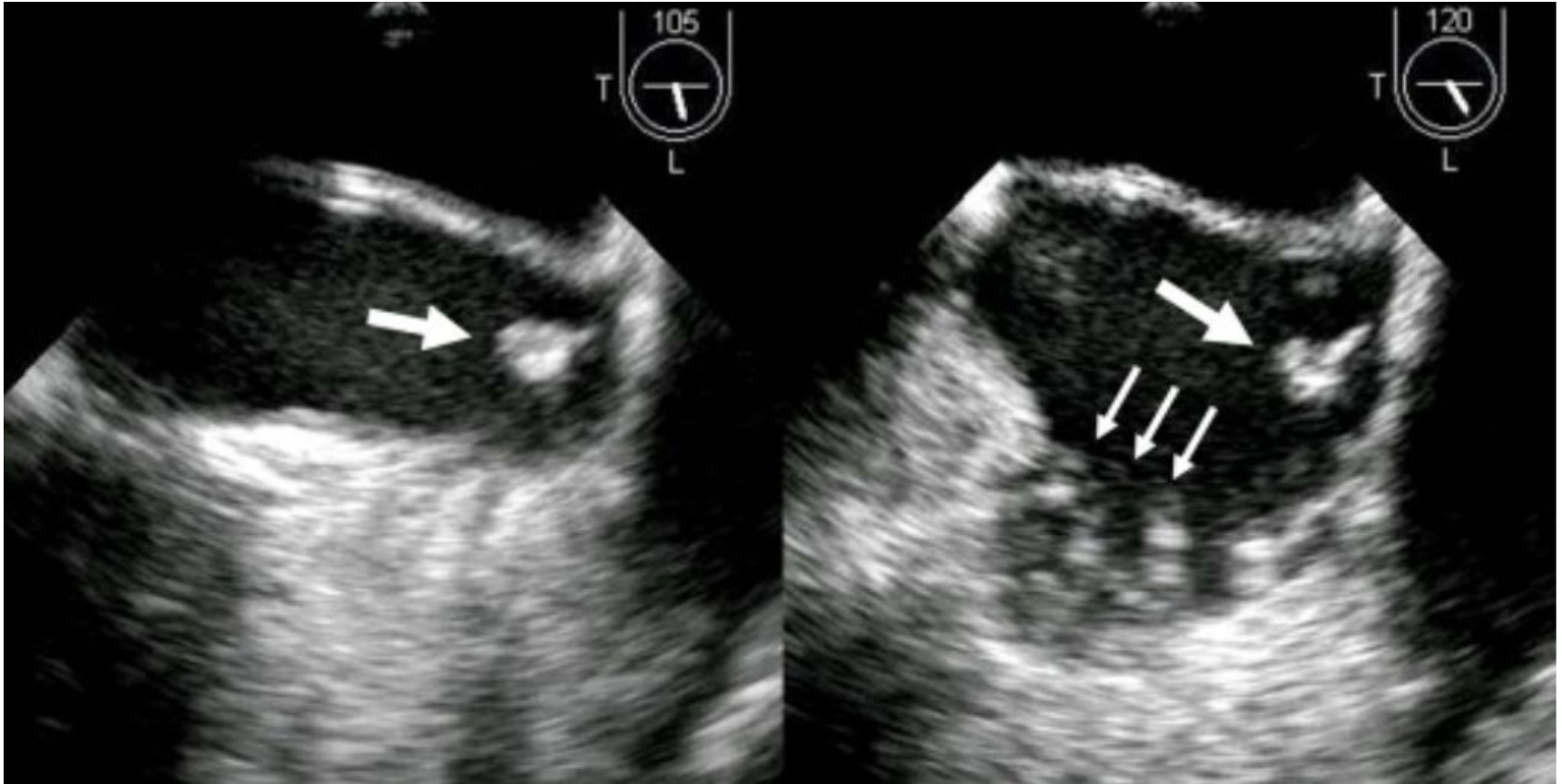
Speech **(have patient speak a simple sentence)**

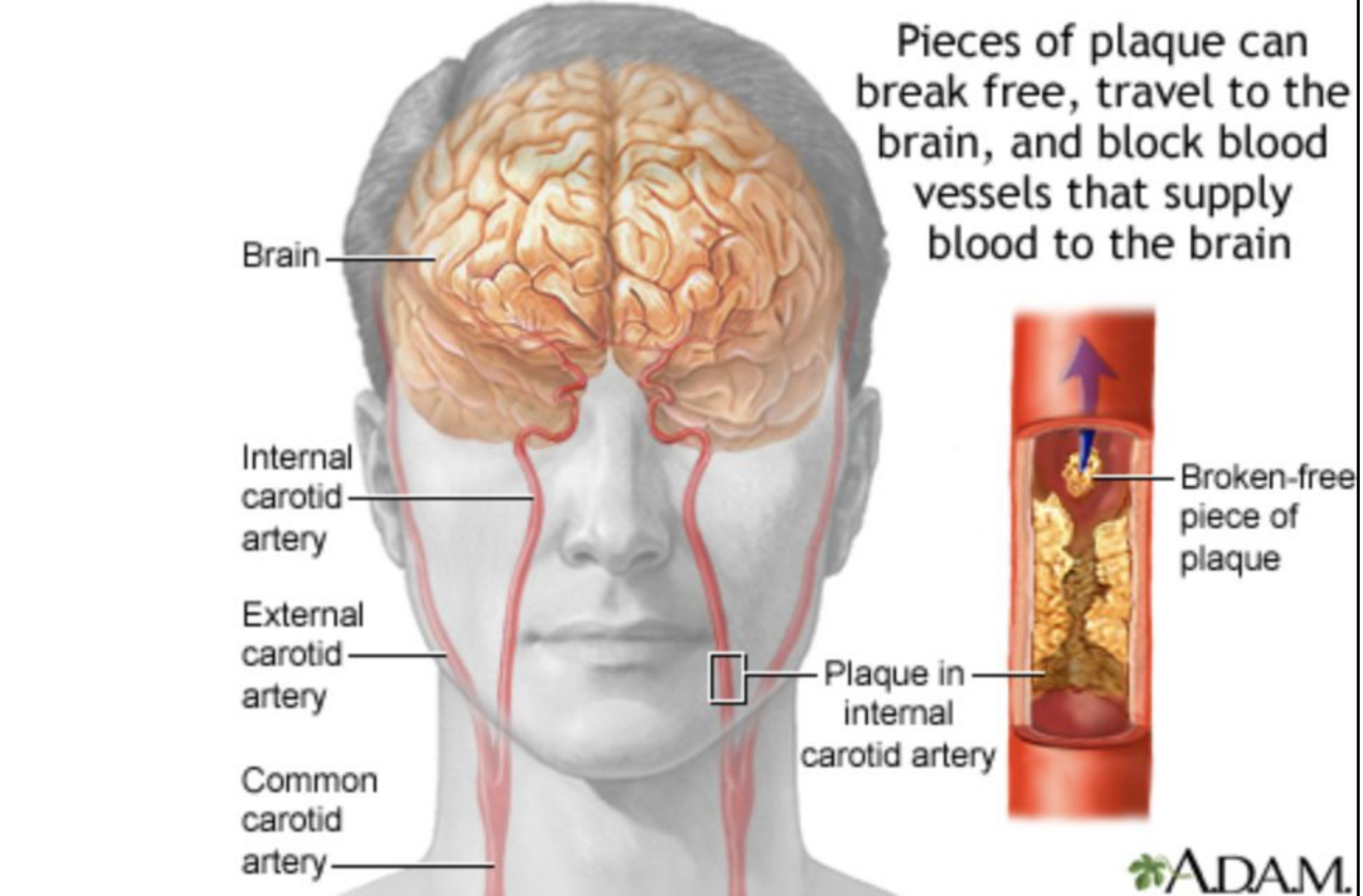
Normal: Patient uses correct words with no slurring
Abnormal: Slurred or inappropriate words, or mute

Los Angeles Motor Scale (LAMS)[22]		
Face	0	Both sides move normally
	1	One side is weak or flaccid
Arm	0	Both sides move normally
	1	One side is weak
	2	One side is flaccid/doesn't move
Grip	0	Both sides move normally
	1	One side is weak
	2	One side is flaccid/doesn't move
Total	0–5	

Assess Cincinnati and LAMS Scores -- LVO's go to UNM or Lovelace

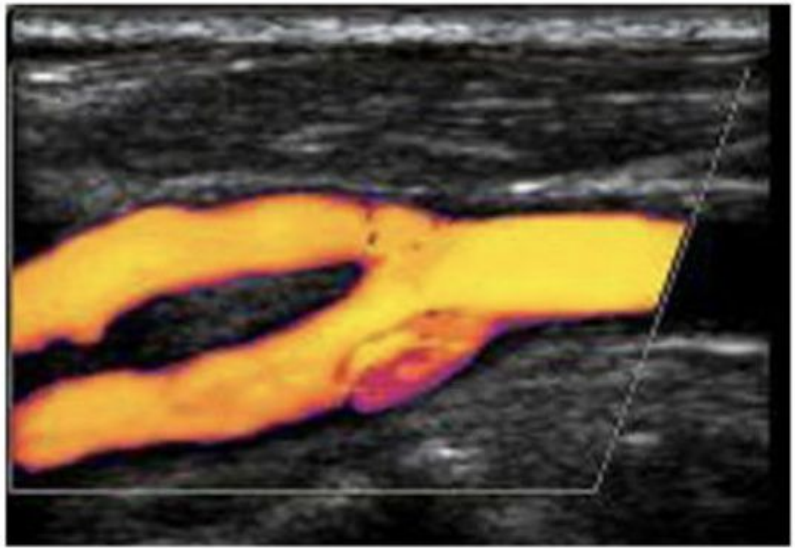
Ischemic Stroke: Embolic Type



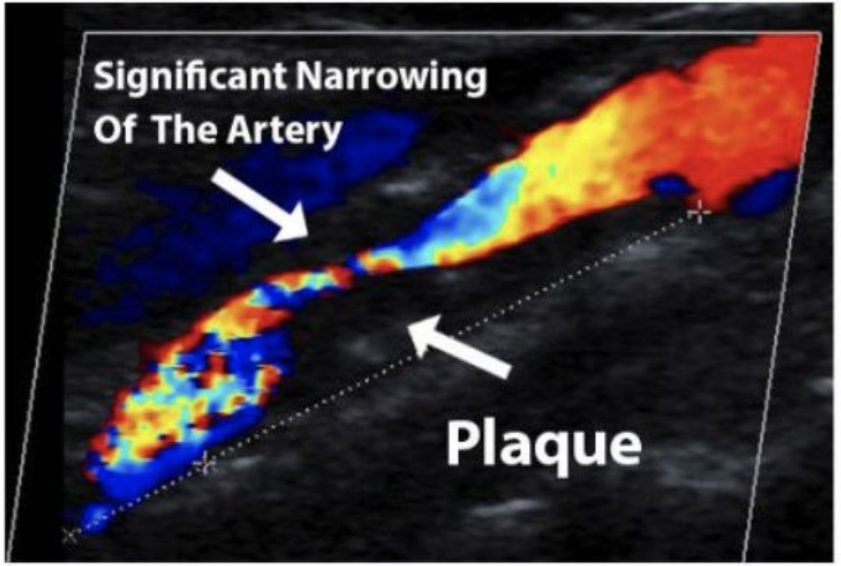

Pieces of plaque can break free, travel to the brain, and block blood vessels that supply blood to the brain
Brain
Internal carotid artery
External carotid artery
Common carotid artery
Plaque in internal carotid artery
Broken-free piece of plaque
A.D.A.M.

Ischemic Stroke: Thrombotic Type

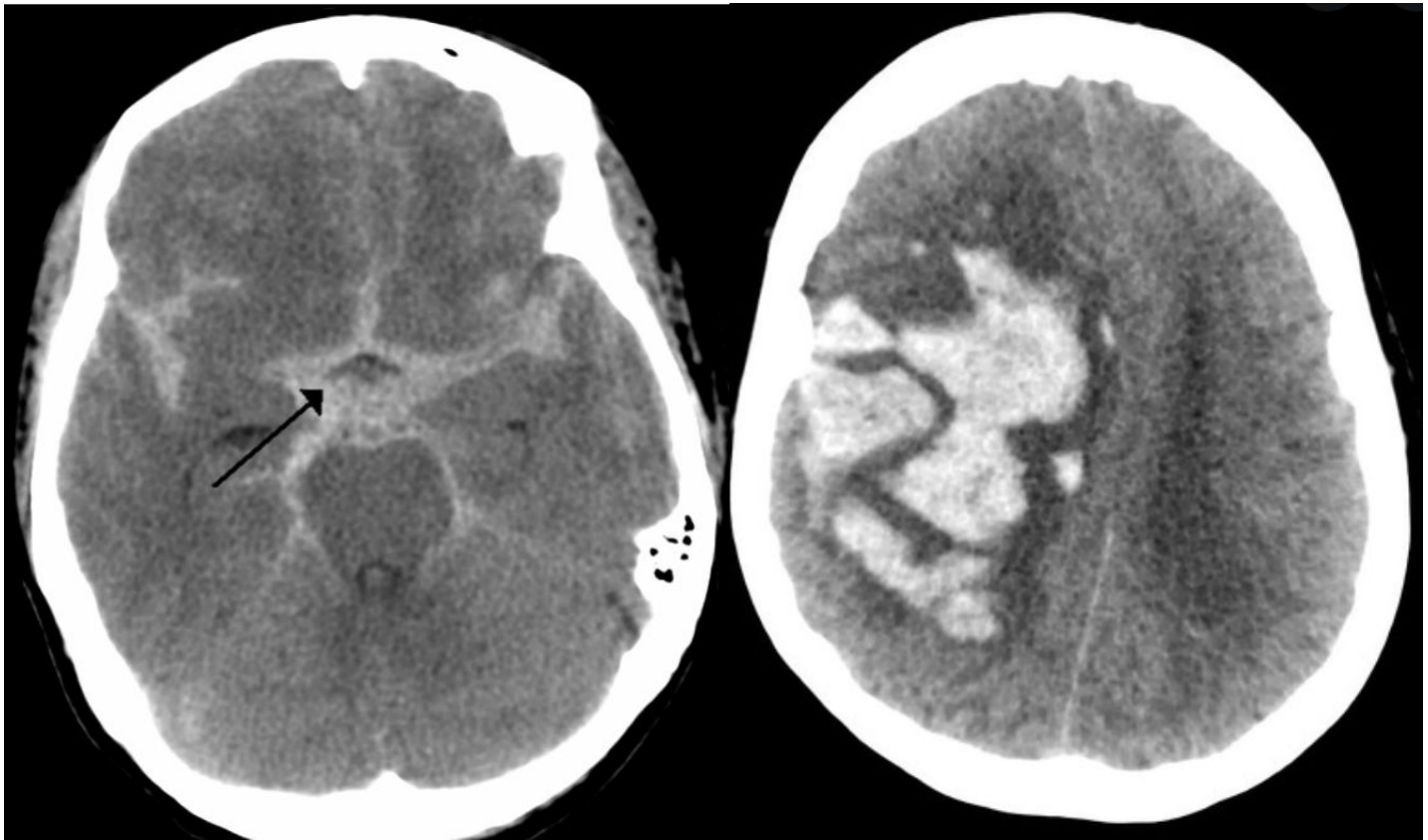
Normal Blood Flow

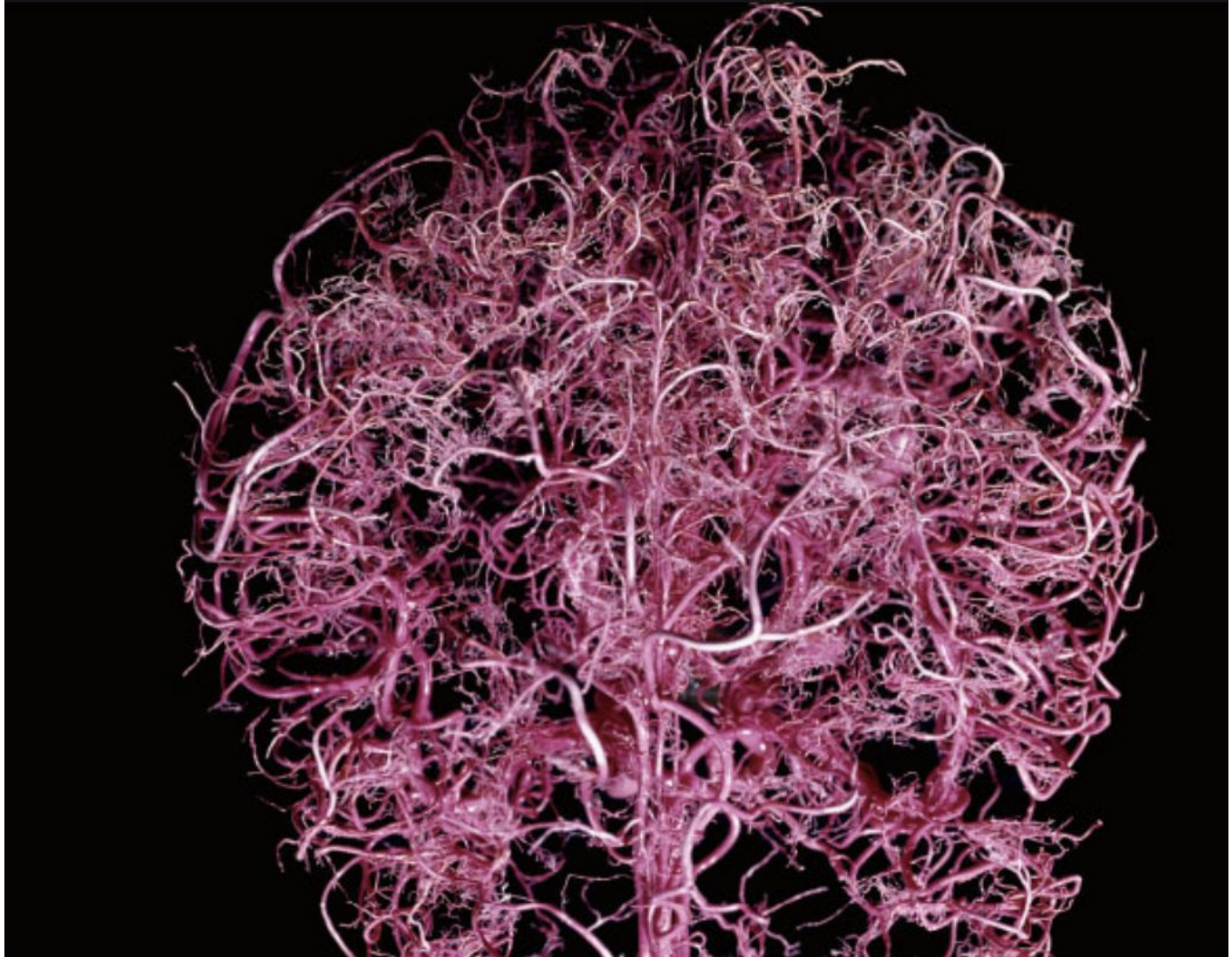


Abnormal Blood Flow



Hemorrhagic Stroke: Subarachnoid vs Intraparenchymal





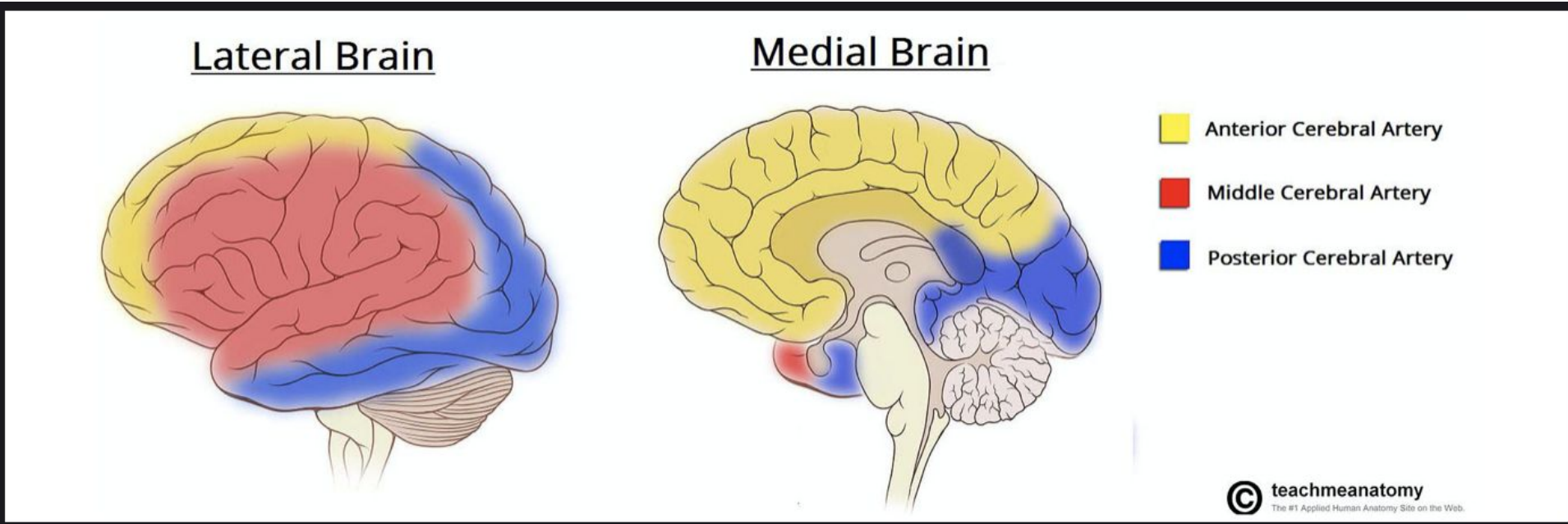
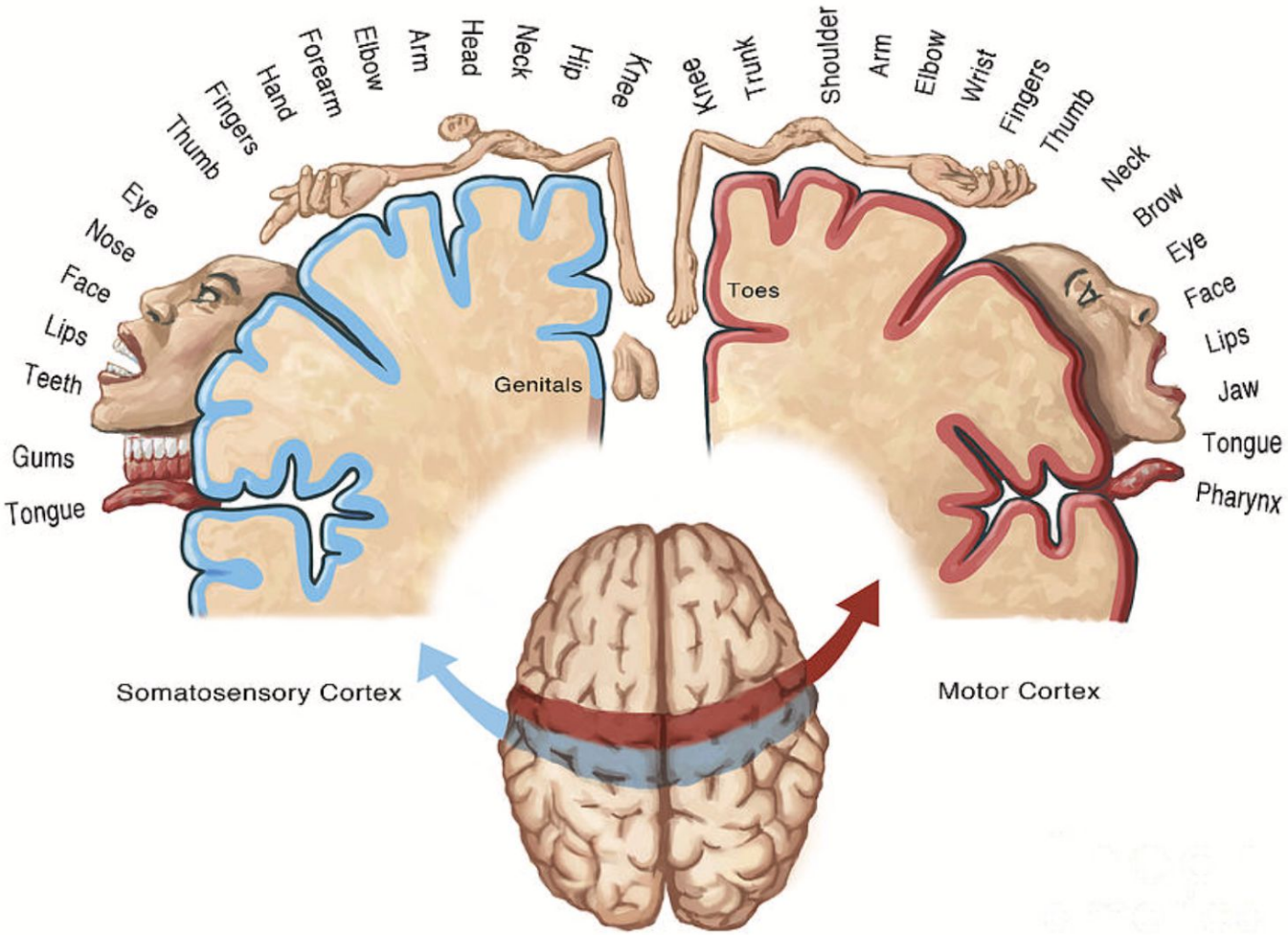


Fig 1.4 – Overview of the blood supply to the cerebrum


Thumb
Fingers
Hand
Forearm
Elbow
Arm
Head
Neck
Hip
Knee
Eye
Nose
Face
Lips
Teeth
Gums
Tongue
Genitals
Somatosensory Cortex
Trunk
Shoulder
Arm
Elbow
Wrist
Fingers
Thumb
Toes
Neck
Brow
Eye
Face
Lips
Jaw
Tongue
Pharynx
Motor Cortex

Category	Score/Description		Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials
1a. Level of Consciousness (Alert, drowsy, etc.)	0 = Alert 1 = Drowsy 2 = Stuporous 3 = Coma						
1b. LOC Questions (Month, age)	0 = Answers both correctly 1 = Answers one correctly 2 = Incorrect						
1c. LOC Commands (Open/close eyes, make fist/let go)	0 = Obeys both correctly 1 = Obeys one correctly 2 = Incorrect						
2. Best Gaze (Eyes open - patient follows examiner's finger or face)	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation						
3. Visual Fields (Introduce visual stimulus/threat to pt's visual field quadrants)	0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = Bilateral Hemianopia (Blind)						
4. Facial Paresis (Show teeth, raise eyebrows and squeeze eyes shut)	0 = Normal 1 = Minor 2 = Partial 3 = Complete						
5a. Motor Arm - Left **5b. Motor Arm - Right** (Elevate arm to 90° if patient is sitting, 45° if supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
6a. Motor Leg - Left **6b. Motor Leg - Right** (Elevate leg 30° with patient supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
7. Limb Ataxia (Finger-nose, heel down shin)	0 = No ataxia 1 = Present in one limb 2 = Present in two limbs						
8. Sensory (Pin prick to face, arm, trunk, and leg - compare side to side)	0 = Normal 1 = Partial loss 2 = Severe loss						
9. Best Language (Name item, describe a picture and read sentences)	0 = No aphasia 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute						
10. Dysarthria (Evaluate speech clarity by patient repeating listed words)	0 = Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligable or worse X = Intubated or other physical barrier						
11. Extinction and Inattention (Use information from prior testing to identify neglect or double simultaneous stimuli testing)	0 = No neglect 1 = Partial neglect 2 = Complete neglect						
	TOTAL SCORE						

F A S T

FACE

ONE SIDE OF THE FACE IS DROOPING

ARMS

ARM WEAKNESS

SPEECH

SPEECH DIFFICULTY

TIME

TIME TO CALL FOR AMBULANCE

CALL 911 IMMEDIATELY

B E F A S T

Balance

Does the person have a sudden loss of balance?

Eyes

Has the person lost vision in one or both eyes?

Face

Does the person's face look uneven?

Arms

Is one arm weak or numb?

Speech

Is the person's speech slurred? Does the person have trouble speaking or seem confused?

Time

Call 9-1-1 now!

Rapid **A**rterial o**C**clusion **E**valuation (RACE) Scale

An EMS Assessment Tool for Acute Ischemic Stroke

(Sensitivity 85%, Specificity 68%)

Test Item	Score = 0	Score = 1	Score = 2	Patient Score
Facial Palsy	Absent	Mild	Moderate/Severe	
Arm Motor	Normal/Mild	Moderate	Severe	
Leg Motor	Normal/Mild	Moderate	Severe	
Head/Gaze Deviation	Absent	Present	N/A	
Aphasia* (if right hemiparesis)	Performs Both Tasks	Performs 1 Task	Performs Neither Tasks	
Agnosia+ (if left hemiparesis)	Patient Recognizes Arm and Impairment	Unable to Recognize Arm or Impairment	Unable to Recognize BOTH Arm and Impairment	
			TOTAL SCORE = (0-9)	

*Aphasia: Ask the patient to: 1. "Close your Eyes" AND 2. "Make a Fist"

+Agnosia: Ask the patient and evaluate recognition of deficit:

1. While showing paretic arm: "Whose arm is this?"
2. Ask patient: "Can you lift both arms and clap?"

If RACE Score = 5 or greater, patient may have an ischemic stroke with a large vessel occlusion

G	Gaze Abnormalities	(0-1)
F	Facial Droop	(0-1)
A	Arm Drift	(0-1)
S	Speech Abnormalities	(0-1)
T	Time Last Seen Normal	(No points)

Have a system: Know and use it.

Cincinnati Pre-hospital Stroke Scale

1. FACIAL DROOP: *Have patient show teeth or smile.*

Normal: both sides of the face move equally

Abnormal: one side of face does not move as well as the other side

2. ARM DRIFT: *Patient closes eyes & holds both arms out for 10 sec*

Normal: both arms move the same or both arms do not move at all

Abnormal: one arm does not move or drifts down compared to the other

3. ABNORMAL SPEECH: *Have the patient say "you can't teach an old dog new tricks."*

Normal: patient uses correct words with no slurring **Abnormal:** patient slurs words, uses the wrong words, or is unable to speak

INTERPRETATION: If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.

LAMS SCORECARD

Would this patient benefit from StrokeEVT?

strokenetwork
SOUTHEASTERN ONTARIO

STEP 1
FACIAL DROOP

Ask the person to smile. Is there any weakness or facial droop?

0 Absent
1 Facial droop present

_____

+

STEP 2
ARM DRIFT

Bring the person's arm(s) up to a 90° angle and ask them to hold that position for 10 seconds. Is there any drift or drop of an arm?

0 Absent
1 Drifts Down
2 Falls Rapidly

_____

+

STEP 3
GRIP STRENGTH

Ask the person to grip your hands. Does one hand have less power than the other?

0 Normal
1 Weak Grip
2 No Grip

_____

=

LVO positive If score is ≥4

STEP 4
ADD SCORE

Total possible score is 5

_____

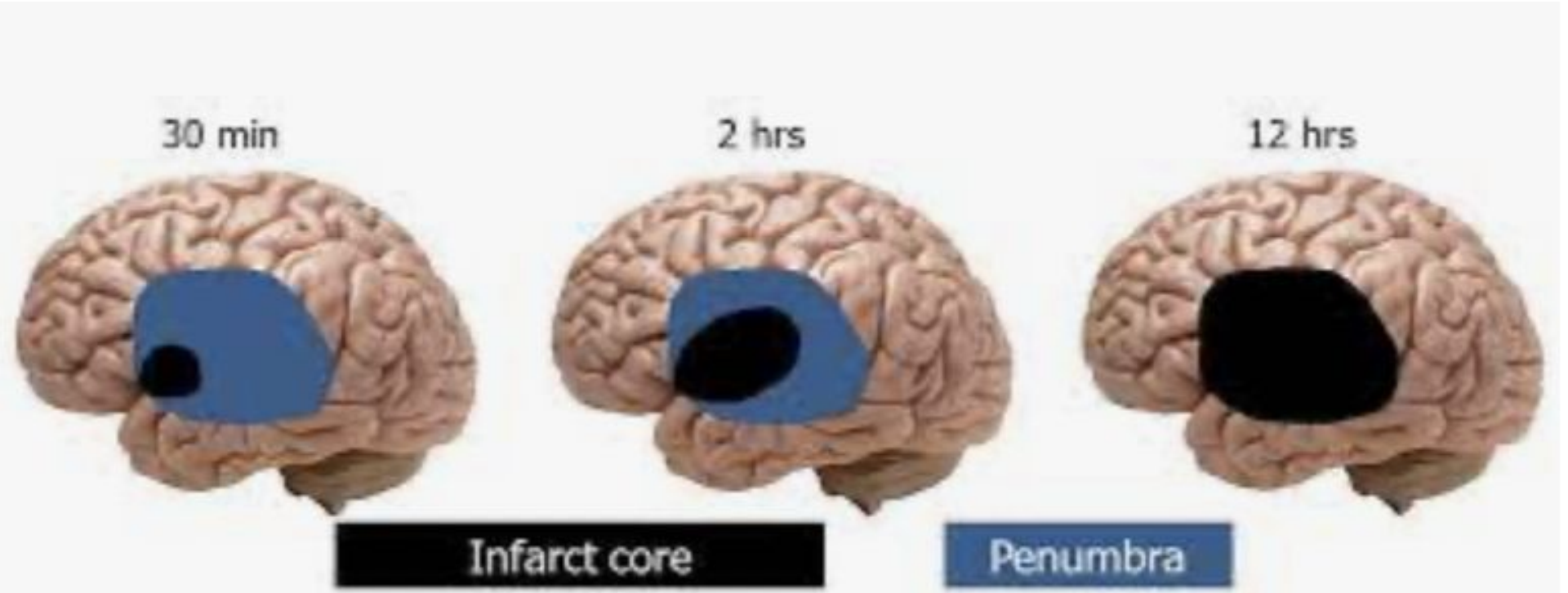
If LAMS score is positive (4 or greater), patient may be eligible for EVT

January 13, 2021: Adapted from Northwestern Ontario Regional Stroke Network

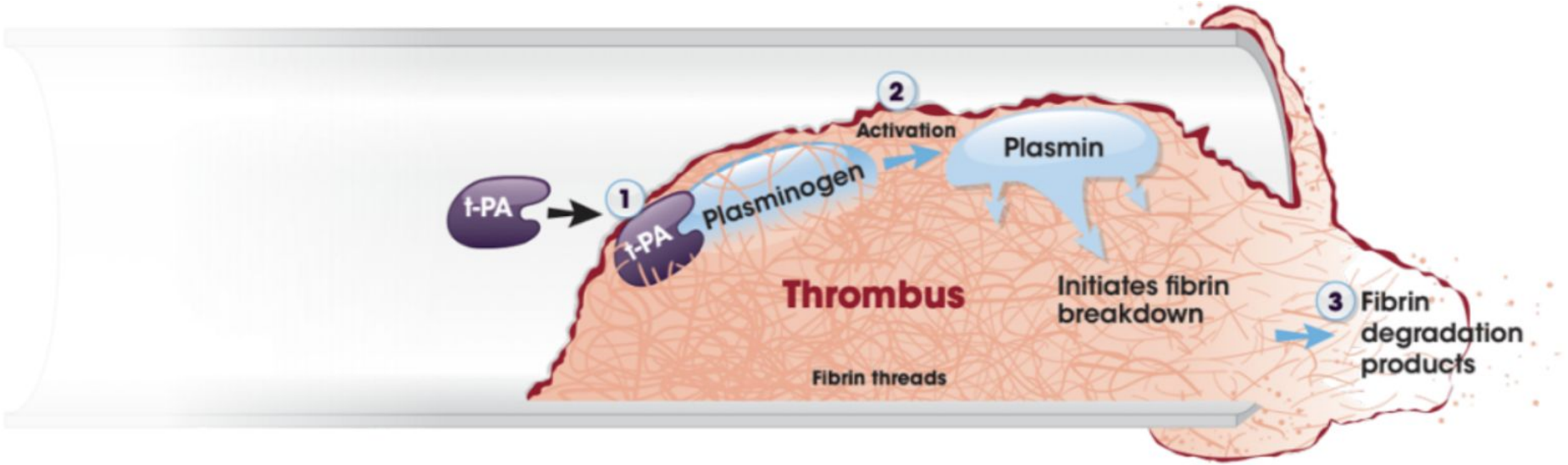
Time Matters: AHA/ASA Guidelines

1. **IV tPA** should be administered to all eligible acute stroke patients **within 3 hours of last known normal** and to a more selective group of eligible acute stroke patients (based on ECASS III exclusion criteria) within 4.5 hours of last known normal. Centers should attempt to achieve door-to-needle times of **<60 minutes in ≥50% of stroke patients treated with IV tPA**.
2. Patients ≥18 years should undergo mechanical thrombectomy with a stent retriever if they have minimal prestroke disability, have a causative occlusion of the internal carotid artery or proximal middle cerebral artery, have a National Institutes of Health stroke scale score of ≥6, have a reassuring noncontrast head CT (ASPECT score of ≥6), and if they can be treated **within 6 hours of last known normal**. No perfusion imaging (CT-P or MR-P) is required in these patients.
3. In selected acute stroke patients within 6-24 hours of last known normal who have evidence of a large vessel occlusion in the anterior circulation and would have been eligible for DAWN or DEFUSE 3, obtaining perfusion imaging (CT-P or MR-P) or an MRI with diffusion-weighted imaging (DWI) sequence is recommended to help determine whether the patient is a candidate for mechanical thrombectomy.
4. In selected acute stroke patients within 6-16 hours of last known normal who have a large vessel occlusion in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is *recommended*. In selected acute stroke patients within 6-24 hours of last known normal who have large vessel occlusion in the anterior circulation and meet other DAWN eligibility criteria, mechanical thrombectomy with a stent retriever is *reasonable*.

Why does time matter?



Door to needle time <60 Minutes 50% of the time



EVT? Endovascular Therapy = Thrombectomy

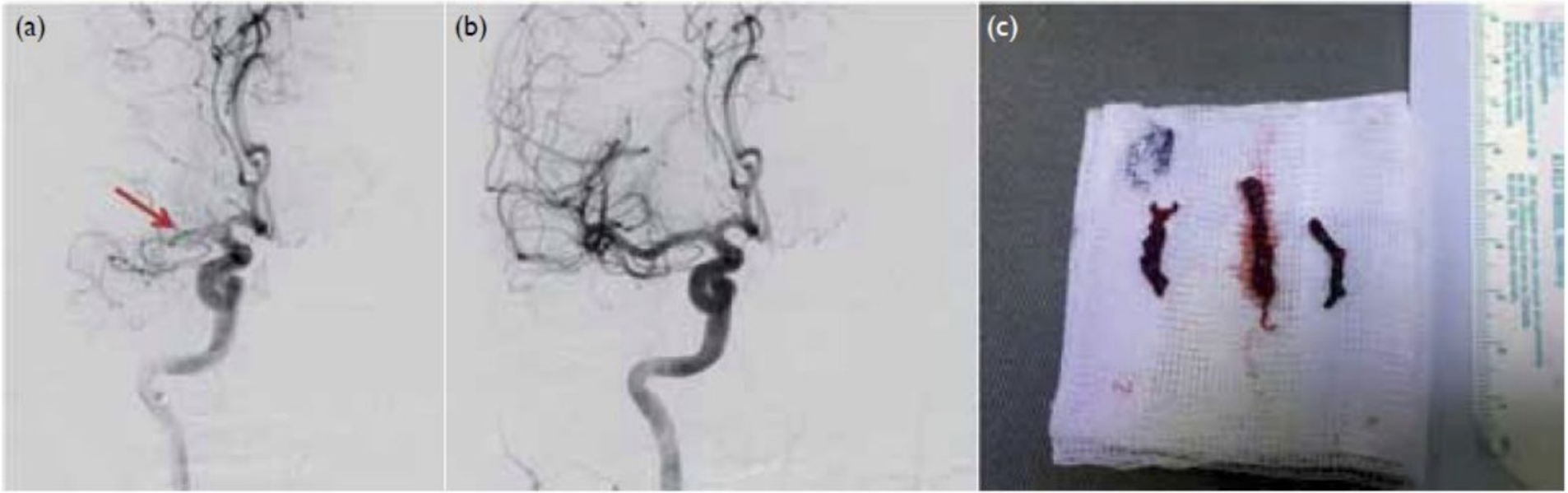
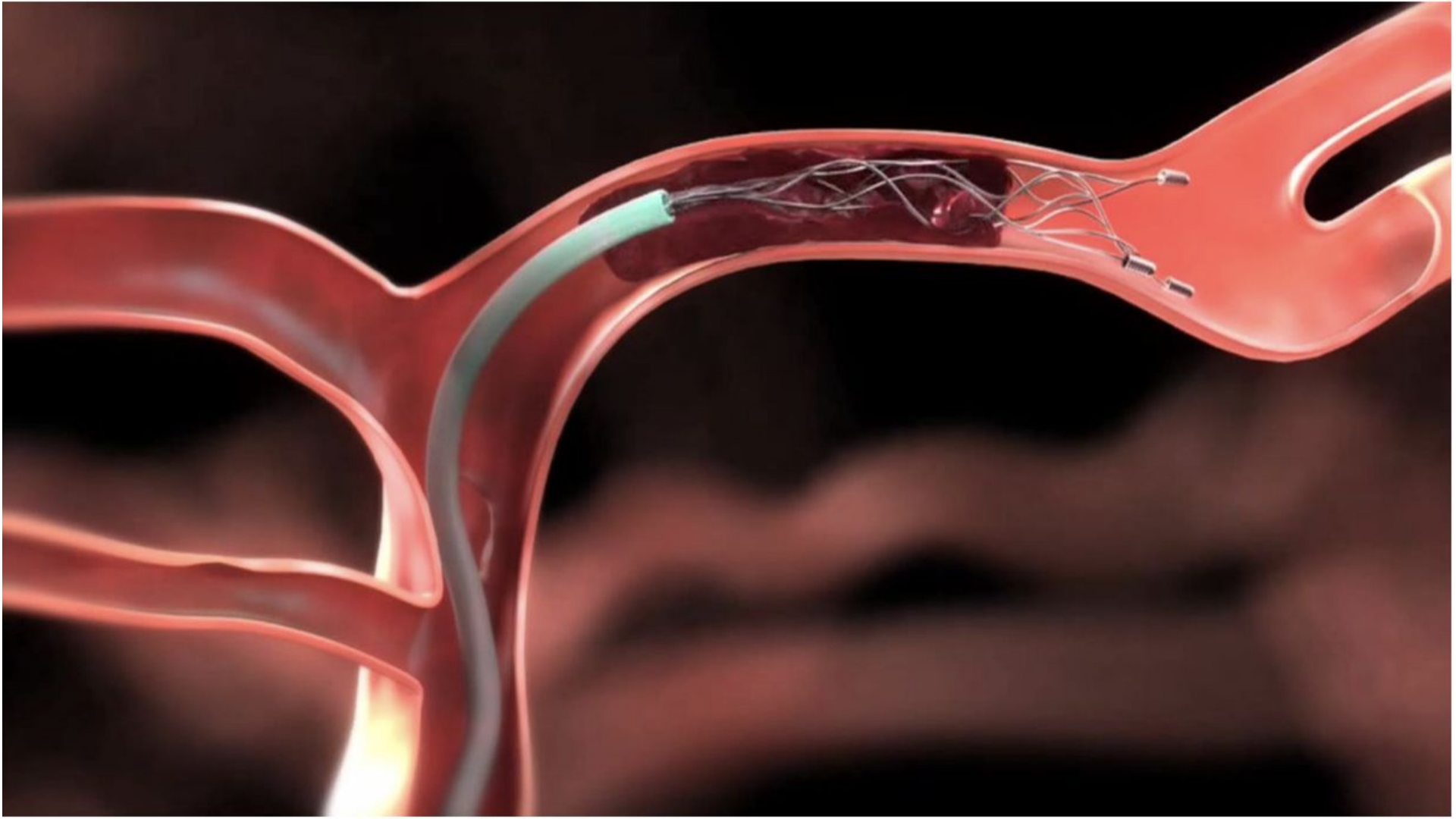
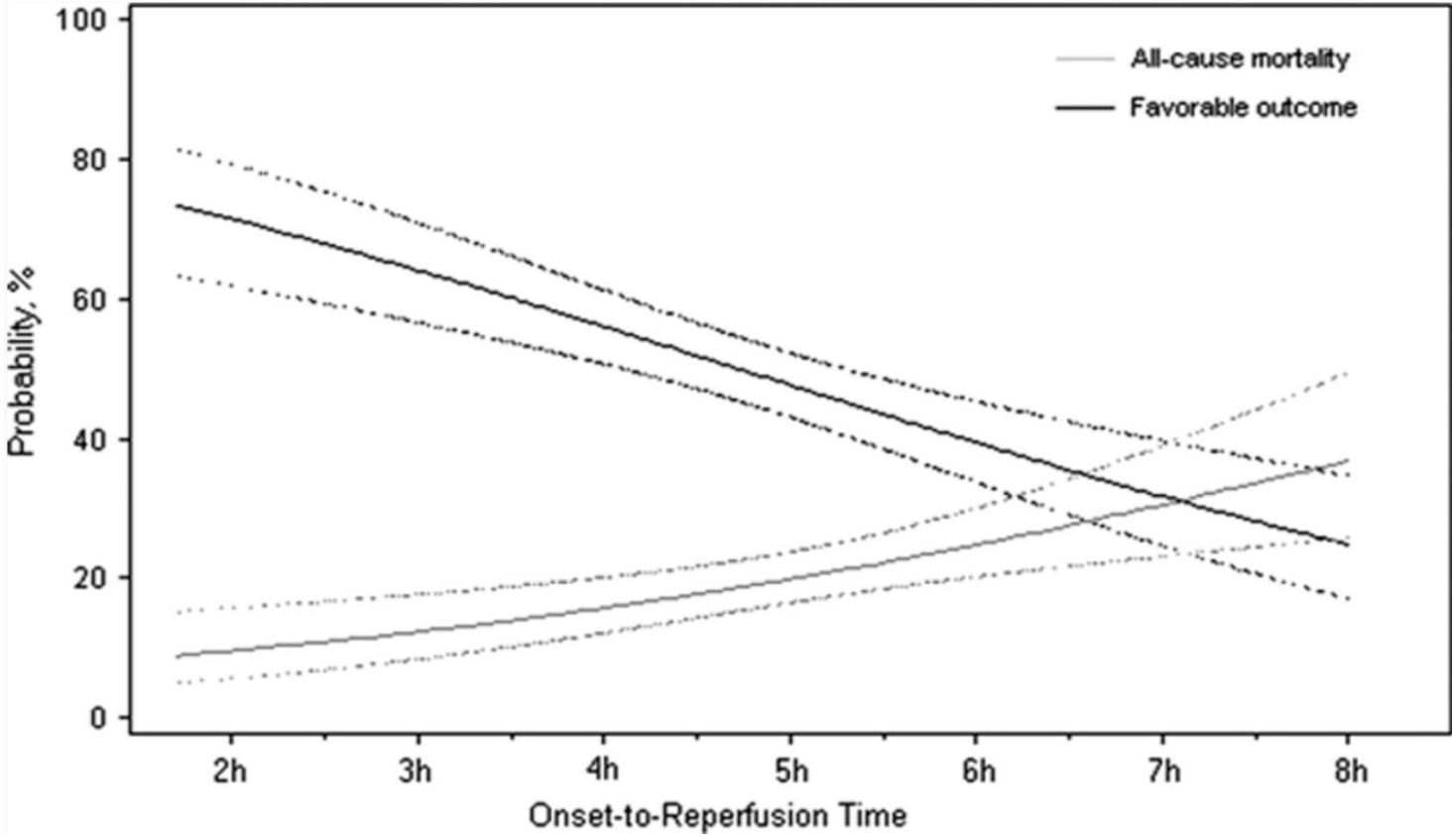


FIG 1. (a) Angiogram showing acute occlusion of the right middle cerebral artery (arrow). (b) Post-thrombectomy angiogram showing revascularisation of the right middle cerebral artery territory. (c) Thrombus removed by endovascular thrombectomy



Why does time matter?



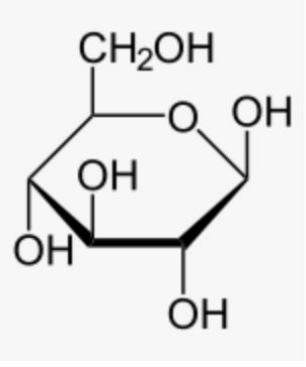
Functional Independence at 90 Days

Thrombectomy (%)	Control (%)	Absolute Risk Reduction	NNT
45%	17%	28%	3.6

Albers et al., 2018

Prehospital Considerations and Management

- Early detection for “good outcome” is imperative.
  - Have a system, know it and utilize it. Time is absolutely of the essence. “Time is Tissue”
- Supplemental Oxygen to maximize oxygen delivery
  - Hypoxia in these cases far more detrimental than the potential for oxygen free radical damage.
- Transport to the nearest “appropriate facility”
- *****Always check a Glucose.*****



What Questions Do You Have?