

Posterior Circulation Strokes: The Subtle & Puzzling

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I do not have any financial disclosures or conflicts of interests related to this topic and presentation.

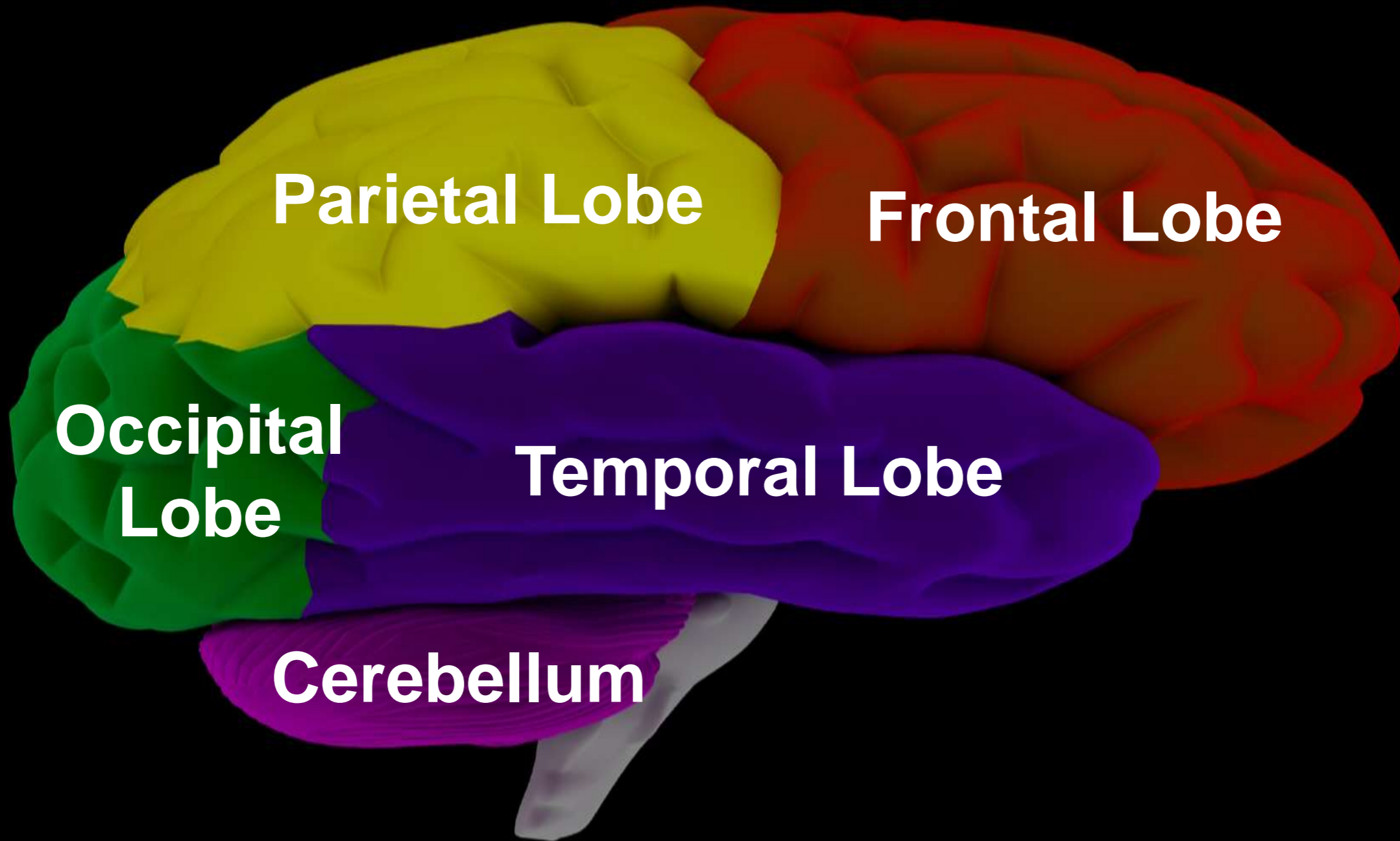
Objectives

- Discuss posterior cerebral anatomy and physiology and correlation with stroke presentation.
- Examine posterior stroke clinical presentation characteristics to minimize bias and delay in stroke diagnosis.
- Examine evidence-based best practices in assessment and management of care for people experiencing posterior circulation strokes using case study methodology.

Posterior Circulation Stroke

- 20% of all Strokes
- Twice as likely to be misdiagnosed
- More likely to have worse outcomes
- Younger patients more prone to have posterior circulation strokes

Correlating the clinical presentation with anatomy and brain structures is important to understand challenges of posterior circulation strokes



Parietal Lobe

Frontal Lobe

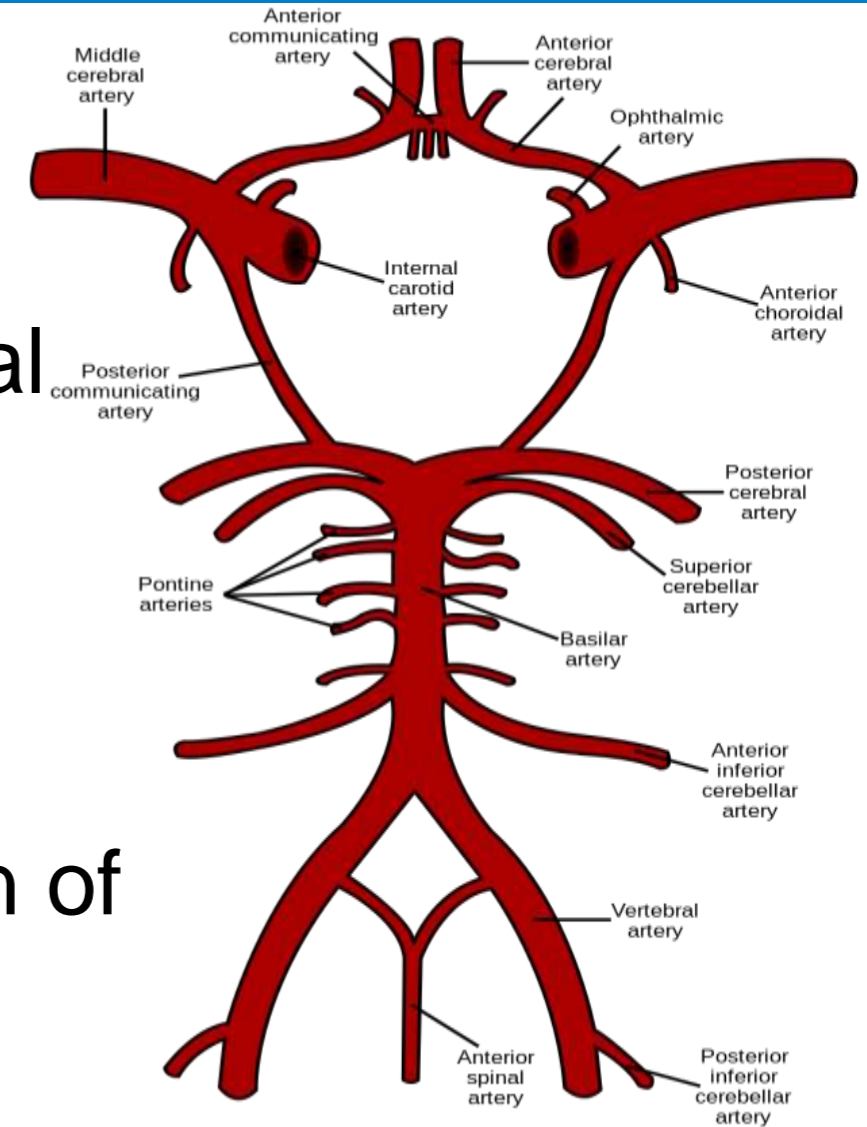
**Occipital
Lobe**

Temporal Lobe

Cerebellum

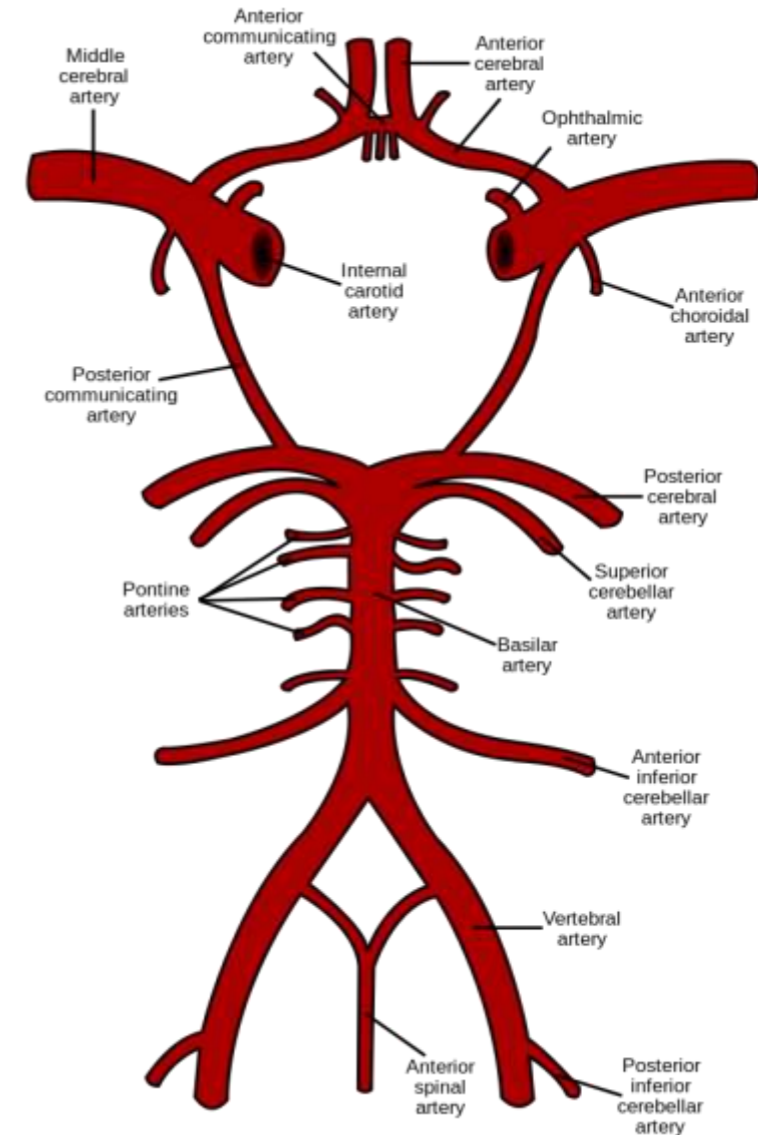
Circle of Willis

- A circular collection of vessels base of the brain & in front of the brain stem
- Blood Supply by the Carotid & the Vertebral Arteries
- Anterior Communicating Artery – 85% of aneurysm development
- The optic chiasm lies in the anterior portion of the Circle of Willis



Posterior Circulation

- Vertebral arteries supply a large portion of posterior circulation
- Join to form basilar artery at the junction of the medulla & pons & travels anterior



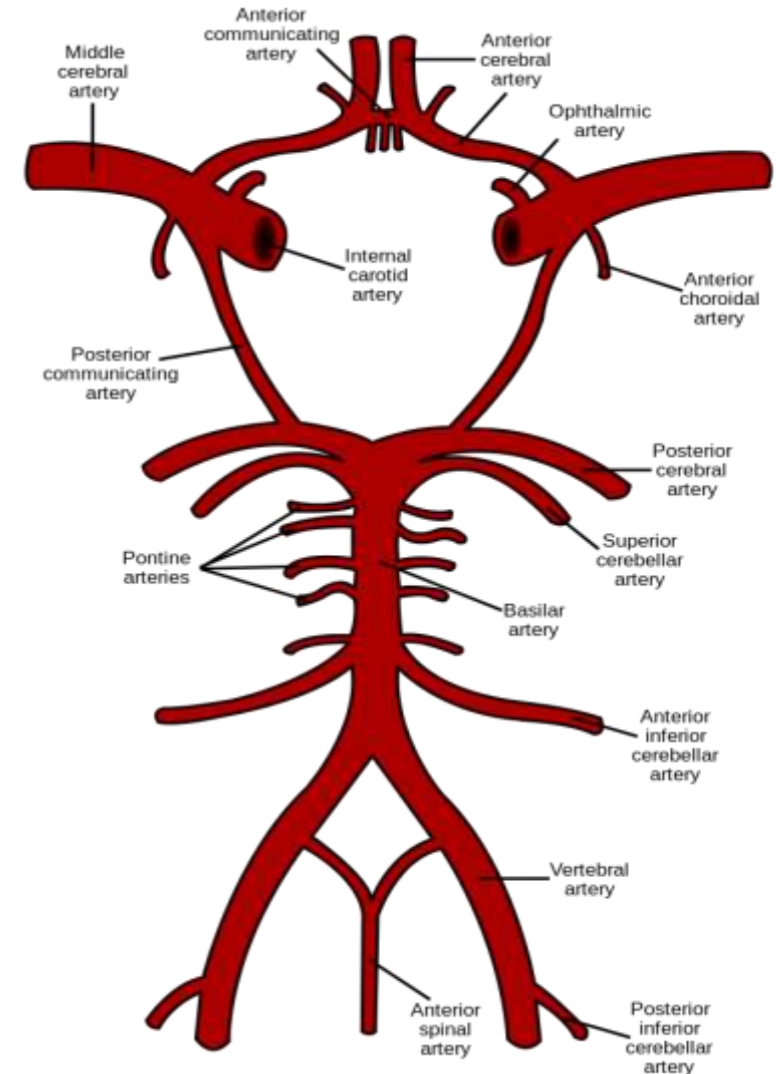
Posterior Circulation (AICA & PICA)

Posterior inferior cerebellar artery (PICA):

- Branches just before basilar
- Cerebellum, superior medulla, choroid plexus, 4th ventricle

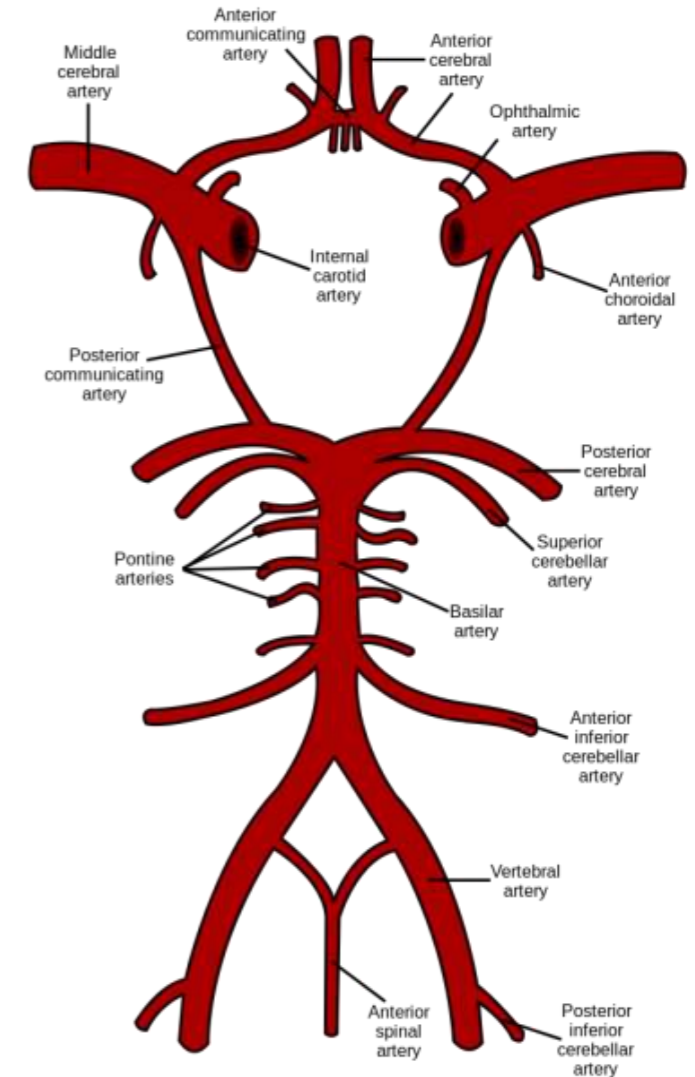
Anterior inferior cerebellar artery (AICA):

- Branches just after the basilar
- Anterior cerebellum



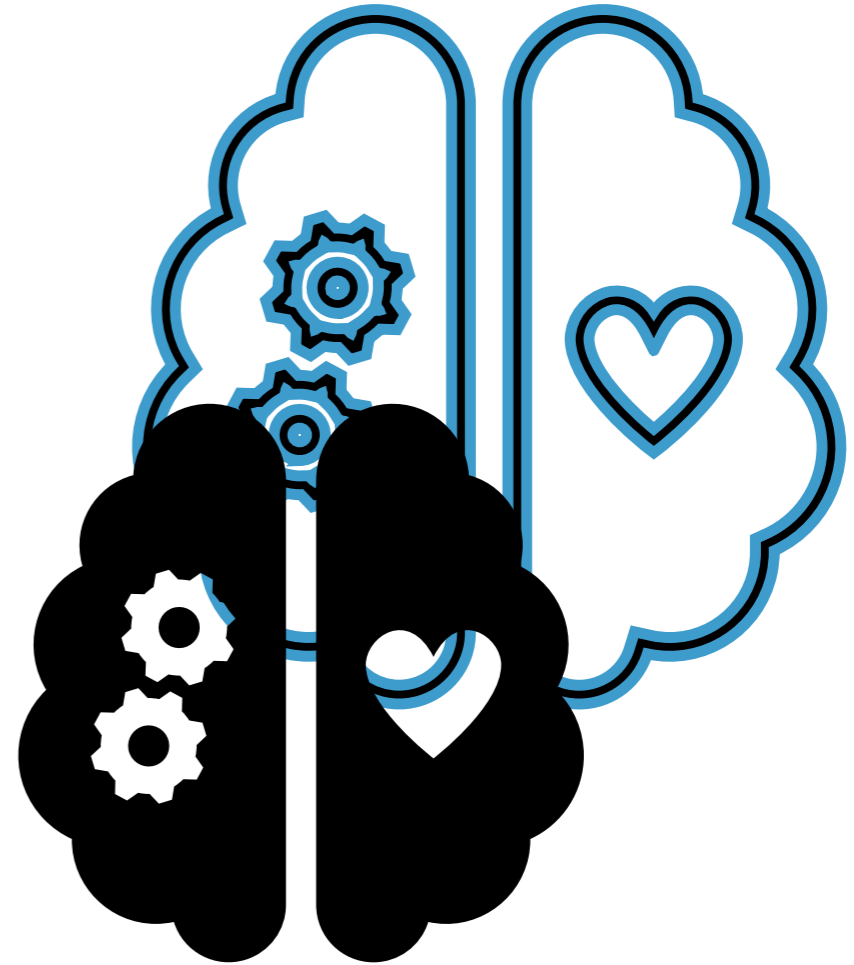
Basilar Artery

- Originate from the vertebral arteries at the junction of the medulla and pons
- Branches into the Posterior Communicating Artery (PCA) & Circle of Willis (COW)



Stroke Syndromes

Stroke syndromes are constellations of symptoms associated with specific locations of impaired blood flow.

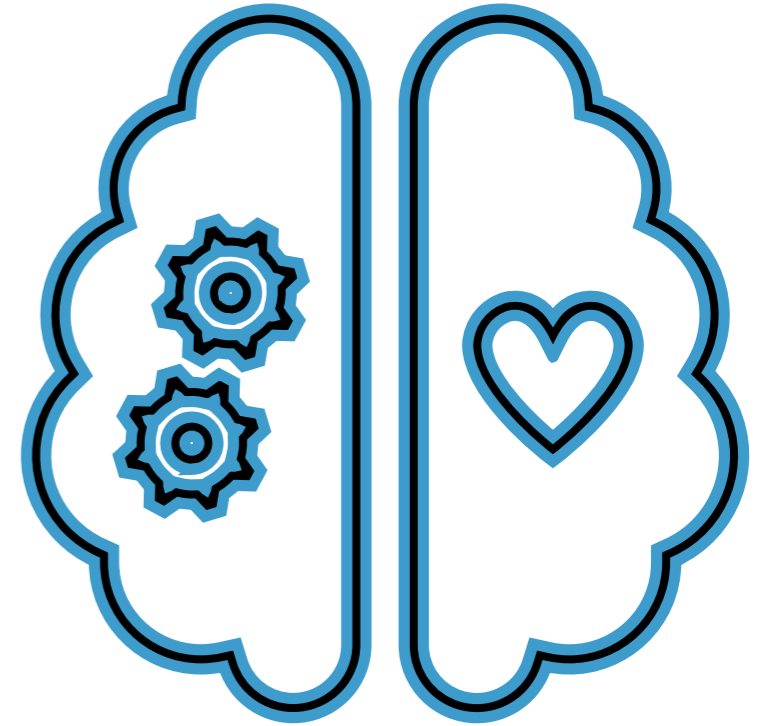


PCA Syndromes

Blood supply to the midbrain & thalamus impaired- Visual losses are common!

Weber's Syndrome: CN III palsy and contralateral hemiplegia

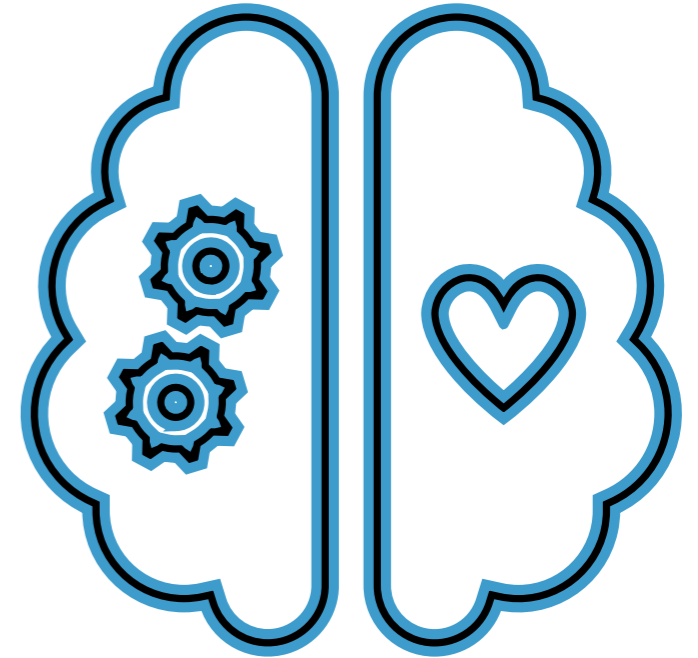
Parinaud's Syndrome: Associated with midbrain stroke- Impaired upgaze & nystagmus



PICA Syndrome

Wallenberg syndrome: Damage to the spinothalamic tract

- Loss of pain and temperature sensation in contralateral trunk & ipsilateral face
- Dysphagia
- Dysarthria
- Dysphonia
- Ipsilateral loss of corneal reflex

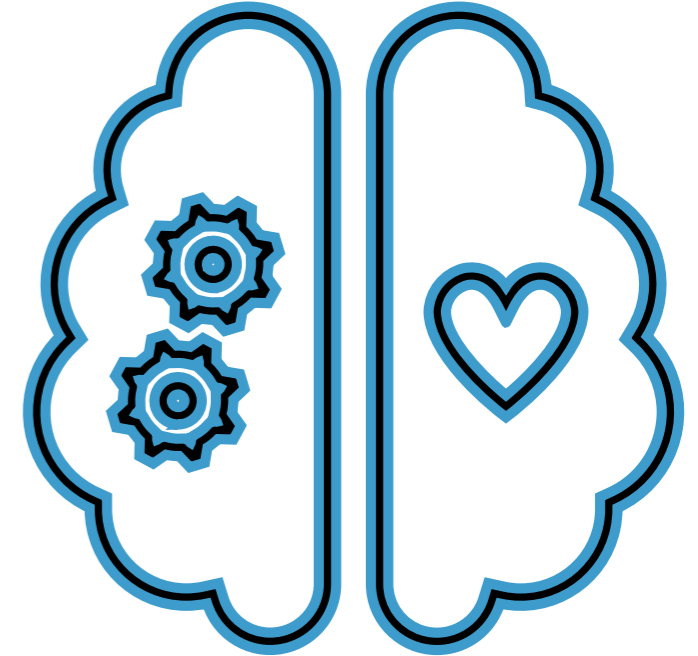


AICA Syndrome

Lateral pontine syndrome

- Vertigo
- Vomiting
- Nystagmus
- Falling toward the side of the lesion
- Facial paralysis & hearing loss (ipsilateral)

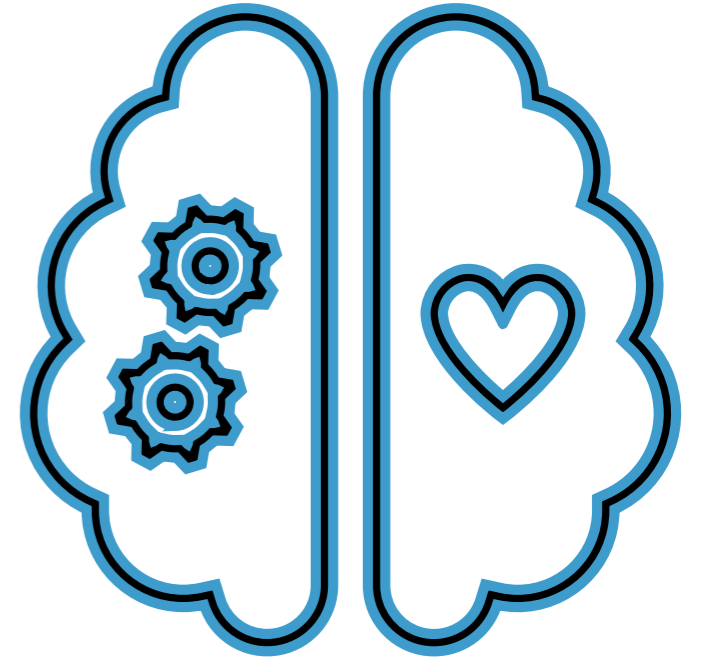
Assess for cerebellar findings!



Basilar Stroke Syndrome

Locked-in Syndrome: Vertebrobasilar artery occlusion leading pontine damage

- The patient is aware though cannot speak or move.
- Communication by blinking or gaze movement may be possible



Conclusion

- Posterior circulation strokes have varying presentations with or without focal neurologic presentations
- Delay in assessment and workup can limit timely intervention!
- The story and excellent assessment can mean the difference!



Stroke Assessment

With Consideration for Posterior Circulation

Using the NIHSS

- Scores range from 0 – 42
- 0 = no deficits
- 42 = devastating
- Used to grade the severity of the stroke
- Reliable & valid assessment tool
- It is not diagnostic.
- Score what you see, not what you think the patient can do
- Be aware of coaching.
- Comparative sensitivity and specificity between anterior and posterior circulation strokes!

Assessment with the NIHSS

- Assessment of known injury
- Determine changes in stroke severity
- Standardize communication about stroke symptoms
- Anticipate assessment priorities for this arriving patient in preparation!

Category	Score/Description	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time
		Initials	Initials	Initials	Initials	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 = Unstable (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 = Unstable (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 unintelligible 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						

NIHSS: LOC

1A: Level of consciousness

May be assessed casually while taking history

Alert; keenly responsive	0
Arouses to minor stimulation	+1
Requires repeated stimulation to arouse	+2
Movements to pain	+2
Postures or unresponsive	+3

1B: Ask month and age

Both questions right	0
1 question right	+1
0 questions right	+2
Dysarthric/intubated/trauma/language barrier	+1
Aphasic	+2

1C: 'Blink eyes' & 'squeeze hands'

Pantomime commands if communication barrier

Performs both tasks	0
Performs 1 task	+1
Performs 0 tasks	+2

NIHSS: Eyes & Face

2: Horizontal extraocular movements Only assess horizontal gaze	Normal	0
	Partial gaze palsy: can be overcome	+1
	Partial gaze palsy: corrects with oculocephalic reflex	+1
	Forced gaze palsy: cannot be overcome	+2
3: Visual fields	No visual loss	0
	Partial hemianopia	+1
	Complete hemianopia	+2
	Patient is bilaterally blind	+3
	Bilateral hemianopia	+3
4: Facial palsy Use grimace if obtunded	Normal symmetry	0
	Minor paralysis (flat nasolabial fold, smile asymmetry)	+1
	Partial paralysis (lower face)	+2
	Unilateral complete paralysis (upper/lower face)	+3
	Bilateral complete paralysis (upper/lower face)	+3

NIHSS: Upper & Lower Extremities

5A: Left arm motor drift

Count out loud and use your fingers to show the patient your count

No drift for 10 seconds	0
Drift, but doesn't hit bed	+1
Drift, hits bed	+2
Some effort against gravity	+2
No effort against gravity	+3
No movement	+4
Amputation/joint fusion	0

5B: Right arm motor drift

Count out loud and use your fingers to show the patient your count

No drift for 10 seconds	0
Drift, but doesn't hit bed	+1
Drift, hits bed	+2
Some effort against gravity	+2
No effort against gravity	+3
No movement	+4
Amputation/joint fusion	0

6A: Left leg motor drift

Count out loud and use your fingers to show the patient your count

No drift for 5 seconds	0
Drift, but doesn't hit bed	+1
Drift, hits bed	+2
Some effort against gravity	+2
No effort against gravity	+3
No movement	+4
Amputation/joint fusion	0

6B: Right leg motor drift

Count out loud and use your fingers to show the patient your count

No drift for 5 seconds	0
Drift, but doesn't hit bed	+1
Drift, hits bed	+2
Some effort against gravity	+2
No effort against gravity	+3
No movement	+4
Amputation/joint fusion	0

NIHSS: Ataxia/Sensation

7: Limb Ataxia
FNF/heel-shin

No ataxia	0
Ataxia in 1 Limb	+1
Ataxia in 2 Limbs	+2
Does not understand	0
Paralyzed	0
Amputation/joint fusion	0

8: Sensation

Normal; no sensory loss	0
Mild-moderate loss: less sharp/more dull	+1
Mild-moderate loss: can sense being touched	+1
Complete loss: cannot sense being touched at all	+2
No response and quadriplegic	+2
Coma/unresponsive	+2

NIHSS: Language

9: Language/aphasia	
Describe the scene; name the items; read the sentences (see Evidence)	Normal; no aphasia 0
	Mild-moderate aphasia: some obvious changes, without significant limitation +1
	Severe aphasia: fragmentary expression, inference needed, cannot identify materials +2
	Mute/global aphasia: no usable speech/auditory comprehension +3
	Coma/unresponsive +3

10: Dysarthria	
Read the words (see Evidence)	Normal 0
	Mild-moderate dysarthria: slurring but can be understood +1
	Severe dysarthria: unintelligible slurring or out of proportion to dysphasia +2
	Mute/anarthric +2
	Intubated/unable to test 0

- Brainstem
 - Cranial Nerve Abnormalities
 - **D**iplopia/**D**ysconjugate gaze:
 - **D**ysarthria/**D**ysphagia:
- Cerebellum
 - **D**izziness, vertigo, nystagmus:
 - Dystaxia, Truncal Ataxia, gait, **D**ysmetria: bilateral limb weakness
- Occipital Lobes
 - Visual Fields

NIHSS: Extinction/Inattention

11: Extinction/inattention

No abnormality	0
Visual/tactile/auditory/spatial/personal inattention	+1
Extinction to bilateral simultaneous stimulation	+1
Profound hemi-inattention (ex: does not recognize own hand)	+2
Extinction to >1 modality	+2

Solidifying Best Practices

Time to treatment!

- Maintain a high level of suspicion
- 35% of strokes/transient ischemic attacks are missed in the ED in patients who present with chief complaints of “dizziness”, “vertigo”, or “imbalance”
- Dizziness & vertigo account for approximately 4.4 million emergency department visits per year
(approximately 4% of ED visits)
- Emergency medicine physicians must distinguish the self-limiting causes of dizziness from the serious causes

Time to treatment!

- Call a code stroke
- Concern is enough... If we wait until we are sure we might be too late
- Half of posterior circulation TIAs present as a brief episode of dizziness
- Prompt diagnosis and treatment of posterior circulation TIAs can prevent future strokes

Communication support

Challenging to determine baseline when symptoms seem vague.

Recruit resources early:

- Family | Friends
- Use technology

**When in doubt,
resist making a
potentially false
assumption about
what's "normal"**

Safety with Swallow

One of the most common medical complications after stroke is aspiration pneumonia.

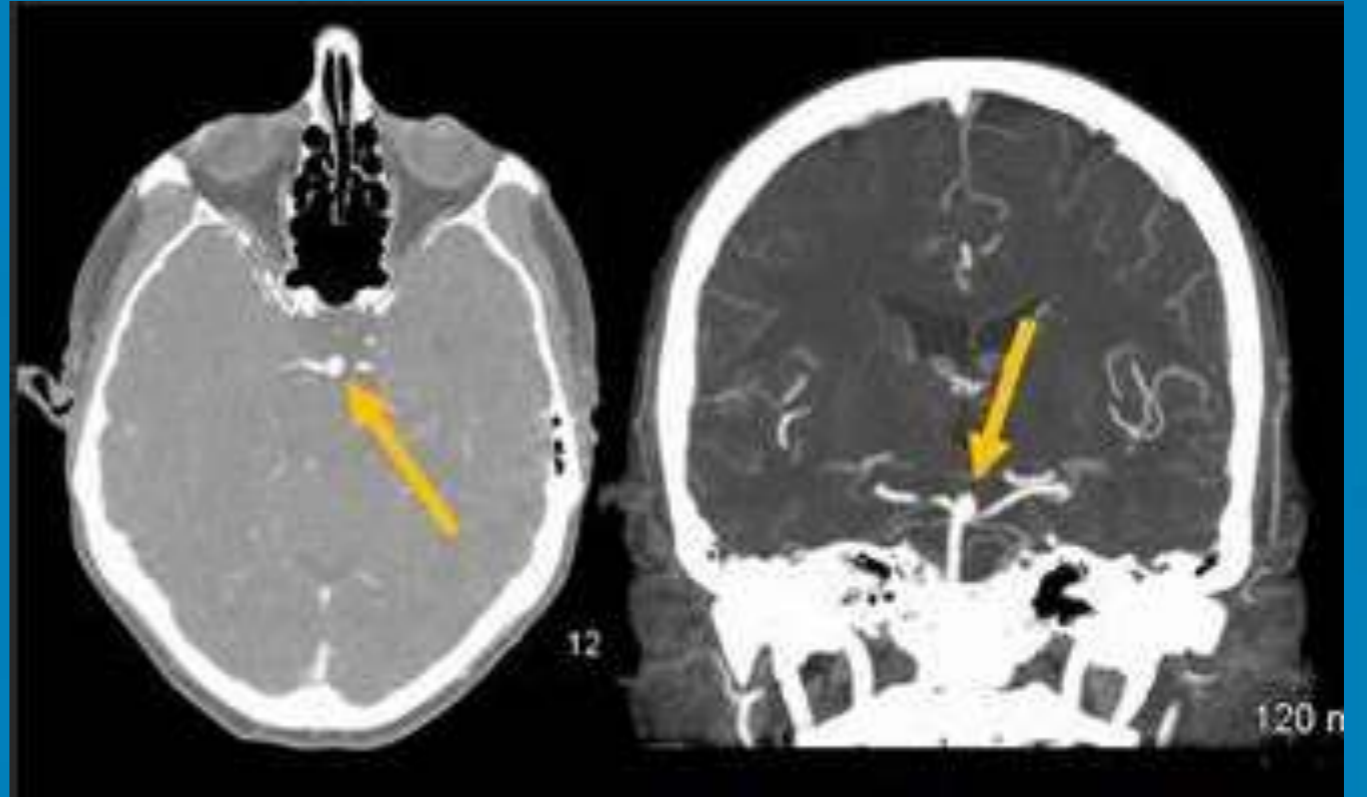
RN swallow screen is key to minimizing risk that could lead to complications, increase length of stay and reduce the opportunity for a functional outcome

Mobility challenges

- Vision
- Dizziness
- Discoordination
- Impulsivity
- Decreased physical awareness



Case Study



Review of Clinical Presentation

- **Posterior cerebral artery** –visual changes, field cut to blindness
- **Basilar artery** – impaired swallow, slurred speech decreased LOA, ataxia
- **Vertebrobasilar artery** –Horner’s syndrome, ataxia
- **Brainstem** –ipsilateral cranial nerve deficit with contralateral motor weakness

60 y.o. male who presents to the Emergency Department with decreased level of alertness.

Patient lives with his sister

Last seen normal at 1:30 PM when sister left for the day.

Sister came home at 9:30pm and found him sleeping very deeply on the couch. She sat down and watched TV near him for several hours.

At approximately 1 AM Pt. woke, and seemed to have to go to the bathroom. He seemed to be very sedated, couldn't sit up straight and couldn't clearly articulate his words.

His eyes shut, had an unsteady gait on the way to the bathroom.

Moved all extremities symmetrically.

What's the differential?

- Severe sedation
- Alcohol intoxication
- Uremia
- Severe dehydration
- DKA
- Posterior circ stroke?

Bias?

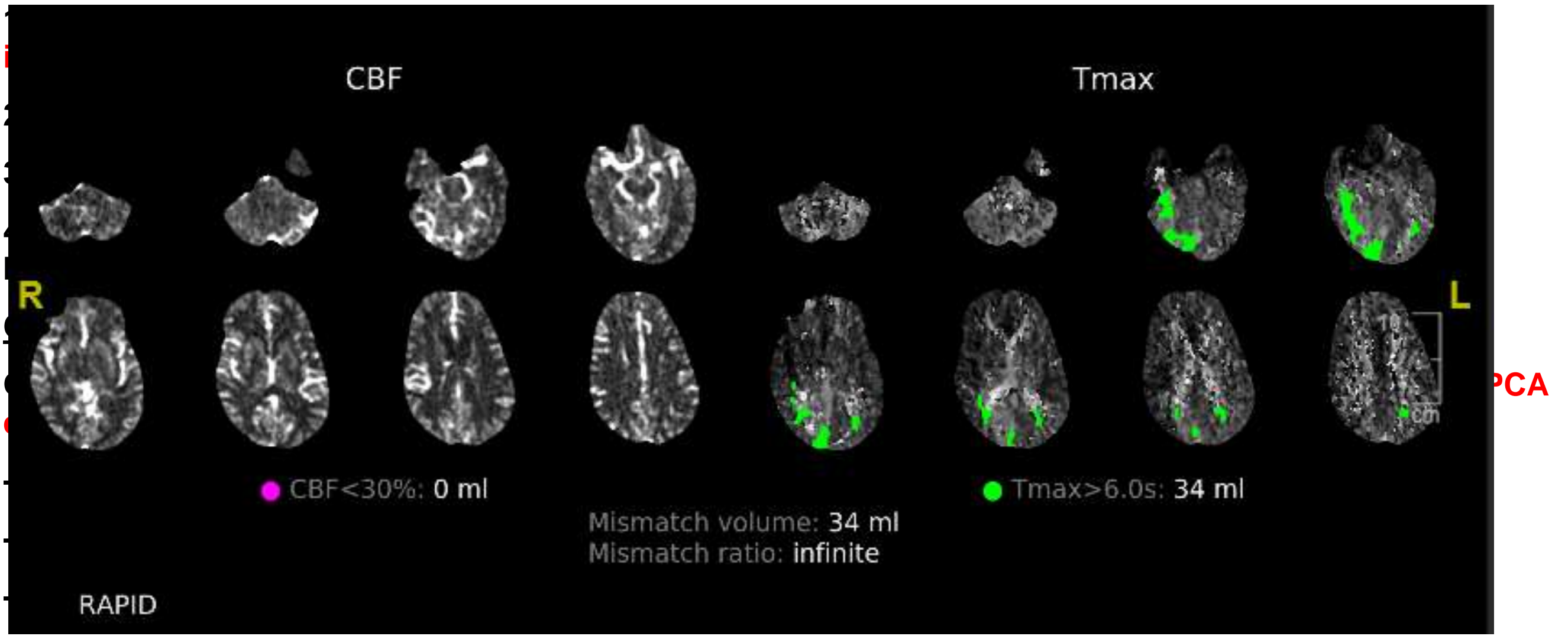
BB EMS from home after sister noticed patient acting "differently" tonight.

Pt apparently has been staying at sister's couch and was hard to arouse tonight.

Patient has no history of substance abuse to strongly suggest overdose or significant alcohol intoxication, however, pupils are constricted.

Imaging

CTA



Imaging

- Repeat CTA of head/neck shows that the BA is open, but ongoing tapering of the right PCA and left PICA narrowing
- MRI brain confirms bilateral thalamic stroke that extends up from anterior/superior portion of the midbrain.

Clinical Presentation

- Vision impairments
- Impulsivity
- Impaired insight

- Other significant findings & challenges?

Patient Outcome

NIHSS ↓ from 12 on admit to 1 on discharge after 34 day LOS

Discharge complicated by: insurance coverage, “behavior”, cognition, psychotropic use

Discharged to Acute Rehab Unit (ARU) for high intensity rehab to support discharge back home

Take Aways

- Symptoms can be **very** subtle
- Typical findings:

Ataxia

Nystagmus

Altered Mental Status

Vertigo/Dizziness

Nausea/Vomiting

Headache

Dysarthria

Unilateral Limb Weakness

Blurry Vision

Early recognition of symptoms matters

Prompt identification and treatment matters

Recognition of neurological processing impairment vs. “behavior”

Anticipate patient needs, identify successful strategies

Share successes with teammates so they can be continued

Question #1

The nurse is caring for a patient who experienced a posterior infarct from a thrombus in the left posterior inferior cerebellar artery. On initial assessment the nurse notes the patient to have difficulty speaking, notable drooling, and decreased response to pain stimulus on the right upper and lower extremities. The nurse understands this correlates with which stroke syndrome?

- A. Basilar artery syndrome
- B. Weber's syndrome
- C. Wallenberg syndrome
- D. Lateral pontine syndrome

Question #2

The nurse identifies an acute change in mental status with development of acute nausea and vomiting. Which assessment should the nurse prioritize to support determination of a possible cerebellar findings for stroke?

- A. Ask the patient to state their name and age
- B. Assess for possible visual fields cuts
- C. Finger to nose test in the upper extremities
- D. Assessing for drift in each extremity

Questions?