

CATRAC Symposium

Crucial Steps in Pre-Hospital Identification & Treatment of Stroke

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N O N E

Objectives

1. Discuss the difference between time last known well and symptoms onset
2. Describe how acute stroke imaging can drive treatment and management of the patient in the hyperacute stroke phase
3. Recall the components of the VAN stroke screening
4. Understand the importance of 'door in door out' in the care of the patient in the hyperacute stroke phase

Stroke Stump Speech

- In 2020, 1 in 6 deaths from cardiovascular disease was due to stroke
- Every 40 seconds, someone in the United States has a stroke
- Every 4 minutes, someone dies of stroke
- Every year, more than 795,000 people in the United States have a stroke
- About 610,000 of these are first or new strokes
- About 185,000 strokes—nearly 1 in 4—are in people who have had a previous stroke
- About 87% of all strokes are ischemic stroke
- Stroke-related costs in the United States came to nearly \$53 billion between 2017 and 2018
- This total includes the cost of healthcare services, medicines to treat stroke, and missed days of work
- Stroke is a leading cause of serious long-term disability
- Stroke reduces mobility in more than half of stroke survivors age 65 and older

Patient PA

- EMS run sheet notes
 - Chief complaint - Stroke, LVO positive
 - History - CHF, GERD, HTN, hypothyroidism, MI, acute kidney injury, Afib, falls, TBI
 - Medications - coreg, lasix, levothyroxine, losartan, lyrica, multivitamins, zofran, pantoprazole, potassium, pregabalin, ranolazine, topiramate, tramadol

Narrative
Medic 22 dispatched emergent to possible stroke. On arrival to facility, 75 yo female in bed, awake, a/ox4, gcs 15, airway patent, breathing adequate. At 0930 facility arrived to discharge patient day of call and noted sudden onset of left sided weakness with tongue deviated to left side, nurse reported stroke assessment positive, and EMS alerted.
EMS arrived to patient complaining of "not able to move left side", EMS noted stroke scale positive for left sided motor deficits, sensory intact on all extremities, pulses intact in all extremities, patient did not have slurred speech, denied headache, and no facial asymmetry.
Patient VAN negative on initial assessment; patient able to move head side to side, no visual disturbances, and no gaze appropriate.
Facility reported patient arrived to rehab due to mild TBI with acute hypoxia and on 2 lpm of O2 at baseline via NC. Patient bgl recorded above and patient vitals as recorded above. Patient bradycardic and hypertensive. Patient was moved to cot via slide sheet maneuver, secured x5 with straps, and loaded to ambulance via powerload. EMS activated stroke alert to ED, transported, and reassessed vitals as recorded above. EMS attempted IV access x2, unsuccessful. EMS provided radio report to receiving ED.
On arrival to ED, EMS moved patient to hallway bed via slide sheet maneuver. Neurologist arrived bedside. EMS provided report. EMS obtained signatures and cleared from call. EMS out of service for possible transfer.



What are you thinking about when you see this medical history and medications?

Case Study

Acute Stroke Times

Door Times (minutes)		
LKW to Arrival		52
Door to ED MD Arrival (10 min)		1
Door to Neurology Arrival (20 min)		0
Door to Imaging Initiation (20 min)		43
Door To Imaging Read (45 min)		48
Order to Labs Complete (45 min)		34
Door to EKG Complete (45 min)		
I V t P A	Pre-bolus VS (15 min before bolus)	29
	Pre-bolus Neuro Assess (15 min before bolus)	29
	Decision to Bolus	0
	Ordered to Bolus (5 min)	0
	Door to Needle/DTN (45 min)	52

Mechanism of stroke - likely Afib, not on anticoagulant

Neurology Consult and Diagnosis

- “She was doing very well at rehab, at her baseline neurologic state at 9:15 AM today, right about to be discharged home. Her nurse stepped out of her room, walked back in at 9:30 AM and found her to have a right gaze preference and left-sided weakness. EMS was called”
- “MR stroke protocol showed an acute right MCA stroke mainly involving the **basal ganglia** without corresponding FLAIR signal change, no hemorrhage, large penumbra (72 mL), right proximal MCA occlusion”
- Treatment - TNK and transfer to higher level of care for Thrombectomy
- **Ascension Seton is MRI first imaging for acute stroke imaging**



What is last known well?
What time is symptom onset?
Why is that important?
Why does it matter that we do MR first?

Tenecteplase Thrombolysis for Acute Ischemic Stroke

- Ascension Seton led the way in using TNK for acute ischemic stroke
 - The Region following suit in recent years
- EXTEND-IA TNK Trial
 - Tenecteplase demonstrates superior early reperfusion versus alteplase in lesions with low clot burden
 - Reperfusion efficacy remains limited in internal carotid artery occlusions and lesions with high clot burden
- Minimize delays in DTN and DIDO
 - No infusion - requires bolus only
- Ischemic stroke treatment with 0.25-mg/kg tenecteplase was associated with lower odds of sICH than treatment with alteplase. The results provide evidence supporting the safety of tenecteplase for stroke thrombolysis in real-world clinical practice

[Tenecteplase Thrombolysis for Acute Ischemic Stroke](#)

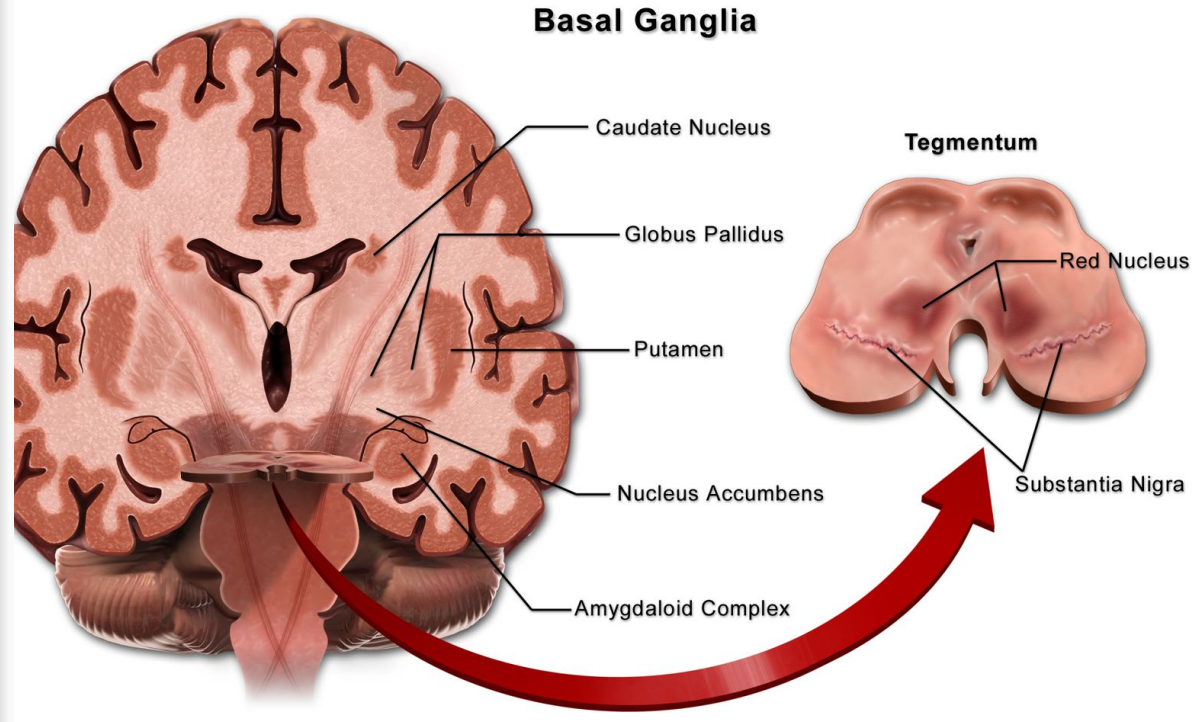
[Tenecteplase Treatment and Thrombus Characteristics Associated With Early Reperfusion: An EXTEND-IA TNK Trials Analysis](#)

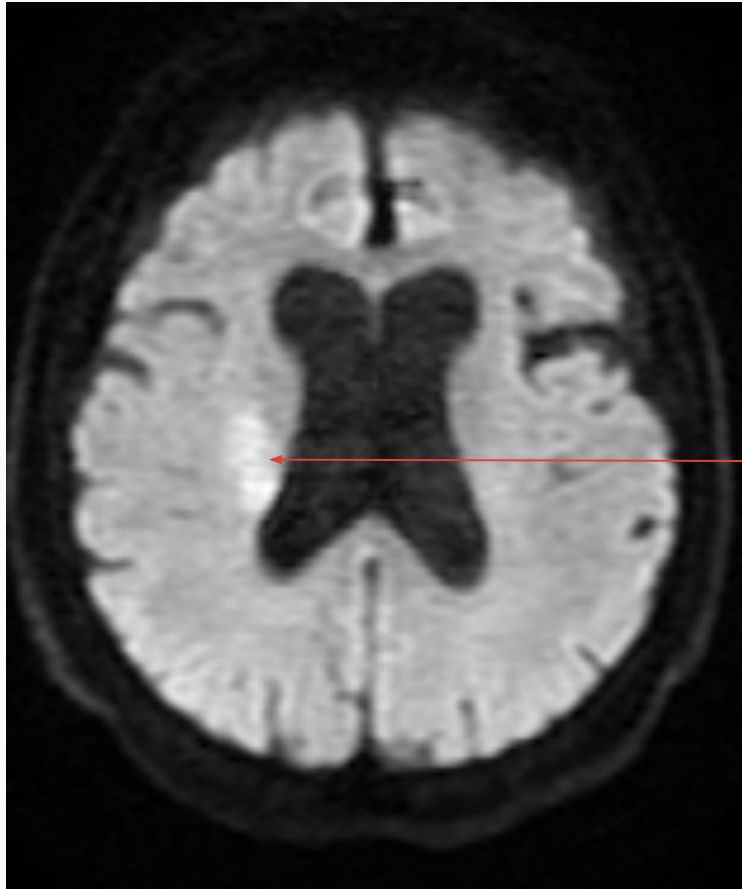
[Comparing Tenecteplase and Alteplase in Acute Ischemic Stroke Treatment: A Comprehensive Outcome Analysis](#)

[Symptomatic Intracranial Hemorrhage With Tenecteplase vs Alteplase in Patients With Acute Ischemic Stroke: The Comparative Effectiveness of Routine Tenecteplase vs Alteplase in Acute Ischemic Stroke \(CERTAIN\) Collaboration](#)

Basal Ganglia Stroke

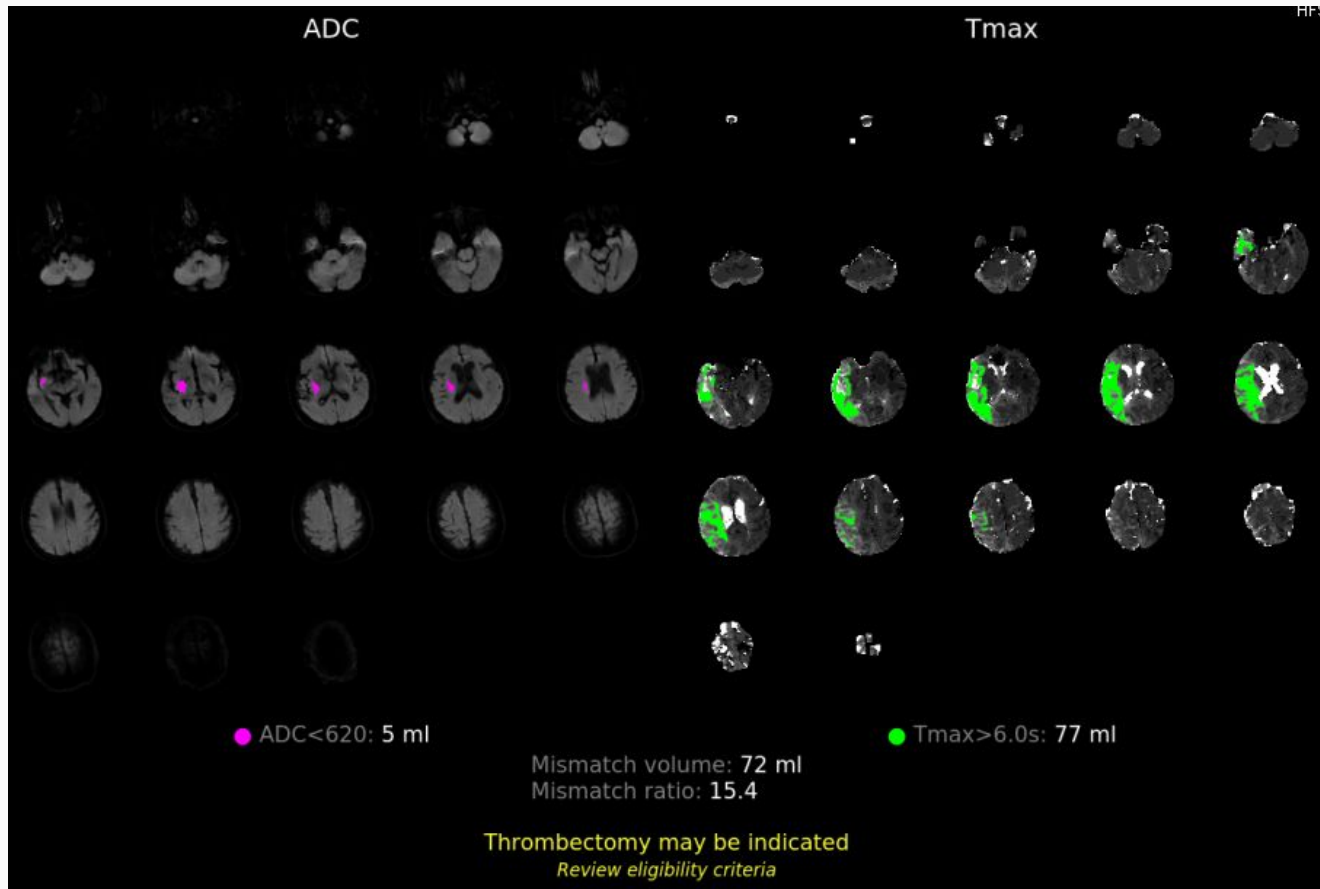
- Basal ganglia are situated at the base of the forebrain and top of the midbrain
- Basal ganglia are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas
- Affects a part of the brain that is essential for movement, language, mood, and other crucial functions
- Basal ganglia stroke may also lead to changes in emotions, movement, and initiative





Ischemic core already present

MRI - RAPID software (Rapid Processing of Perfusion and Diffusion)



- Ischemic **pink**, in **pink**
- The **green** shows the at risk brain (the **penumbra**) which was at risk of infarction if treatment isn't pursued
- You can see there was a huge portion of right middle cerebral artery territory that was at risk of infarct (**the green**) that hadn't yet infarcted (not yet pink)
- The "mismatch volume," or the volume that was at risk but not yet infarct, was huge (72mLs)

Context for size of penumbra - Average lacunar stroke is 1 - 2 mls, not always detected on RAPID 10 mls is arguably worth considering EVT



- Coronal picture of the anterior circulation
- Right middle cerebral artery was occluded
 - You can see the absence of filling compared to the left side



Decision to transfer to higher level of care for thrombectomy

Door in Door out (DIDO)

- AHA Target Door-in-Door-out Times - goal of ≤ 90 minutes in 50 percent or more of acute ischemic stroke patients transferred
- [AHA Best Practice Strategies](#)
 - Education and awareness
 - Pre hospital notification
 - Streamline triage
 - Rapid imaging
 - Coordinated stroke team
 - Standardized protocols
 - Continuous PI
 - Patient and family education

Case Study

Door in Door out Times

- Pre activation @ 09:45
- Arrival at Hospital @ 10:07
- Decision to Treat @ 10:59
- Activation of EMS for Transfer @ 11:12
- Departure from Hospital @ 11:12



Door in Door out - 78 mins

Large Vessel Occlusion - Pre hospital screening

- Large vessel occlusion (LVO) is the obstruction of large, proximal cerebral arteries and accounts for 24–46% of acute ischaemic stroke (AIS) ([NIH, 2021](#))

Pre hospital screening tool - VAN - [Validation by AHA](#)

[AHA presentation - Pre Hospital VAN Stroke Assessment](#)

- VAN = vision, aphasia, neglect
- Validated screening tool

Why use the VAN?

Test item	Directions
Vision	Is there a gaze preference to either side (usually away from the hemiparesis)?
Aphasia	Ask the patient to name simple objects (ie: watch, pen).
Neglect	With eyes closed, touch each arm independently and ask which side is being touched. Then touch both simultaneously. If neglect is present the patient will only report one side being touched, almost always neglecting the left side.

- Fast! Requires minimal effort and resources
- **Arm weakness is key! Test it:-) if no arm weakness - assume VAN negative**
- components - **vision, aphasia, neglect**

- VAN screening tool accurately identified LVO patients and outperformed a NIHSS ≥ 6 severity threshold
- May best allow clinical teams to expedite care and mobilize resources for LVO patients
- A larger study to both validate this screening tool and compare with others is warranted

Let's break down the VAN - Vision

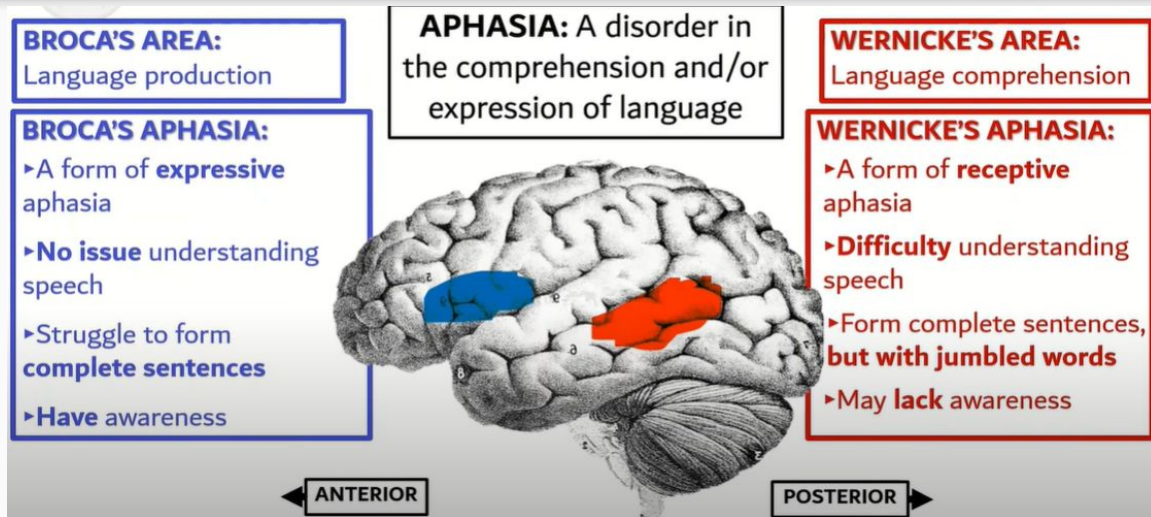
- Vision changes in stroke
 - Used to test all 4 quadrants but after massive analysis noted that almost all pts had complete homonymous hemianopsia (can see completely anything on L or R)
 - Testing for uneven eyes or visual field cut
 - Look at nose and test left and right (wiggle fingers)
 - Look for conjugate gaze

- MCA strokes - will look toward the stroke lesion therefore looking away from affected side
- Seizure - eyes will go away from lesion

Into the hole and away from the fire:-)

Let's break down the VAN - Aphasia

- Aphasia- Broca or Wernicke
 - Wernicke's (posterior temporal lobe, dominant hemisphere) - impaired language comprehension
 - Brocas (frontal lobe, usually left side, area responsible for speech and motor movement) - poor or absent grammar
- Test by asking the pt to name 2 items, repeat a phrase, and follow 2 commands



Do not confuse aphasia for confusion!!!



Why is this important?

Let's break down the VAN - Neglect

- Formerly extinction and inattention in the NIHSS
- Can be confused with visual field impairment
- Forced gaze/ignoring one side (can't overcome)
- Test by having the pt follow finger and touch both sides (neglect will only feel one side)

- Almost always a right hemisphere phenomenon
- MCA – hemibody neglect, hemisensory neglect, hemi auditory neglect
- PCA – hemisensory neglect, visual field neglect
- Patient may have no awareness of their deficits. As a result, may try to get up off of stretcher when paretic on one side. May have arm stuck through bed rail in unnatural position without awareness. “I fell down and couldn't get up,” not understanding why

Case Study

Thrombectomy Times

- Arrival to Hospital @ 11:54
- IR team activated prior to arrival
- Pt arrival in IR @ 11:55
- MD arrival in IR @ 11:45
- Procedure start @ 12:11
- Groin @ 12:12
 - TICI 3 @ 12:40



DTG - 18 mins
Door to
recanalization - 46
mins

TICI - Thrombolysis in Cerebral Infarction scale

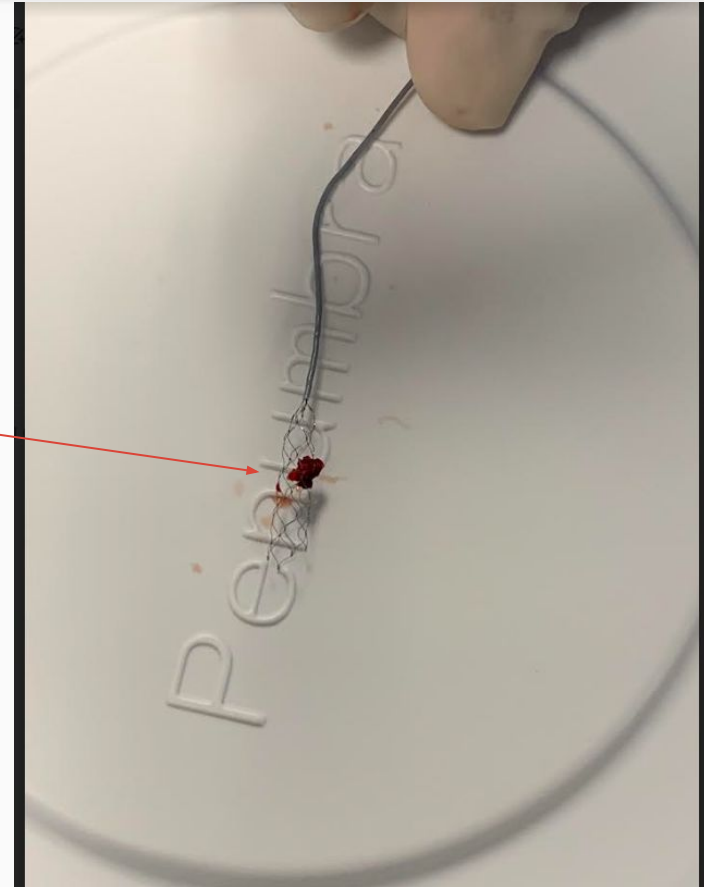
Category	Title	Description
Grade 0	No Perfusion	No antegrade flow beyond the point of occlusion.
Grade 1	Penetration with Minimal Perfusion	The contrast material passes beyond the area of obstruction but fails to opacify the entire cerebral bed distal to the obstruction.
Grade 2	Partial Perfusion	The contrast material passes beyond the obstruction and opacifies the arterial bed distal to the obstruction. However, the rate of entry of contrast into the vessel distal to the obstruction and/or its rate of clearance from the distal bed are perceptibly slower than its entry into and/or clearance from comparable areas not perfused by the previously occluded vessel.
Grade 2a		Only partial filling (less than two-thirds) of the entire vascular territory is visualized.
Grade 2b		Complete filling of all of the expected vascular territory is visualized but the filling is slower than normal.
Grade 3	Complete Perfusion	Antegrade flow into the bed distal to the obstruction occurs as promptly as into the obstruction and clearance of contrast material from the involved bed is as rapid as from an uninvolved other bed of the same vessel or the opposite cerebral artery.

Post Thrombectomy Imaging



MCA now
filling

THE CLOT!



Patient Outcome

Presenting NIHSS 17 (0-42)

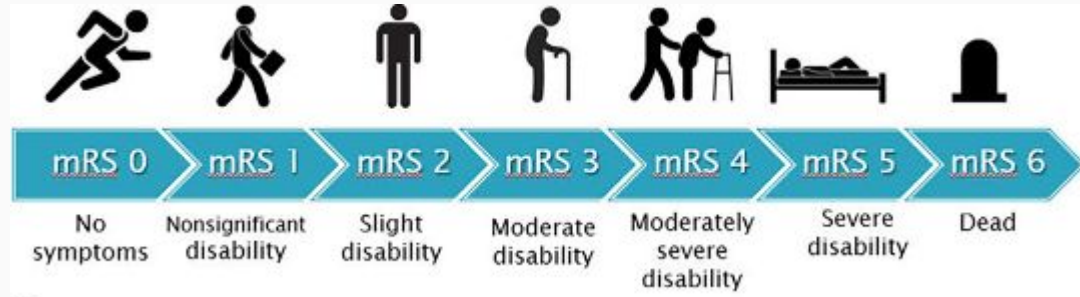
Pre mRS 3 (0-6; 6 = deceased)

DC NIHSS 4

DC mRS 4

Inpt stay - 4 days

DC to inpatient rehab



In closing

Successes in this case:

Multidisciplinary approach/collaboration

Ongoing patient evaluation

Transparent communication

Commitment to delivering timely stroke care

Thank you for all
you do
From the entire
Ascension Stroke
Team