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Lessons from the Field

Rural Stroke Case Review from Dispatch to Discharge

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1. Review the patient's journey from symptom onset through diagnosis, treatment, transfer, and post-acute care

2. Identify System Strengths and Barriers to Care and the impacted patient outcomes.

.

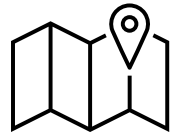
•3. Provide Applicable Lessons to Strengthen the Stroke System of Care

4. Reinforce best practices (early prenotification, telestroke activation, parallel processing, rehab planning).

Patient Overview

- Patient: Sarah, 72-year-old female

- Location: Small rural town with critical access hospital -- 85 miles from the nearest comprehensive stroke center



- Onset of Events:
  - Played pickleball and went to lunch with friends
  - Did some light housework
  - Started feeling tired, and "just not right," so she decided to rest for ~ 1 hr
    - after all, she did have a busy day
  - Began to prepare dinner and while chatting with her husband, he noticed she didn't sound normal
  - She dropped a small pot of water, got very dizzy and needed to sit down.

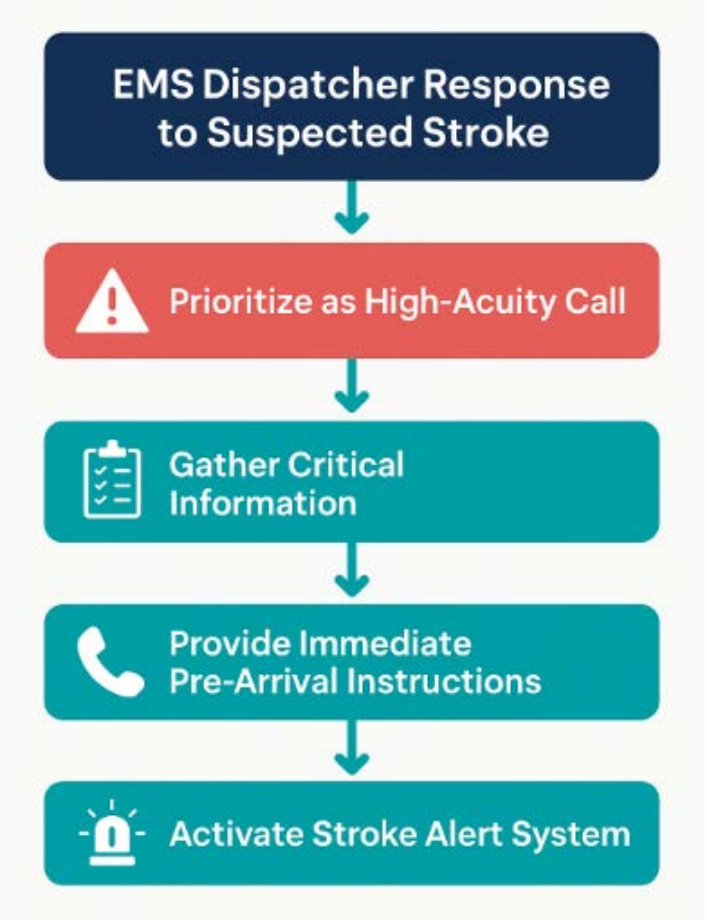
- Actions: Husband called 911 at 5:45 pm.

Dispatch

- Received 911 call at 5:45 PM

- Notify responding EMS units & provide the following info:
  - Last Known Well (LKW)
  - Symptoms
  - Stroke risk factors
  - Any safety concerns

* *If local protocol allows, alert the nearest hospital of a potential stroke so they can prepare for rapid assessment.*



Goal: Seamless handoff from dispatch → EMS → ED with no delays!

911 Dispatch

- What happens in your locality when someone calls 911 with these symptoms?

- Has dispatched received education that would help them recognize this as a possible stroke or neurological emergency?

- Gather critical info to help get this patient to treatment as fast as possible:
  - Last Known Well—ask “When was the last time the patient was acting normally?”
  - “When did symptoms start? Are they getting worse?”
  - F.A.S.T. symptoms?
  - Is the scene safe?
  - Provide Immediate Pre-Arrival Instructions—ensure the patient is lying or sitting to prevent falls, do not give food, water, or oral medications, watch for sudden loss of consciousness, seizures, or worsening symptoms.
  - Help gather medication & health information
  - Ensure clear access to the patient: unlock doors & turn on lights

EMS & Stroke

- What is the on-scene time goal for EMS?

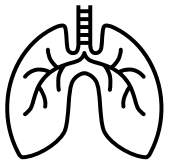
- What is the guideline-based time limit to provide thrombolytic therapy?

- What is the median time from Last Known Well to hospital arrival times for South Dakota stroke patients?

EMS

What are the first priorities of EMS?

- Rapid assessment of ABCs (Airway, Breathing, Circulation)



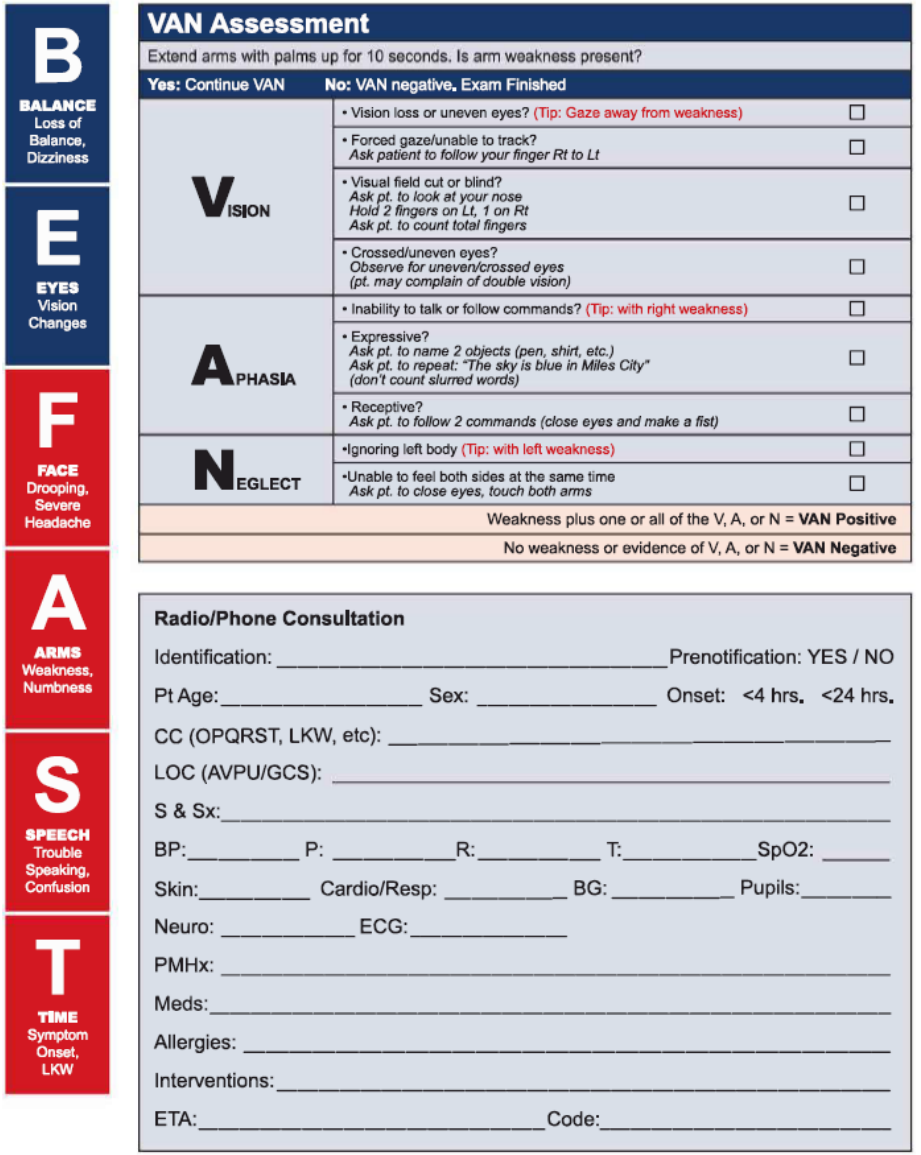
- Determine responsiveness (AVPU scale- alert, verbal, pain, unresponsive)
- Obtain vital signs, including glucose (fingerstick)

- Oxygen if hypoxic - keep >94%
- Implementation of BEFAST/VAN assessments looking for neurological deficits

Focused Stroke Assessment

- BEFAST
  - BALANCE
  - EYES
  - FACE
  - ARMS
  - SPEECH
  - TIME OF ONSET

- Stroke VAN
  - Vision
  - Aphasia
  - Neglect
    - Five components
    - Helps identify *posterior* circulation strokes
    - If positive, perform VAN/LAMS



B BALANCE Loss of Balance, Dizziness

E EYES Vision Changes

F FACE Drooping, Severe Headache

A ARMS Weakness, Numbness

S SPEECH Trouble Speaking, Confusion

T TIME Symptom Onset, LKW

VAN Assessment

Extend arms with palms up for 10 seconds. Is arm weakness present?

Yes: Continue VAN **No:** VAN negative. Exam Finished

VISION	• Vision loss or uneven eyes? (Tip: Gaze away from weakness)	☐
	• Forced gaze/unable to track? *Ask patient to follow your finger Rt to Lt*	☐
	• Visual field cut or blind? *Ask pt. to look at your nose Hold 2 fingers on Lt, 1 on Rt Ask pt. to count total fingers*	☐
	• Crossed/uneven eyes? *Observe for uneven/crossed eyes (pt. may complain of double vision)*	☐
APHASIA	• Inability to talk or follow commands? (Tip: with right weakness)	☐
	• Expressive? *Ask pt. to name 2 objects (pen, shirt, etc.) Ask pt. to repeat: "The sky is blue in Miles City" (don't count slurred words)*	☐
	• Receptive? *Ask pt. to follow 2 commands (close eyes and make a fist)*	☐
NEGLECT	•Ignoring left body (Tip: with left weakness)	☐
	•Unable to feel both sides at the same time *Ask pt. to close eyes, touch both arms*	☐

Weakness plus one or all of the V, A, or N = **VAN Positive**

No weakness or evidence of V, A, or N = **VAN Negative**

Radio/Phone Consultation

Identification: _____ Prenotification: YES / NO

Pt Age: _____ Sex: _____ Onset: <4 hrs. <24 hrs.

CC (OPQRST, LKW, etc): _____

LOC (AVPU/GCS): _____

S & Sx: _____

BP: _____ P: _____ R: _____ T: _____ SpO2: _____

Skin: _____ Cardio/Resp: _____ BG: _____ Pupils: _____

Neuro: _____ ECG: _____

PMHx: _____

Meds: _____

Allergies: _____

Interventions: _____

ETA: _____ Code: _____

BE FAST - Balance and Eyes

Balance Issues

- Dizziness

Questions: Do you feel off balance or does it feel like the room is spinning?

Eyes - loss of vision, blurred vision

- Corrected vision?
- Eye Deviation

Command: Follow my finger all the way to right and left

Question: How many fingers am I holding up? 4 quadrants

BE FAST - Facial Palsy

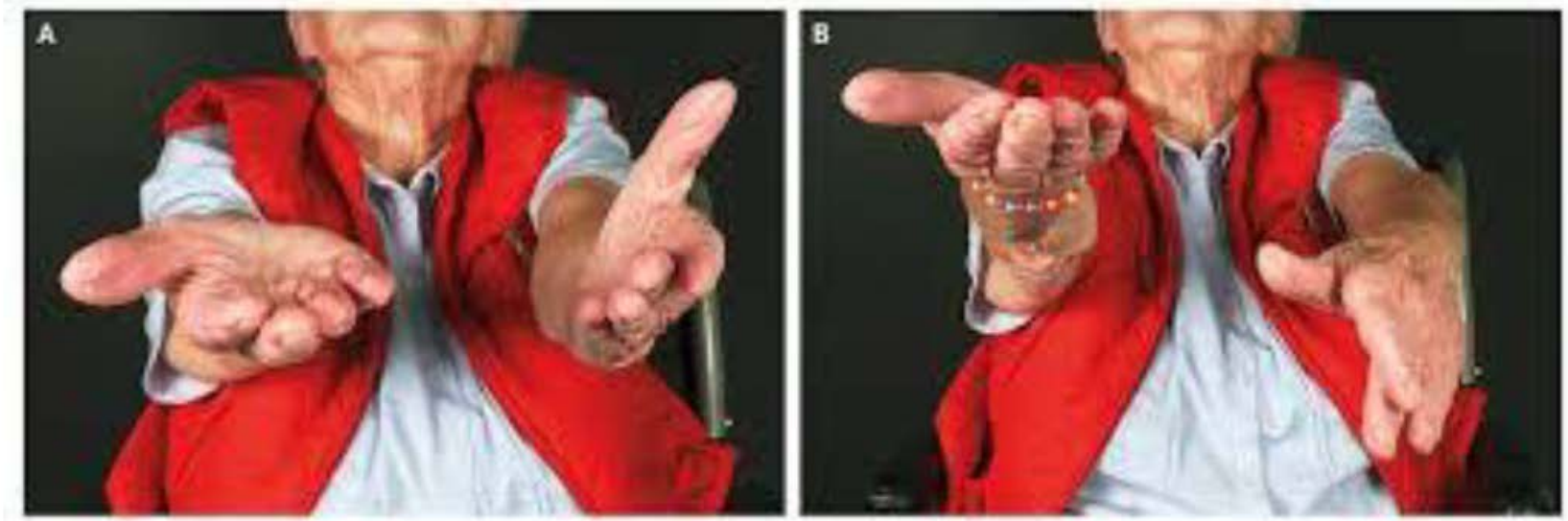
Facial Palsy: Facial weakness, Facial droop

Command: Smile big and show me those teeth

BE FAST - Arm Weakness

Arm Weakness

- Command - Hold out your arms, palms up, for 10 seconds with eyes closed
- First step of VAN assessment



BE FAST - Speech

Speech Changes

- Assess speech: articulation, naming, following commands
- Command: Read these words or repeat these words (listen for slurring)

Expressive Aphasia:

Commands: Name 3 objects, show me what you want, nod yes/no, tell me what this picture shows

Receptive Aphasia:

Commands: Show me 2 fingers, close your eyes, stick out your tongue, touch your nose

BE FAST - Time

- IS THE PATIENT A RELIABLE SOURCE
- When did this start?
- Last Known Normal
- Last seen without symptoms
- Onset of symptoms
- Witnessed onset can be preferred

Question to confirm the time of stroke start or time last normal.

To patient: When did you first notice this?

To patient: Did you feel normal when you

1. When you went to bed last night?
2. Woke up?
3. Ate Breakfast/lunch/dinner?

To witness:

1. Did you see this stroke start? When?
2. No, you did not? Then when was the last time anyone saw them and they were normal?

Did the family SEE this happen?

- If not, when was the last time they saw the patient and the patient was normal
- Patient may be able to answer all questions
- Pin timing questions to daily events like meals, getting up in the AM, etc.

VAN –Prehospital Stroke Assessment

Stroke VAN Assessment			
Is arm weakness present? (extend arms with palms up for 10 sec.)			
YES: Continue VAN			
NO: VAN negative. Exam Finished			
V	Vision	(Tip: Gaze away from weakness) • Vision loss or uneven eyes? ☐	YES/NO
		• Forced gaze/unable to track? ☐ Ask patient to follow your finger Rt to Lt	
		• Visual field cut or blind? ☐ Ask pt. to look at your nose. Hold 2 fingers on Lt, 1 on Rt. Ask pt. to count total fingers.	
		• Crossed/uneven eyes? ☐ Observe for uneven/crossed eyes. (pt. may complain of double vision)	
A	Aphasia	(Tip: with right weakness) • Inability to talk or follow commands? ☐	YES/NO
		• Expressive? ☐ Ask pt. to name 2 objects (pen, shirt, etc.) Ask pt. to repeat: "the sky is blue in Miles City" (don't count slurred words)	
		• Receptive? ☐ Ask patient to follow 2 commands (close eyes and make a fist)	
N	Neglect	(Tip: with left weakness) • Ignoring left body ☐	YES/NO
		• Unable to feel both sides at the same time ☐ Ask pt. to close eyes, touch both arms	
VAN Positive: weakness plus one or all of the V, A, or N (vision, aphasia, neglect)			
VAN Negative: no weakness or no evidence of V, A, or N			

VAN Step 1: ARM TEST

- Assess motor function using BEFAST

o If the patient has no arm-drift, paralysis, or unilateral weakness, STOP - the test is over

o If arm-drift is present, move on to step 2

VAN Step 2: Visual Disturbances

- Symptoms:
  - Double vision, seems to only see in one direction, says there is loss of vision?
  - Only looking in one direction or unable to track?
  - Crossed or uneven eyes?
- If YES, the test is finished. The patient is VAN positive.
- If NO, move on to step 3

VAN Step 3: Aphasia

- Symptoms
  - Inability to talk or follow commands?
    - Ask the patient to name two objects
    - Ask patient to follow two commands
    - Ask the patient to repeat a sentence
- If YES to any criteria, the test is finished.

  The patient is VAN positive
- If NO, move on to step 4

A

VAN Step 4: Neglect

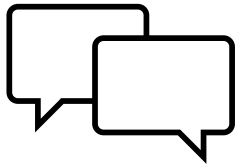
- Symptoms
  - Is the patient ignoring one side of their body?
  - Is the patient unable to feel both sides of the body at the same time?
- If YES, the patient is VAN positive
- If NO weakness or NO VAN findings, then the patient is VAN negative

This patient can see each of the nurse's hands individually. But when she wiggles both, he cannot sort and "neglects" her right hand. This is visual neglect. VAN tests sensory neglect.

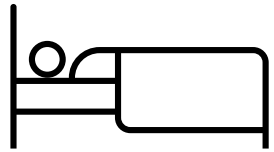
N

Determining "Last Known Well" (LKW)

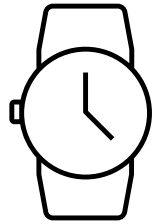
- Note time where it is certain the patient was asymptomatic
- Only use the patient's word if they are a reliable source



- If the patient's LKW was at bedtime, note that time



- Avoid "minutes ago"; convert to time



- Differentiate the discovery of symptoms vs. LKW

https://professional.heart.org/en/science-news/2021-update-care-of-the-patient-with-acute-ischemic-stroke

Sometimes it is HOW you ask

Asking the patient

Instead of: "*When did this start?*"

Ask:

- Were you normal when you woke up this morning?
- Were you normal at breakfast?
- How about at lunch?
- Were you normal at dinner time?
- Were you normal when you went to bed?
- Find a normal and then a not normal time and then ask, "So after xxx and before xxx, when did you notice you were different?"
- Look at your watch. Tell the patient what time it is. "It is 6 pm, Mr. Smith. Do you know what time you started feeling weird?

Asking the witness/family

Instead of: *"When did this start?"*

Ask:

- Did you see this person go from normal to not normal in front of you?
- If YES – what time was that?
- If NO – when was the last time you saw or talked to them when they seemed normal?

Making a Transport Decision

- SICK vs NOT SICK
- LOAD ‘n’ GO
- Target on scene time: 10 minutes
- Maximum on scene time: 15 minutes

https://professional.heart.org/en/science-news/2021-update-care-of-the-patient-with-acute-ischemic-stroke

*2021 Nursing stroke AIS prehospital and acute.pdf

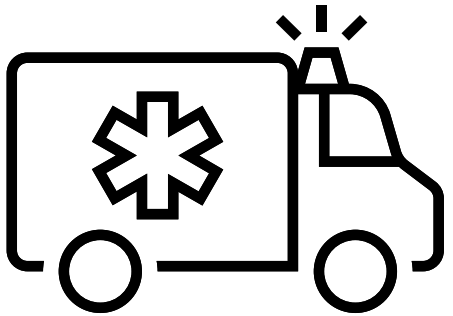
Making a Transport Decision

Unstable Patients:

- Manage life threats, package patient for transport
- Consider ALS/Air resources
- Determine destination facility
- Consider transporting patient's primary historian/obtain contact information

Stable Patients:

- Perform Secondary Assessment enroute



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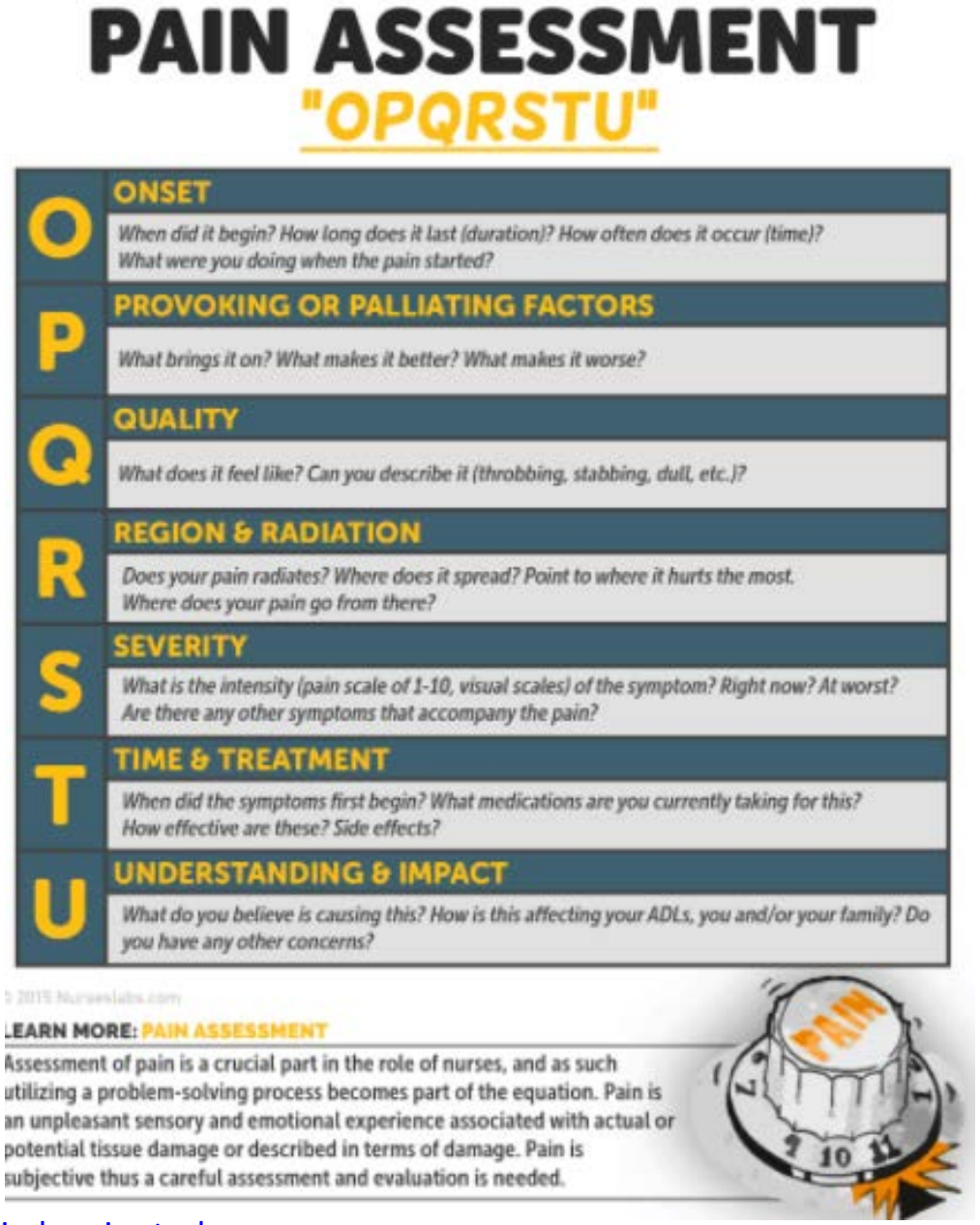
SECONDARY ASSESSMENT

- HISTORY
  - SAMPLE
  - OPQRST Primary and Associated Symptoms

- EXAMINATION
  - ABCDEs including Glasgow Coma Scale
  - Focused Exam
  - Assessment of other affected areas



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Notify Receiving Agency or Facility

Radio/Phone Consultation

Identification: _____ Prenotification: YES/NO

Pt Age:_____ Sex: _____ Onset: <4 hrs. <24 hrs.

CC: (OPQRST, LKW,etc.):_____

LOC:(AVPU/GCS):_____

S&Sx:_____

BP: P: R: T: SpO2:

Skin: Cardio/Resp: BG: Pupils:
Neuro: ECG:

PMHx:_____

Meds:_____

Allergies:_____

Interventions:_____

ETA: Code:

https://professional.heart.org/en/science-news/2021-update-care-of-the-patient-with-acute-ischemic-stroke

EMS Summary

- Stroke is a time-sensitive illness just like trauma and AMI
- Stroke assessment skills build on behaviors already learned
- Transportation decisions occur after the Primary Assessment
- Limit on scene time to 15 minutes
- Establish IV Access if local protocol permits
- Obtain & document a blood glucose
- Obtaining the Last Known Well and a Stroke Scale score are the most important and helpful things EMS can provide
- Prenotification to hospitals to activate the stroke system of care

https://professional.heart.org/en/science-news/2021-update-care-of-the-patient-with-acute-ischemic-stroke

Back to Sarah…

BEFAST Assessment Results

B – Balance

- Finding: Dizziness and unsteadiness reported at onset.
- Result: Positive – Sudden loss of balance or coordination suggests posterior circulation involvement

E – Eyes

- Finding: Blurred vision or possible visual field disturbance.
- Result: Positive – Sudden visual changes are a warning sign, especially for posterior strokes.

F – Face

- Finding: Patient's smile was normal, no drooping
- Result: Negative

A – Arms

- Finding: Sudden weakness on one side of the body.
- Result: Positive – Right arm drifted or was unable to hold position

S – Speech

- Finding: Speech sounded abnormal — possibly slurred or confused.
- Result: Positive – Sudden changes in speech are a major stroke indicator

T – Time

- Finding: Last Known Well (LKW) time needed for treatment eligibility: 4:45 pm
- Action: Immediate activation of stroke alert and rapid transport

BEFAST

Balance
Sudden loss of balance

Eyes
Blurred vision

Face
Facial droop

Arms
Arm weakness

Speech
Slurred speech

Time

Last Known Well Time:
4:45pm

VAN

Motor Weakness
PRESENT

V **Vision loss**
POSITIVE

A **Aphasia**
POSITIVE

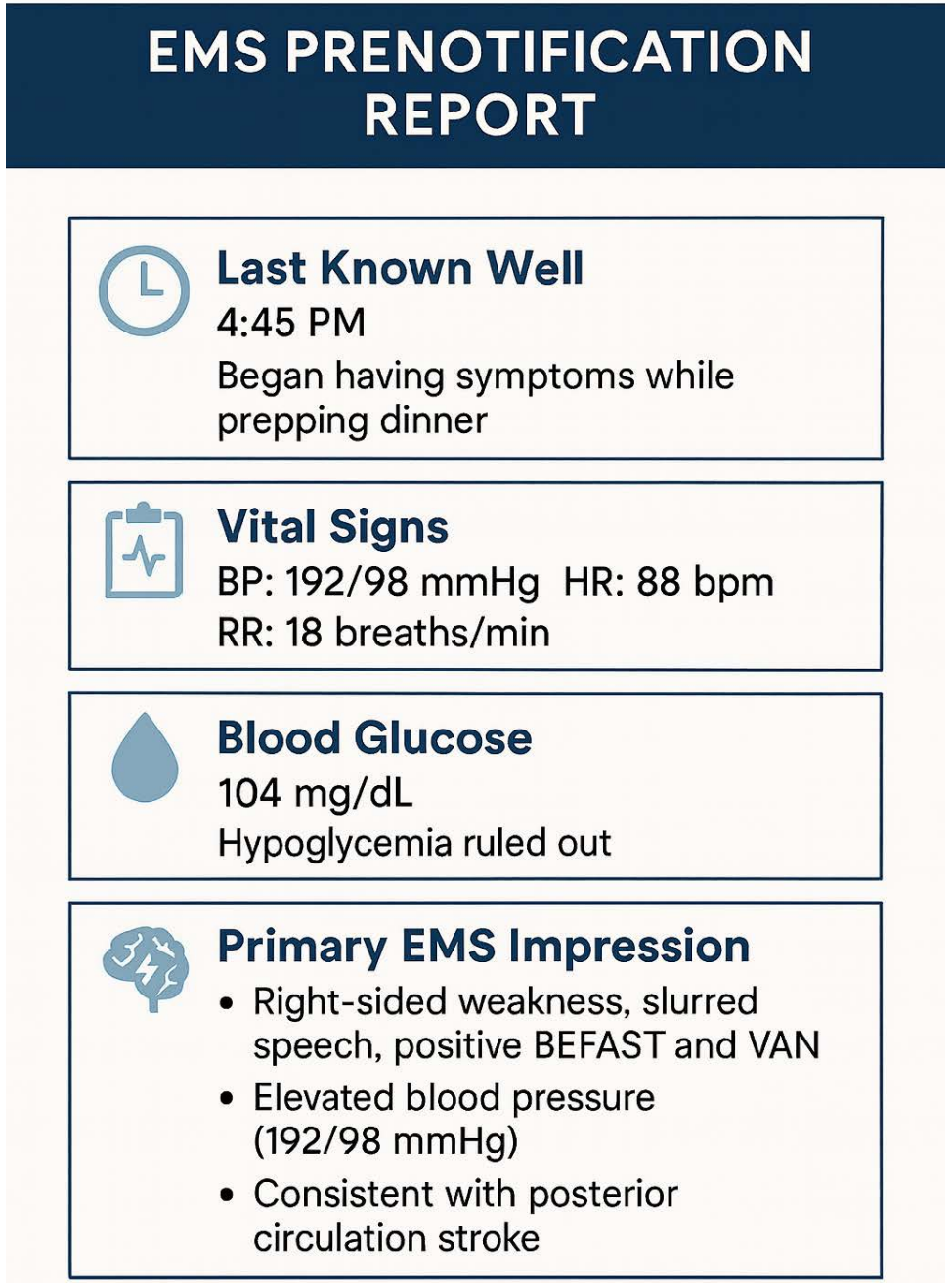
N **Neglect**
NEGATIVE

EMS Prenotification to the Hospital Activate the Stroke System of Care

- 72 yr. old woman

- Presenting Symptoms: Sudden right-sided weakness, slurred speech, dizziness, and blurred vision
  - EMS was on scene at 6:10 pm
  - BEFAST was positive for stroke
  - VAN assessment was positive for a suspected LVO
  - EMS called the hospital at 6:22 pm, right after they left the scene
    - (EMS total – 12 minutes; 97 minutes since LKW)

- How much longer is this patient in the window for thrombolytics?



ED Care

Sarah was taken to the nearest hospital – a CAH

- Arrival time is 6:35 pm (13 minutes since EMS call)
  - The ED team was ready thanks to the pre-notification from EMS!
- This hospital ED staff and the local EMS recently attended a Mission: Lifeline Stroke training and EMS began taking stable patients directly to the CT
- There was a brief "Stroke Stop" in the ED

Imaging

CT initiated at 6:45 pm, Interpreted at 7:10 pm (35 minutes since arrival to ED)

- Non-Contrast CT (Initial Scan) -- Findings:
  - No acute intracerebral hemorrhage seen.
  - Subtle hypodensity in the posterior circulation territory, possibly indicating early ischemic changes.
  - May appear normal if performed very early in stroke onset.
- Interpretation*:* This result is consistent with an acute ischemic stroke, but early posterior strokes can be difficult to detect on non-contrast CT.

- CT Angiography (CTA) – Findings:
  - Occlusion detected in a posterior circulation vessel, likely the basilar artery or posterior cerebral artery (PCA).
  - Evidence of large vessel occlusion (LVO), correlating with positive VAN assessment.
- Implication*:* Confirms the need for rapid transfer for mechanical thrombectomy if within the treatment window.

Concurrent Steps

- Tele-stroke was initiated WHILE patient was in CT
- The neurologist was able to see the CT images *immediately*. The ED team and the Neurologist completed a NIH Stroke Scale together
- NIHSS = 11 *(see next slide for details)*
- The Stroke Team did a thrombolytic checklist
- Patient had no contraindications or warnings for lytics
- EKG showed A-fib *(she did not have a hx of A fib prior to this event)*

NIHSS Results

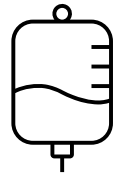
NIHSS Item	Description	Score for Patient	Reasoning
1a. Level of Consciousness	Alert, drowsy, or unresponsive	**0**	Patient was alert and answering questions.
1b. LOC Questions	Ask age & month	**0**	No reported confusion; likely able to answer.
1c. LOC Commands	Open/close eyes, squeeze hands	**0**	Followed commands appropriately.
2. Best Gaze	Normal vs. gaze palsy/deviation	**0 or 1**	No clear mention of gaze palsy → likely **0**, but could be **1** if subtle.
3. Visual Fields	Loss in one or both fields	**1**	Blurred vision noted, possible field cut.
4. Facial Palsy	Symmetry, partial or complete droop	**1**	Caller said “didn’t sound like themself,” suggesting mild droop.
5a. Motor Arm – Left	Weakness in left arm	**0**	No left-sided weakness noted.
5b. Motor Arm – Right	Weakness in right arm	**2**	Sudden right-sided weakness, moderate severity.
6a. Motor Leg – Left	Weakness in left leg	**0**	No left-sided involvement reported.
6b. Motor Leg – Right	Weakness in right leg	**1 or 2**	Likely mild-moderate weakness → **1 or 2** depending on severity.
7. Limb Ataxia	Coordination issues	**1**	Dizziness and balance issues suggest mild ataxia.
8. Sensory	Loss to pinprick/light touch	**1**	Right-sided weakness may include some sensory loss.
9. Language (Aphasia)	Comprehension, naming, commands	**1**	Slurred speech, but not completely unable to speak.
10. Dysarthria	Clarity of speech	**1**	Slurred speech clearly reported.
11. Neglect (Inattention)	Extinction or neglect present?	**0**	No neglect reported.

While the patient is in CT, prepare to give the thrombolytic

- The ED team sets this up BEFORE bringing the medication to the bedside to prevent delays

- Pharmacy is part of this stroke team & also received the stroke alert triggered from the EMS pre-notification

Get Ready!



IV Access:

- Ideally two large-bore IVs:
  - One for TNK administration
  - One for other meds/fluids or potential reversal meds

if complications arise

Vital Signs Monitoring:

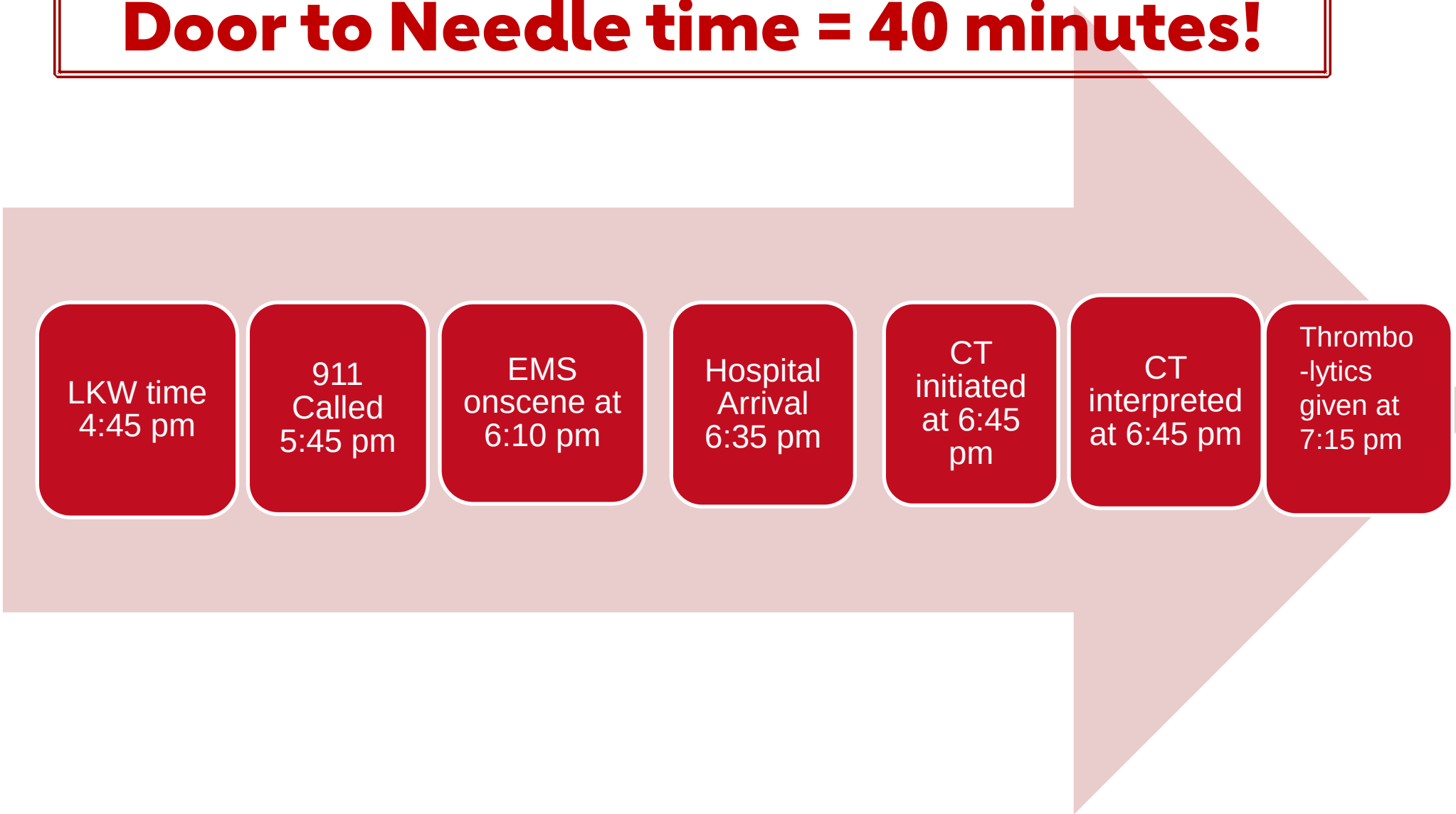
- Continuous cardiac monitor
- Blood pressure checked every 5 minutes during and after bolus

Crash Cart Ready:

- In case of complications such as allergic reaction or sudden hemorrhage

Thrombolytics are given at 7:15 pm

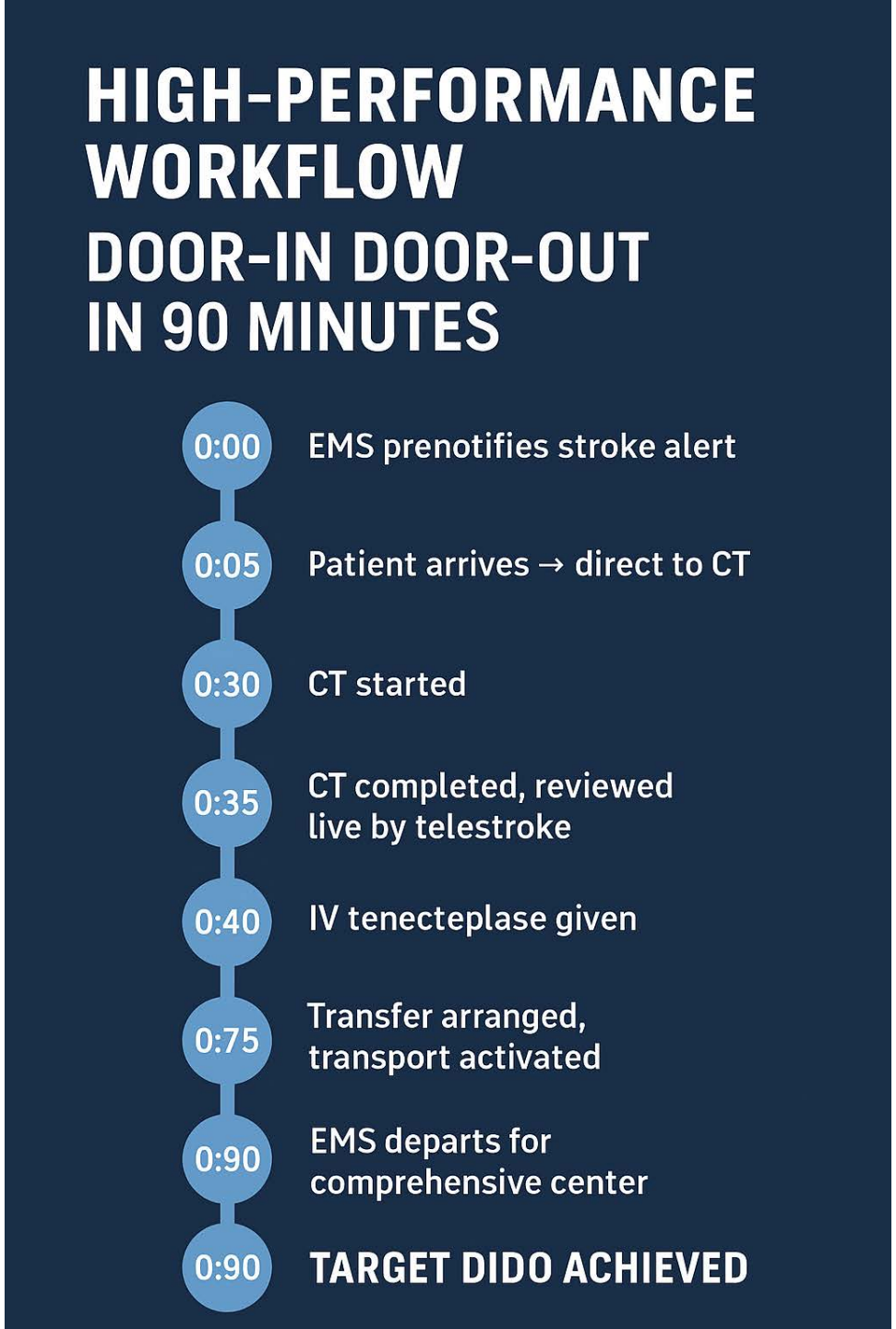
Door to Needle time = 40 minutes!



Door In, Door Out

Best Practice Strategies:

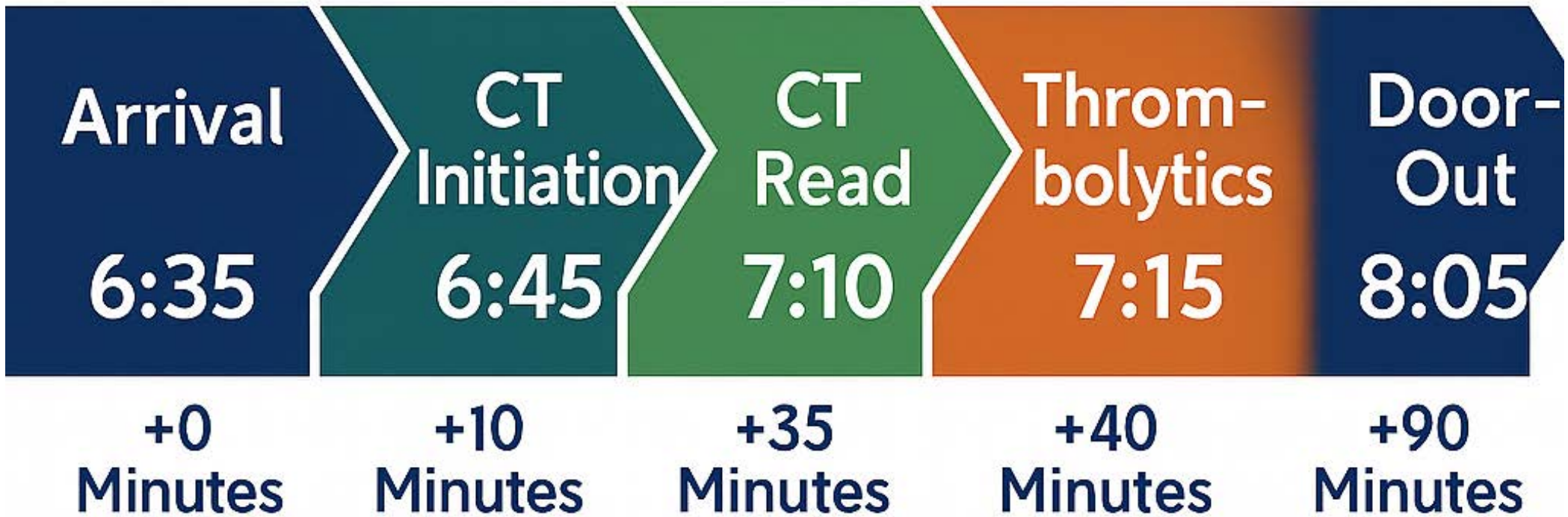
- Standardized stroke alert scripts for EMS, ED, and receiving hospital
- Telestroke integration: Neurologist helps make decisions live, no phone tag
- Dedicated stroke coordinator or charge nurse to manage workflow
- Mock drills quarterly to identify workflow bottlenecks
- Identify transport early-ground vs air
- Use the telestroke or E-Care to set up transfer



Door In, Door Out

- When EMS provided Pre-notification, the ED also alerted flight from the receiving hospital that there was a potential stroke, so they were on stand-by
- When the telestroke provider read the CT & CTA, she let her team know there would be a *"potential mechanical thrombectomy coming their way."* Flight is part of the stroke alert team. They took off right after CT interpretation time. The flight team was in the air at 7:15
- Flight can be launched ASAP & canceled enroute if necessary
- Flight lands at the hospital by 7:55 and the patient is loaded in the helicopter by 8:05 pm
- DIDO= 90 MINUTES!!

Door-In-Door-Out



IF STROKE IS NOT TREATED IN 4.5 HOURS

1,9 MILLION BRAIN CELLS LOST PER MINUTE

513 MILLION BRAIN CELLS LOST

IN 4.5 HOURS

36 YEARS OF AGING EQUIVALENT

Certified Stroke Center for Thrombectomy

For every 30-minute delay to reperfusion, the chance of functional independence decreases by ~10%.

Event	Timeframe
Last Known Well/Symptom Onset	4:45 pm
Arrival at CAH ED	6:35 pm
Thrombolytic Given	7:15 pm
Door Out	8:05 pm
Arrival at Thrombectomy Center	8:45 pm
Groin Puncture	9:00 pm
Successful Reperfusion	9:35 pm
Rehab Assessment	Next Day by noon
Discharge to Inpatient Rehab Facility	Hospital Day 4

Discharge to Post-Acute Care

Common barriers to getting the appropriate stroke rehab

After several days in acute care, Sarah was making progress and ready for the next level of care:

Rational for recommendation to IRF:

- Very active & independent before
- Highly motivated
- Could tolerate 3 hrs of therapy/day
- Great support from family and friends at home

Current LOF:

•NIH 5-6: Deficits: upper & lower r sided weakness, facial palsy, dysarthria, balance issues
•Diet: soft & bite sized, thin liquids, needs feeding and oral care assistance, meds whole with apple sauce
•Mobility: Stand by assist with walker

Barriers to Discharge

- Insurance pre-authorization delays (72 hours)
- Limited IRF bed availability
- Transportation logistics: 90 miles from her home and support system
- Social determinants: Lives alone, family works full-time
- Rural Landscape: Limited local rehab options

What happens to Sarah?

Insurance denies IRF
She is placed in a SNF in the same town as the Comprehensive Stroke Center

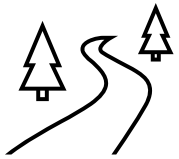
Post-Acute Rehabilitation

Sarah's Rehabilitation Journey at the Skilled Nursing Facility

- By Discharge:
  - Stroke education completed with Sarah and her husband throughout the stay
  - Able to ambulate & could go home
  - Passed the depression screening

- DC Planning Barriers:
  - Only her husband was able to be there due to location
  - The SNF was unable to provide complete list of local resources since Sarah's hometown is so far away

- Continued Rehabilitation Needs:
  - Continued to require OP therapies to get back to pickleball and other activities that are important to her—which may be a long road!



Back To The Community

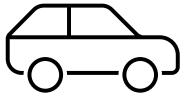
Sarah gets back home with her husband, but continues her rehabilitation journey:

Current LOF:

- Eating regular food, care for herself independently, walking independently, still gets tired easy
- Her girlfriends take her to pickleball and she can get on the courts to warm up, but isn't ready for competition and to coffee & lunch afterward

Therapy Needs:

- Access to home health is a barrier
- Referrals to outpatient PT, OT, and SLP
- Driver rehab referral



Social & Emotional Needs:

- Overwhelmed with all the new medications and restrictions/precautions
- Good support – husband lives with her & kids visit as often as they can,but live 30 & 100 mi away!
- Found info regarding post-stroke resources & support groups from her discharge packet.
- Found a virtual stroke survivor support group that she enjoys attending. They get together for annual Christmas Party, which she loves!

Take Home Messages

- PCPs need to have resources available and know what their communities offers for their post-stroke patients
- Increased CBIS providers
- Increased education and support for caregiver burnout & depression
- Identifying patient depression after getting home—still unable to get back to past life, feeling guilty for asking family & friends for help

Questions?

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