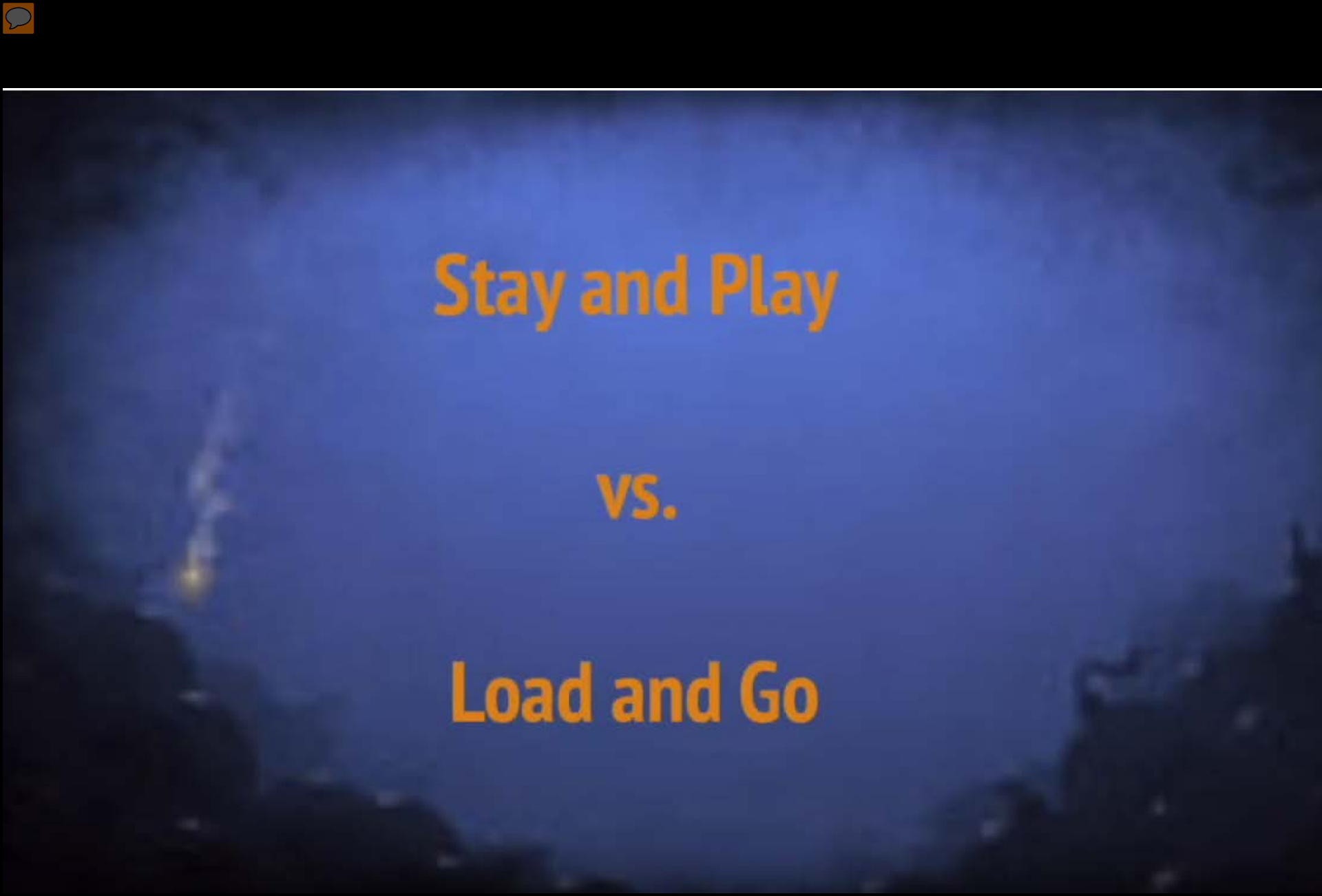
Stroke

Jen Dyer, RN, EMT-P NWC EMSS
Arlington Hts, IL



https://www.youtube.com/watch?v=iEWkbK1gZhI

Stroke: Objectives

- Accurately perform & interpret BEFAST stroke assessment
- Obtain essential history for patients w/ stroke S&S
- Determine most appropriate receiving hospital based on S&S and time of onset/LKW
- Pre-notification Stroke Alert for patients with S&S suggestive of acute stroke
- Provide concise report to OLMC incl essential elements for patients warranting Stroke Alert
- Obtain call back number for historian if not accompanying patient to hospital

Stroke and EMS

AHA & ASA: policy and guidelines specific to EMS!

Primary EMS goals:

Timely response

Rapid neuro evaluation & stabilization

Expeditious transport to approp stroke center

Stroke and EMS

Essential to our success:

Rapid and appropriate assessment using a validated tool for large vessel occlusion (LVO)

LVO: ischemic stroke that results from a blockage in one of the major arteries of the brain, resulting in loss of perfusion to significant portions of the brain

Perspective: Stroke Care is Evolving!

www.medscape.com

EXTEND: More Evidence of tPA Benefit 9 Hours After Stroke

Pauline Anderson

February 13, 2019

HONOLULU — Extending the time window for thrombolytic therapy to 9 hours for patients selected using automated computed tomography (CT) perfusion imaging can result in excellent functional outcomes, final results of a new study suggest.

"The study confirms that we should move toward tissue-based selection for reperfusion therapy rather than basing selection on time," study author Mark Parsons, PhD, director of neurology and professional chair of neurology at University of Melbourne in Australia, told *Medscape Medical News*.

The study, EXtending the time for Thrombolysis in Emergency Neurological Deficits (EXTEND), was presented here during the International Stroke Conference (ISC) 2019.

The new results showing the validity of CT perfusion imaging for patient selection match those of a study reported last year by European investigators, the current study authors say. The WAKE-UP trial showed that tPA was safe and effective in patients with wake-up stroke that had occurred more than 4.5 hours before treatment, but that study used magnetic resonance imaging (MRI), not CT perfusion, for patient selection.

In many stroke centers, CT perfusion imaging is much more available than MRI, the researchers note.

The current guideline for thrombolysis in acute ischemic stroke is administration within 4.5 hours of stroke onset, but advanced neuroimaging studies suggest that the ischemic penumbra can exist for up to 24 hours and salvaging tissue can lead to improved clinical outcome, lead author Henry Ma, MD, adjunct senior lecturer, Monash University, Melbourne, Australia, told delegates during his presentation.

EXTEND was a phase 3, multicenter, double-blind trial in which patients were randomized to receive either intravenous (IV) tissue plasminogen activator (tPA) at 0.9 mg/kg, or to placebo.

Researchers stratified patients into 3 groups according to time of randomization after stroke: 4.5 to 6 hours; more than 6 to 9 hours; and "wake up" stroke, where the precise time of the stroke is unknown.

Automated Processing

An important element of the study was the use of CT perfusion or MR perfusion imaging and RAPID software for automated image processing, said Ma. The software interprets images and indicates whether a patient has a small infarct core and a large area of salvageable brain.

This information can be used to decide if a particular patient might benefit from thrombolysis.

Ma did not report how many patients underwent imaging with CT and how many had MRI, but he hinted that CT was used for a majority of cases.

The penumbral mismatch criteria in the study were as follows: a hypoperfusion to core volume ratio of more than 1.2; perfusion lesion to core absolute difference of more than 10 mL; and ischemic core lesion of less than or equal to 70 mL.

The study was stopped last June — after 225 of the planned 310 patients were recruited — following publication of the WAKE-UP trial, the researchers note, on the recommendation of the Data and Safety Monitoring Board.

Relevance to EMS

EMS is well established as a critical partner in stroke care. **Expect changes in the role and responsibilities of EMS as stroke care evolves.**

Stroke

Can be classified by vascular supply impacted and anatomic location

Cerebral Blood Supply

Most complex circulatory system in the body

Two major sets of vessels

- **Carotid** arteries: (Anterior circulation source)
  Face and scalp
  Frontal lobe, ant parietal lobe, temporal lobe
- **Vertebral** arteries: (Posterior circulation source)
  Posterior 2/5^{ths} cerebrum, part of cerebellum, brain stem

The Circle of Willis connects the two systems

Design ensures that perfusion is maintained if disruption in any part of either ant or post circulation

Middle Cerebral Arteries "MCA"

Supplies outer surfaces of frontal, parietal, temporal lobes and basal ganglia

Largest of brain arteries

Int Carotid Artery - direct connection to MCA

Most frequently occluded

Blood supply to brain

Carotid arteries: 80% total CBF (“anterior”)

S&S usually discovered by Cincinnati Stroke Screen

Vertebral arteries: 20% CBF
(“posterior”)

Anterior Stroke Symptoms

Unilateral paralysis or numbness

Language disturbance

Visual disturbance

Monocular blindness (ICA supplies ophthalmic artery)

Blood supply to brain

Vertebral arteries: 20% CBF
("posterior")

How do we assess for S&S of stroke supplied by the posterior circulation?

Assessment Tool for S&S of "Posterior" Circulation Stroke?

BEFAST

Stroke Screen

Posterior Stroke Symptoms

May be non-specific!

* Vertigo *

(*Sensation of room spinning around patient*)

Nausea, vomiting

Ataxia

Diplopia

Dysphagia

Visual field loss

Gaze palsies

Ischemic Stroke

Cells in central infarct area (umbra) start to die within 6 minutes

Cells in peri-infarct zone (penumbra) are ischemic and at risk for death, but may recover

Penumbra

Rapid transport to stroke center can protect penumbra via emergency interventions and medical management

Brain can show injury in 3 ways

Altered mental status

Seizures

Localizing signs

- Unilateral hemiparesis or hemiplegia
- Unilateral sensory changes / deficits
- Neglect: visual, auditory, tactile
- Speech/language abnormalities
- Visual changes: visual field loss; diplopia, gaze palsy
- Balance/coordination disturbances
- Cognitive impairment, changes in affect, behavior

TIME: Why it matters

Direct correlation between shorter time from symptom onset to definitive care and best outcomes

WHY?

32,000 brain cells die/sec

1.9 million die/min

Ischemic tissue ages 3.6 yrs/hour

These cells are not only motor & sensory but impact *mind, thought, personality, memories…*

EMS Keys to Success

Rapid access to EMS

Recognize: Hx & PE within 3-5 min

Identify & r/o stroke mimics

Resuscitate: Supportive care

Minimize scene time to $\leq 10\ min$

Transport ASAP to appropriate stroke center

Call Stroke Alert to OLMC

Finish exam enroute

First 10

When minutes matter…

ABCDs: Resuscitative measures

Stroke screen within 3-5 min

O_2 only if $SpO_2 < 94\%$

Position: head/neck neutral; no pillow

SBP > 100: HOB ↑ 10-15º

IV – OLMC may request 18-20g AC

AMS? Evaluate AEIOU-TIPS

How can EMS expedite transport?

Limit on scene assessments / care to those urgently needed or clearly indicated by pt's presentation

Stroke Screen / Stroke Alert Checklist

Essential history priorities incl call back #

OLMC Stroke Alert report

Transport destination determination guide

Essential information for writing PCR

Stroke Screen / Stroke Alert Checklist

NWC EMSS STROKE SCREEN/STROKE ALERT DRAFT CHECKLIST 2019						
Pt. name		DOB		Gender		
Witness name		Call back number:				
Chief complaint(s)						
Severe headache or seizure at onset?	← Critical question! May signal hemorrhagic event					
Head trauma at onset?					Y	N

Demographics and essential information!

Witness name

Call back number

CC / Symptoms

Severe headache or seizure?

Head trauma?

BEFAST Stroke Screen

EXAM – NEW ONSET - BE FAST Stroke Screen		✓ IF ABNORMAL	
B	**BALANCE**/Coord – Unsteady, fall? Finger to nose, rapid alternating movements, heel to shin; note ataxia; vertigo	R	L
E	**EYES**: Vision changes: blurred, diplopia, loss of visual field; photophobia Eye position; ptosis. Horizontal gaze: gaze palsy or fixed deviation	R	L
F	**FACE:** Smile, show teeth; close eyelids, wrinkle forehead Note unilateral weakness/asymmetry:	R	L
A	Motor – **ARM** (close eyes and; hold out both arms for 10 sec) Normal; Abnormal: drift to no effort against gravity	R	L
S	**SPEECH** (Repeat "You can't teach an old dog new tricks" or sing Happy Birthday (expressive/receptive aphasia); dysarthria, word substitution or retrieval deficits		
T	**TIME last known well** (military clock): ☐ ≤ 3.5 hrs ☐ >3.5 hr		

Balance

Looking for ***new*** onset problems with balance, unsteadiness, tilting to one side, stumbling gait, one-sided incoordination of movements.

Inquire if they have had problems with balance, unsteadiness or if they have fallen

B

Fine motor / coordination

Looking for ***new*** onset ataxia and or problems with coordination

We will do three assessments

B

Fine motor

1. Patient touches finger to their nose, then your finger on your outstretched hand, repeatedly. Test both Rt and Lt sides.

2. Bring fingers one by one to thumb of same hand in rapid succession; test on both sides.

3. Rapidly slide the heel of one foot down the shin of the opposite leg; test on both sides

B

Vertigo

Inquire whether they have the sensation of the room spinning around them, and if so, was it when they were active, at rest, or both? Confirm that the sensation was not that of “light-headedness”

Change in vision

Looking for new onset of change in the patient’s normal vision

Assessment: Inquire whether they have experienced new blurred or double vision, or any changes from normal (baseline) vision.

E

Visual Fields

Looking for new onset loss of vision in any of the 4 visual fields in either eye

E

Visual Fields

Assessment: Position yourself level with and facing the patient, approx. arm's length away. Have pt cover one eye and focus on your face. Extend 1 or 2 fingers outward and wiggle in each of the upper and lower right and left visual fields. Patient identifies which quadrant the movement is in. Test separately on both eyes.

E
Photophobia

Looking for new onset discomfort or pain when eye is exposed to light

Assessment: Inquire whether the patient experiences sensitivity or discomfort when eyes open to light.

E
Ptosis

Looking for one upper eyelid covering more of the iris than the opposite side, or a lid that extends over the iris (drooping appearance)

Assessment: Position yourself directly in line w/ patient. Inspect for abnormal lid position

E
Eye Position

Looking for asymmetrical horizontal and or vertical alignment of eyes.

Assessment: Inspect for symmetry from a position directly facing the patient, and inspect for resting gaze palsy.

E
Extraocular movements

Looking for difference in range and or symmetry of eye movement, pain with movement, and or inability to move the eye (fixed eye position, usually to one side)

E

Extraocular movements

Assessment: Instruct patient to fix their gaze on an object and follow its movement with their eyes only, keeping their head still. Move object laterally to both sides and vertically up and down from each left and right horizontal extreme. Movement should be in the shape of a capital H.

F

Facial Symmetry

Looking for new onset facial asymmetry and or abnormal /lack of movement of facial muscles and or eyelids

Assessment: Instruct patient to

- Smile
- Show their teeth
- Tightly squeeze eyes closed
- Wrinkle their forehead

F
Facial symmetry / Bell's palsy

Patients with Bell's Palsy ***cannot*** wrinkle both sides of their forehead.

Patients with stroke ***can***.

A
Motor strength and symmetry of upper extremities

Looking for new
onset of
weakness,
clumsiness,
heaviness or
paralysis of hand
and or arm.

A

Motor strength and symmetry of upper extremities

Assessment: Instruct patient to close eyes and lift both arms, palms up, in front of them, and hold for count of 10. Examiner may raise the patient's arms if patient does not or is not able to do so. Observe for asymmetrical ability to hold, for drift, weakness, or no movement/flaccidity.

S

Ability to form or articulate words (*How* they say it)

Looking for new onset abnormality in phonation, pacing, or fluidity and clarity of speech (dysarthria). Listen for slurring.

S

Ability to form or articulate words (How they say it)

Assessment: Ask the patient to repeat the phrase, “You can’t teach an old dog new tricks”. If they can’t talk, have them sing, “Happy Birthday to You”.

Dysarthria

https://www.youtube.com/watch?v=SriryvkbU9c

Looking for new onset abnormality in the ability to communicate verbally, to “find” the correct words, to express ideas using organized speech, and or to understand what they read or hear.

S

Speech content

(*What* they say)

S

Speech content (What they say)

Ask the patient to repeat the phrase, “You can’t teach an old dog new tricks”. If they can’t talk, have them sing, “Happy Birthday”.

Are they saying the sentence correctly? Transposing words? Do they make sense or are they speaking clearly but making no sense?

Aphasia

https://www.youtube.com/watch?v=dKTdMV6cOZw

Another Example of Aphasia

https://www.youtube.com/watch?v=3oef68YabD0

T

B	**BALANCE**/Coord – Unsteady, fall? Finger to nose, rapid alternating movements, heel to shin; note ataxia; vertigo	R	L
E	**EYES**: Vision changes: blurred, diplopia, loss of visual field; photophobia Eye position; ptosis. Horizontal gaze: gaze palsy or fixed deviation	R	L
F	**FACE:** Smile, show teeth; close eyelids, wrinkle forehead Note unilateral weakness/asymmetry:	R	L
A	Motor – **ARM** (close eyes and; hold out both arms for 10 sec) Normal; Abnormal: drift to no effort against gravity	R	L
S	**SPEECH** (Repeat "You can't teach an old dog new tricks" or sing Happy Birthday (expressive/receptive aphasia); dysarthria, word substitution or retrieval deficits		
T	**TIME last known well** (military clock): ☐ ≤ 3.5 hrs ☐ >3.5 hr		

Critical information!

Be as specific time as possible

Determine if symptom onset / time is less than or more than 3.5 hrs

Back to the Stroke Checklist

Other assessments	Level of consciousness: GCS: E V M		
	Orientation: Answers accurately: Name, age, month of year		
	Responds to commands: open/close eyes		
	Gross hearing – Note new onset unilateral hearing deficit	R	L
	Say "Ah", palate rises, uvula midline Stick out tongue: remains midline (note abnormalities)	R	L
	Neglect: one sided extinction (visual, auditory, sensory)	R	L
	Motor – Lift leg. Normal; Abnormal: drift to no effort against gravity	R	L
	Sensory – Focal changes or deficits (face, arms, legs)	R	L
	ANS: Sweating only one side	R	L
	Neck stiffness (cannot touch chin to chest; vomiting		

Other assessments

Done enroute as needed

Do not extend scene

PMH and Meds

PMH	☐ None ☐ A-Fib/Flutter ☐ AVM, tumor, aneurysm ☐ Bleeding disorders ☐ CAD/Prior MI/Heart/vascular dx ☐ Carotid stenosis ☐ Pregnant (or up to 6 wks post- partum) ☐ Depression ☐ Diabetes ☐ Drug/Alcohol Abuse ☐ Dyslipidemia ☐ Family hx stroke ☐ HF ☐ HRT ☐ HTN ☐ Migraine ☐ Obesity ☐ Previous stroke ☐ Previous TIA: ☐ Previous intracranial surgery/bleed ☐ Serious head trauma ☐ *Prosthetic valve ☐ PVD ☐ Renal failure ☐ Sleep apnea ☐ Smoker/tobacco use
MEDS	☐ Anticoagulant use in 48 hrs: ☐ warfarin/Coumadin ☐ apixaban/Eliquis ☐ argatroban ☐ dabigatran/Pradaxa ☐ desirudin/Privask ☐ edoxaban/Savaysa ☐ enoxaparin/Lovenox ☐ fondaparinux/Arixtra ☐ LMW heparin ☐ lepirudin/Refludan ☐ rivaroxaban/Xarelto Platelet inhibitors: ☐ ASA ☐ clopidogrel/Plavix ☐ dipyridamole/Aggrenox ☐ prasugel/Effient ☐ ticagrelor/Brilinta ☐ ticlodipine/Ticlid ☐ Cocaine/other vasoconstrictors, e.g. amphetamines: PCP

Significant as stroke risk factors and as possible contraindications to some therapies

Ask about these items specifically.

Destination options

Decision based on:

Patient criticality

LKW time and travel time

Decision tree simplified

Destination options:		
Nearest hospital	Patient unstable	
Nearest SC (Primary or Comprehensive)	☐ Onset/LKW <3.5 hours with acute S&S of stroke	
Nearest **Comprehensive** SC	☐ Onset/LKW >3.5 hours with acute S&S of stroke AND ☐ Travel time <15 min longer than to nearest PSC	
Stroke alert called to (OLMC hospital)		Time:
Receiving hospital		Time beyond PSC to CSC:
Comprehensive SCs ☐ ABMC ☐ ALGH ☐ NCH ☐ Res		

The unstable patient : unsecured airway; inability to adequately oxygenate/ventilate; uncorrected hypoperfusion; uncontrolled seizing

Decision tree simplified

If LKW *less than* 3.5 hours

Destination options:		
~~Nearest hospital~~	Patient unstable	
Nearest SC (Primary or Comprehensive)	Onset/LKW <3.5 hours with acute S&S of stroke	
Nearest **Comprehensive** SC	☐ Onset/LKW >3.5 hours with acute S&S of stroke AND ☐ Travel time <15 min longer than to nearest PSC	
Stroke alert called to (OLMC hospital)		Time:
Receiving hospital		Time beyond PSC to CSC:
Comprehensive SCs ☐ ABMC ☐ ALGH ☐ NCH ☐ Res		

Patient with ischemic stroke S&S is potential candidate for tPA

Both PSC & CSC administer tPA → *choose the closer / nearest facility*

Decision tree simplified

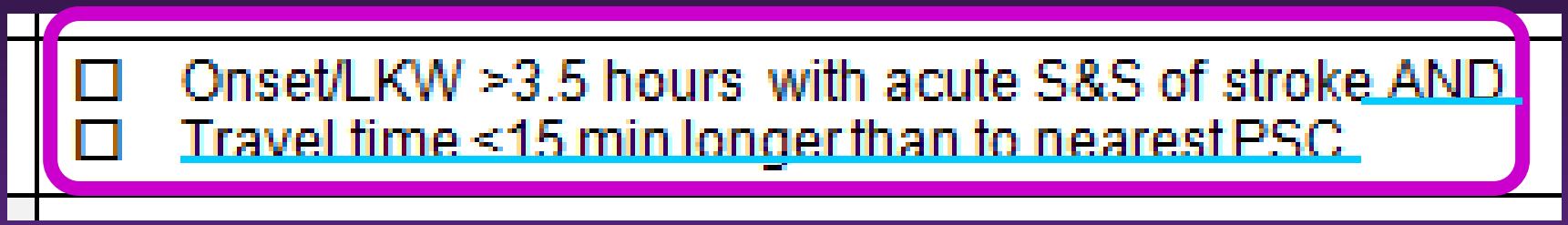
If LKW *more than* 3.5 hours

Destination options:		
Nearest hospital	Patient unstable	
Nearest SC (Primary or Comprehensive)	☐ Onset/LKW <3.5 hours with acute S&S of stroke	
Nearest **Comprehensive** SC	☒ Onset/LKW >3.5 hours with acute S&S of stroke AND ☒ Travel time <15 min longer than to nearest PSC	
Stroke alert called to (OLMC hospital)		Time:
Receiving hospital		Time beyond PSC to CSC:
Comprehensive SCs ☐ ABMC ☐ ALGH ☐ NCH ☐ Res		

S&S exceeding 3.5 hrs puts patient outside time window for tPA, but may be candidate for thrombectomy (only at Compr SC.)

* Added travel time must not > 15 min.! *

Decision tree simplified



Extended travel time to CSS:
Benefit of potential treatment justifies risk of *additional 15 min or less* travel time to alternate destination.

Complete the Checklist

Destination options:		
Nearest hospital	Patient unstable	
Nearest SC (Primary or Comprehensive)	☐ Onset/LKW <3.5 hours with acute S&S of stroke	
Nearest **Comprehensive** SC	☐ Onset/LKW >3.5 hours with acute S&S of stroke AND ☐ Travel time ≤15 min longer than to nearest PSC	
Stroke alert called to (OLMC hospital)		Time:
Receiving hospital		Time beyond PSC to CSC:
Comprehensive SCs ☐ ABMC ☐ ALGH ☐ NCH ☐ Res		

Stroke alert called time

Name of receiving hospital

If bypassing PSC to go to CSC, document *added* travel time in minutes

Four area Compr SCs (bottom line)