Mission: Lifeline Stroke

Mission: Lifeline Stroke will develop a program to reduce barriers and delays in care by improving efficiencies in each system: Community, EMS, Emergency Department, Radiology, Laboratory, Endovascular lab, Critical Care Unit and Rehabilitation.

One of the cornerstones of the program is focusing on the “System” rather than each individual entity so that feedback can be gathered to improve quality of care for stroke victims.
Stroke

• The sudden death of brain cells due to lack of oxygen, caused by blockage of blood flow or rupture of an artery to the brain.

• Also called Cerebral Vascular Accident or CVA, Brain Attack

TIME IS BRAIN!!

• The brain loses approximately 1.9 million brain cells a minute during a stroke. This is equivalent to the brain aging 3.1 weeks per minute.

• 57 million brain cells are lost every 30 minutes
Types of Stroke

1. **Ischemic Stroke**
   - A clot (thrombus or embolus) blocks the flow of blood to part of the brain.

2. **Hemorrhagic Stroke**
   - Stroke caused by the rupturing of a weakened blood vessel in the brain.

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**Ischemic Stroke**

87% of all strokes are ischemic
Hemorrhagic Stroke

Approximately 13% of strokes are hemorrhagic
Arteries that penetrate the brain tissue can rupture and cause intracerebral bleeding.

Cerebral artery aneurysms can cause subarachnoid bleeding.

ICH: Small arteries rupture and bleed into the brain tissue.
Transient Ischemic Attack (TIA)

• Temporary interruption of blood supply to the brain resulting in symptoms of stroke. Symptoms may last up to 24 hours, but usually last only a short time.
• The clot usually dissolves on its own or gets dislodged, and symptoms usually last less than five minutes.
• TIA and Stroke have similar symptoms and are treated the same in the prehospital setting.
• **Immediate medical attention is necessary. Patient should be transported to hospital for immediate work-up, even if symptoms resolve.**

• TIAs are a warning sign of a future stroke and are considered high risk events. Don’t think of it as a “mini-stroke”, think of it as an “imminent stroke”!
• About one-third of people who have a TIA go on to have a more severe stroke within one year.
• Up to 25 percent of people who suffer a TIA die within one year.

**WARNING**
Stroke Assessment

Cincinnati Prehospital Stroke Scale

• Most widely used stroke assessment tool

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%.
However...

• In a study reviewing 736 stroke patients, 14.1% did not have any FAST symptoms at presentation. Of these, 42% had gait imbalance or leg weakness, 40% visual symptoms, and 70% either symptom. With their addition, the proportion of stroke patients not identified was reduced to 4.4% (P<0.0001).

• *Stroke. 2017;48:00-00. DOI: 10.1161/STROKEAHA.116.015169.*

Therefore...

• The ND Stroke Task Force recommends using the BEFAST stroke assessment tool.
Balance

- **Sudden** trouble walking, dizziness, loss of balance or coordination.
- Perform bilateral index finger to nose test and bilateral heel to shin test.

Eyes

- **Sudden** double vision or trouble seeing out of one or both eyes.
- Assess 4 quadrants of visual field by having patient locate your hand in each quadrant.
- Assess horizontal gaze by having patient follow your index finger.
**Face**

- *Sudden* drooping or numbness on one side of the face.
- Ask the person to smile or show teeth. Does the person’s face appear uneven?

![Facial Droop Diagram](image)

**Arm**

- *Sudden* numbness or weakness of the arm, especially on one side of the body.
- Ask the person to close his/her eyes then raise and extend both arms. Does one arm drift downward?

![Arm Drift Diagram](image)
Speech

• *Sudden* confusion, trouble speaking or understanding.
• Have patient repeat phrase such as “You can’t teach an old dog new tricks”. Does the patient slur words, use the wrong words or is unable to speak?

Time

• If patient is experiencing signs and symptoms of a stroke, it is *time* to activate a pre-hospital stroke alert.
• BLS teams should also arrange to intercept with ALS.
• It is also *time* to establish last known well/symptom onset.
Why time matters...

• In ischemic stroke, the area of brain tissue that’s irreversibly injured is referred to as the “infarct” or “core.” The area of brain with decreased blood flow that hasn’t experienced irreversible damage is called the “penumbra.”

• The penumbra is the target of directed interventions. Opening obstructed blood vessels with either thrombolytics, such as recombinant tissue plasminogen activator (rt-PA), or direct intra-arterial clot removal, may restore blood flow to the penumbra, limiting damage and reversing some if not all neurologic deficits.

• The key to these interventions is time. If blood flow isn’t restored within the first several hours from symptom onset, the tissue will infarct, leaving little chance of improving outcomes.
Last Known Well (LKW)

• This is the last time that a patient can be said with certainty to have been symptom free. Every effort should be made to obtain this time, as patient treatment relies on it!
• Only use patient’s word if they are a reliable source.
• May have to ask multiple sources to determine: RN, CNA, therapist, MD, family, etc...

Last Known Well (LKW)

• If they were last known well at bedtime, write what time that was.
• Avoid “minutes ago”; convert to an actual time
• The more info the better!
• Discovery of symptoms vs. last known well
Example #1

- EMS dispatched at 0745 to skilled nursing facility for a 76-year old female with right sided paralysis. Patient is receiving rehab following an extended stay at a local hospital.
- Staff reports to dispatcher that they found patient in her bed this morning and aren’t sure the last known well time, but she wasn’t like this yesterday.
- Upon arrival the patient is unable to verbalize to the crew any pertinent information. Nursing staff at bedside report that they contacted the night nurse and aide who said the patient had been seen around 11 pm when she had called the nurses station to report a headache. Tylenol was given and no one had checked on her until 0730 this am.

Example #1 Cont.

- Nursing staff is unsure of the patient’s history but is copying her medication record and other pertinent information.
- Per the medication record the patient received Tylenol at 0320, not at 11 pm as reported. Patient loaded and transported to the local hospital advising a Stroke Code.

**What is last known well?**
- Last known well should be confirmed with staff giving medication at 0320

**What is time of symptom discovery?**
- Discovery time 0730
Example #2

• EMS dispatched to private home for complaints of right arm numbness and slurred speech
• EMS arrives on scene at 1810
• Patient’s daughter reports, “This started about 30 minutes ago”
• EMS completes stroke assessment and calls local ED at 1815 with prehospital stroke alert. Report LKW 30 minutes ago, ETA 10 minutes

Example #2

• ED RN reports to ED Physician at 1820: “Patient coming to room 10, LKW 30 minutes ago, symptoms of slurred speech, R arm numbness”
• EMS at hospital at 1828: Report to nurse “57-year old male presented with R arm numbness and slurred speech about 30 minutes ago. Hasn’t been taking Coumadin due to scheduled back surgery tomorrow, history of atrial fibrillation”

**When is last known well?**

• Answer- 1740? Still unclear, ask family, witness an exact time. Report exact time to Physician and nurse at accepting hospital.
Each time a patient normalizes, the clock for TPA starts over.

Anatomy of the Brain and Major Stroke Syndromes
Cerebrum

• Largest part of the brain; **composed of right and left hemispheres**.

• Performs higher functions like interpreting touch, vision and hearing, as well as speech, reasoning, emotions, learning, and fine control of movement.
Left Hemisphere Stroke Symptoms

- **Sudden loss of ability to produce or understand language (aphasia)**
- Sudden weakness (hemiparesis), paralysis (hemiplegia) and/or loss of sensation (hemisensory loss) to the right side of the body (right hemiparesis)
- Sudden loss of sight in the right half of the patient’s field of vision (right visual field cut)
- Deviation of eyes to left side (left gaze deviation)
Right Hemisphere Stroke Symptoms

- **Left sided neglect** - patients ignore or forget objects on the left side of their body
- Sudden weakness (hemiparesis), paralysis (hemiplegia) and/or loss of sensation (hemisensory loss) to the right side of the body (right hemiparesis)
- Sudden loss of sight in the left half of the patient’s field of vision (left visual field cut)
- Deviation of eyes to right side (left gaze deviation)

Cerebellum

- Controls the coordination of voluntary movement, balance and equilibrium, and muscle tone
- Also plays a role in emotion and cognition
Cerebellum Stroke Symptoms

- Sudden loss of the ability to coordinate muscle movement (ataxia)
- Sudden vertigo/nausea
Brainstem

• Only a half-inch in diameter, the brain stem controls all basic activities of the central nervous system: consciousness, blood pressure and breathing.
• All motor control for the body flows through it. Brain stem strokes can impair any or all of these functions.
• More severe brain stem strokes can cause locked-in syndrome, a condition in which survivors can only move their eyes.
Brainstem Stroke Symptoms

- Sudden eye abnormalities: double vision (diplopia), both eyes do not move together (dysconjugate gaze) or one or both eyes do not move in a specific direction (gaze deviation)
- Sudden N/V, vertigo, tinnitus
- Difficulty talking/words are slurred (dysarthria)
- Difficulty swallowing (dysphagia)
- Decreased consciousness

Hemorrhagic Stroke Symptoms

- Sudden severe headache
- Intolerance to light
- Neck stiffness/pain
- Patients with an intracerebral hemorrhage may present very similar to left and right hemisphere ischemic stroke patients
Common Stroke Mimics

- Hypoglycemia
- Bell’s Palsy
- Atypical Migraines
- Seizures
- Tumors/Brain Mets

Prehospital Interventions
On Scene

- Perform stroke assessment
- Assess ABCs/vital signs
- Glucose fingerstick
- Determine last known well
- Obtain contact information for witness/family
- Determine transport destination and activate prehospital stroke alert
- **Limit scene time to <15 minutes!**

Transport Decision

- Continue to implement and follow your transport plans as required by the ND Department of Health
- Transport the patient to closest most appropriate facility
- Bypass non-stroke capable facilities and transport stroke patients to an acute stroke-ready hospital, within a specified timeframe of onset of symptoms

Reference ND Century Code 25-43-04
Stroke Centers

- Comprehensive Stroke Center (CSC)
- Primary Plus Stroke Center/Thrombectomy Capable Stroke Center
- Primary Stroke Center (PSC)
- Acute Stroke Ready Hospital (ASRH)
- All other hospitals
Transport Decision

Positive Stroke Scale = Advanced Life Support

ALS Intercept vs. Emergent Air Transport

• Patient may need IV access, medication administration, advanced air way management and a pre-hospital thrombolytic checklist.

TIME IS BRAIN!

En Route to Hospital

• Establish large bore IV access
• Perform 12L ECG
• Continuous telemetry monitoring
• Assess medical history including any prescription medications (is patient on non-Aspirin blood thinners)
• ALS agencies-Perform stroke severity scoring (FAST ED)
• Complete fibrinolytics checklist if available
Patient Hand-Off

• Very important to relay last known well time (should also be documented as exact time if possible)
• Report any history of trauma, presence of headaches (severe) or seizure activity (staring/shaking)
• **Provide contact information for witness if able**

Patient Hand-Off

Report on the following:

• Neurologic exam findings: LOC, speech/language, visual fields, motor strength
• Blood Glucose Value
• Blood Pressure
• Result of stroke severity scale (if completed)
Role of EMS...

- Most importantly for prehospital providers, the early EMS notification of the receiving hospital will make timely treatment more likely.

- **DO** monitor vitals and check glucose
- **DO** administer O2 starting at 2L/min if O2 Sats <94%

- **Do NOT** allow aspiration (NPO, head up)
- **Do NOT** give glucose (unless glucose <60 mg/dL)
- **Do NOT** treat hypertension
- **Do NOT** give aspirin
- **Do NOT** delay transport
Treatment

IV Alteplase (tPA)

• Given within 0 to 4.5 hours of last known well
• Considered a “standard of care” for AIS
• Limit the size of the infarct by dissolving the clot and restore blood flow to the ischemic tissue in the brain in hope of improving functional outcome
• Risks vs. benefits
A Step Further...

• Large Vessel Occlusions (LVOs)
  – Major arteries that supply blood to the brain
  – Vertebral, basilar, carotid terminus, middle and anterior cerebral arteries

The Impact of Large Vessel Occlusion Strokes

• Account for nearly half of acute strokes
• If untreated can cause significant deficits and poor outcomes
Endovascular Therapy

- May be done up to 24 hours after last known well
- Require CT-Angiogram to reveal viability of penumbra
- Perfusion scans help determine candidates for intervention

Endovascular Therapy

- Mechanical Thrombectomy
  - Goal is to remove the clot and re-perfuse the penumbra viable brain tissue surrounding the area of ischemia
Fortunately...

- The FAST-ED Large Vessel Occlusion screening tool can help identify potential LVO patients.
- Is comparably accurate to the NIHSS stroke scale in predicting LVO.
FAST-ED

- Facial Droop/Palsy
- Arm Motor Function
- Speech
- Time
- Eye Deviation
- Denial:
  - Aphasia (right sided deficits)
  - Agnosia (left sided deficits)

FAST-ED Training Video Coming Soon!
Hemorrhagic Treatment

• Medical Intervention
  – Reversal of blood thinners
  – Blood pressure lowering

• Surgical Interventions
  – Craniotomy and clot evacuation
  – External ventricular drains
  – Aneurysm clipping

• Endovascular Interventions
  – Aneurysm coiling
  – Flow diverter placement
  – Vascular abnormality glue embolization

ND Stroke Treatment Data
Get With The Guidelines Stroke Registry

- Nationally, 3,229 hospitals enter data into the Get With The Guidelines Stroke Registry
- All stroke certified hospitals in ND participate in the Get With The Guidelines Stroke Registry- 41 hospitals

Patient Arrival Mode

ND CAHs Only

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<th>Private Transport</th>
<th>Transfer from another hospital</th>
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Door to CT Within 25 Minutes – ND CAHs Only

% of Patients

2016 2017 2018

57.1% 68.0% 72.0%

Door-to-Needle Time Within 60 Minutes – All ND Hospitals

% of Patients

2016 2017 2018

66.2% 74.1% 78.2%
Case Review

- 54 year old Male
- Lived 11 miles out of town with CAH
- 2.5 hours from Primary Stroke Center with endovascular capabilities
- Patient suddenly fell
- Upon arrival of EMS they called the CAH for Stroke Code
- The CAH immediately Called for Air Ambulance- before the arrival of patient.

Case Review Continued

- Upon Arrival of Flight team
- Pt Symptoms
  - Right sided paralysis
  - Obvious fixed Gaze to left- unable to track with eyes
  - Unable to speak
  - Right sided neglect
  - Blood Glucose was normal
  - No head trauma, significant PMH
  - FASTED SCORE 7- 60-85% PROBABILITY OF LVO
Case Review Continued

• Patient just got out of CT upon flight crew arrival
  – Ischemic stroke
• Hospital gave TPA Bolus as flight crew started IV infusion with their tubing and pump - 1.5 hours after LKW
• Upon Landing in Bismarck- patient no longer had fixed gaze
• Could look to right side
• Could move right side, but still had weakness- which was improved
• Garbled speech

Case Review Continued

• Patient went straight to CT scan
• Then to Interventional Radiology
• Large clot was pulled out of vessel
• Patient went home 3 days later with no Deficits.
In Closing...

- Time is brain!
- BEFAST!
- Always establish last known well
- Obtain glucose
- Prepare and follow stroke transport plan
- Pre-activate hospital team