Innovations in Stroke Care
Anne Lindstrom, APN, FNP-BC, SCRN
Northwestern Medicine Central DuPage and Delnor Hospitals

Disclosures
I have no disclosures.

Objectives
- Discuss history of stroke care in the United States
- Review current recommendations for acute treatment in stroke
- Review telemedicine models currently in use for stroke care
- Understand role of mobile stroke units
The Reality of Stroke

- The fifth leading cause of death
- 800,000 strokes occur each year
- 87% are ischemic
- In 2007, mortality rate was 273,000
- Cost of Stroke - 65.5 Billion

History of Stroke Care

- Hippocrates first recognized stroke more than 2,400 years ago, calling the condition apoplexy “stricken down by violence.”
- In the 1600s, Dr. Jacob Wepler discovered something disrupted blood supply to the brain of people who died from apoplexy.
- One of earliest known treatments occurred in 1800s when surgeons began removing cholesterol blockages from carotid arteries.
- First Carotid Endarterectomy performed in 1807 by Dr. Amos Twitchell in New Hampshire.
- Supportive care was treatment until 1996 when tissue plasminogen activator (tPA) was approved by the FDA.

Tissue Plasminogen Activator (tPA)

- The Gold Standard for Treating Stroke
- The only FDA-approved treatment for ischemic strokes is tissue plasminogen activator (tPA, also known as IV rtPA, given through an IV in the arm).
- tPA works by dissolving the clot and improving blood flow to the part of the brain being deprived of blood flow.
- If administered within 3 hours (and up to 4.5 hours in certain eligible patients), tPA may improve the chances of recovering from a stroke.
- A significant number of stroke victims don’t get to the hospital in time for tPA treatment; this is why it’s so important to identify a stroke immediately.
Why is time important?

- Every minute the brain goes without oxygen is a loss of approximately 1.9 million neurons and a 3.1 week acceleration of the natural aging process.
- Every minute lost is equal to 1.8 days of disability.
- Research has demonstrated that for every 30 minutes there is a delay in reperfusion, the probability of a good clinical outcome decreases by 12%. (Gupta, et al., 2012).


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2015 AHA/ASA Focused Update Regarding Endovascular Treatment Recommendations

- Patients eligible for IV tpa should receive it even if endovascular therapy is being considered (unchanged from 2013 guidelines).
- Patients should receive endovascular therapy with a stent retriever if they meet all of the following criteria (new recommendation):
  - Presystolic NIH score 0 to 1
  - Acute ischemic stroke receiving IV tpa within 4.5 hours of onset
  - Cerebral artery occlusion of the internal carotid artery or proximal MCA (M1)
  - Age ≥ 18 years of age
  - NIHSS score ≥ 9
  - ASPECTS of ≥ 6
  - Treatment can be initiated within 6 hours of symptom onset.
- If endovascular therapy is considered, a noninvasive intracranial vascular study is strongly recommended to guide clinical decision-making. (new recommendation)
- Observing patients after IV tpa to assess for clinical response before pursuing endovascular therapy is not required to achieve beneficial outcomes and is not recommended. (new recommendation)
Case Study

- 49 year old female who presented to a local ED within 1.5 hours post onset of stroke symptoms.
- NIHSS 23= Global Aphasia, Right sided weakness, and left gaze preference.
- CT scan demonstrated a hyperdensity in the left MCA artery and changes of an evolving left MCA territory infarct, tpa started.
- Angiogram revealed an occluded left ICA just distal to the origin of left posterior communicating artery.

Head CT
Initial Angiography

Left internal carotid artery occluded distal to the left posterior communicating artery

TREVO 2 Deployed
Guideline Recommendations

- Telestroke technology can provide improved stroke care to patients in underserved areas.
- Telestroke is the use of telemedicine specifically for stroke care. Telemedicine is the use of electronic communication methods, such as telephone, Internet, and videoconferencing, to exchange medical information from one geographic site to another.20
- The American Heart/American Stroke Association recommends the use of telemedicine, or telestroke, to improve stroke care in underserved areas.
EMS & Telemedicine Research Project

- A Telemedicine platform to more quickly identify stroke patients in a pre-hospital setting
- EMS will partner up to provide Smart Glass technology to First responder rigs for Stroke identification
- The On-Call Stroke Neurologist will be able to evaluate the patient within minutes of EMS arrival to the patient's location
- The Emergency Department, Stroke Team and or Interventional Team will be notified of the impending Stroke patient as necessary.

EMS & Telemedicine Research Project

- Goals of the project include
  - Decreasing door to drug time with IV's & Ba's
  - Decreasing door to puncture time with Interventional Endovascular Services
  - Decrease over call rate of non stroke related Code Ba's within the Emergency Department

Grant Funding for this project was given to Dr. Shownkeen by Northwestern Medicine Foundation.
Case Study

- Wheaton EMS called for 81 y/o female with weakness, LKW 17:35, dispatch time 18:01
- On scene at 18:05
- Gluc 94
  - Cincinnati (Slurred speech, facial droop, left side weakness)
- Connected to Neurologist via Third Eye device
- Code BAT called from field at 18:20
- Patient arrived to hospital 18:27, NIHSS 8
- CT completed 18:43
- Tpa ordered 18:36
- Tpa started 18:46
- Discharge to acute rehab NIHSS 2

Dispatch to tpa: 45 mins
EMS on scene to tpa: 41 mins
Door to tpa: 19 mins

PHANTOM-S Trial in Germany

- In Germany, results from The Pre-Hospital Acute Neurological Treatment and Optimization of Medical care in Stroke (PHANTOM-S) trial were reported in March 2013.
- Study compared 1,804 evaluable patients who were attended by the STEM0 ambulance to 2,965 patients who received regular emergency services.

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<thead>
<tr>
<th>Measure</th>
<th>Mobile Unit</th>
<th>EMS</th>
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<tbody>
<tr>
<td>Stroke patients given tPA (%)</td>
<td>33</td>
<td>21</td>
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<tr>
<td>Time to tPA (mins)</td>
<td>52</td>
<td>77</td>
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Cleveland Clinic Study Results

- Patients in this study included their first 100 mobile stroke patients compared to a control group of 53 patients that did not receive care via the mobile stroke unit.
- Time period covered: July 18, 2014 through November 30, 2014.

<table>
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<tr>
<th>Measure</th>
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<th>Control Grp</th>
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<tr>
<td>Alarm to CT completed</td>
<td>33 minutes</td>
<td>56 minutes</td>
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<td>Alarm to CT read</td>
<td>44 minutes</td>
<td>64 minutes</td>
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<tr>
<td>No. of patients receiving tPA</td>
<td>16 (16%)</td>
<td>12 (22.6%)</td>
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<tr>
<td>Alarm to IV tPA</td>
<td>50.5 minutes</td>
<td>94 minutes</td>
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<td>Door to IV tPA</td>
<td>31.5 minutes</td>
<td>58 minutes</td>
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**MSU - Operating US Programs**

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**Memphis - Mobile Stroke Unit (Inside View)**

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**First Patient at UT Houston**

- 30 year old Woman
- Sudden onset of dizziness and numbness to the right hand
- Couldn’t stand, talk or see by the time the ambulance arrived
- Basilar artery occlusion suspected
- Treated with IV t-PA within 78 minutes of symptom onset
- Patient taken to endovascular suite; but clot had largely dissolved by that time