Current Issues in Stroke Systems Development

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Objectives

• Review AHA/JC Stroke Center Classifications
• Discuss recent evidence in favor of endovascular treatment for certain strokes
• Discuss the role of EMS and state stroke systems in optimizing patient destination and treatment decisions
• Discuss Utah’s Stroke System Development
Stroke by the Numbers


Stroke Types

- **Ischemic 87%**
  - Embolic
  - Large vessels
  - Small vessels
  - Others

- **Hemorrhagic 13%**
  - ICH
  - SAH

ICH, intracerebral hemorrhage; LVO, large-vessel occlusion; SAH, subarachnoid hemorrhage.
Current Stroke Certifications

- The Joint Commission®
  - American Heart Association®
  - American Stroke Association®

  **CERTIFICATION**
  Meets standards for
  Comprehensive Stroke Center

- The Joint Commission®
  - American Heart Association®
  - American Stroke Association®

  **CERTIFICATION**
  Meets standards for
  Primary Stroke Center

- The Joint Commission®
  - American Heart Association®
  - American Stroke Association®

  **CERTIFICATION**
  Meets standards for
  Acute Stroke Ready Hospital

- NAEMSO

- UTAH DEPARTMENT OF HEALTH
Models of Stroke Care: Characteristics Of Different Stroke Centers

Academic medical center, tertiary care facility

Wide range of hospitals, standard stroke care, stroke unit; use tPA

Rural hospitals; basic care; drip and ship; use teletechnologies
Acute Stroke Ready Hospital (ASRH)

• Joint Commission and American Heart Association Criteria

• A dedicated stroke-focused program.
• Staffing by qualified medical professionals trained in stroke care.
• Collaboration with the local Emergency Management Systems (EMS) that encourages training in field assessment tools and communication with the hospital prior to bringing a patient with a stroke to the hospital.
• 24/7 ability to perform rapid diagnostic and laboratory testing.
• Ability to administer intravenous clot-busting medications to eligible patients.
• Availability of telemedicine technology.
• Use of transfer agreements/protocols with facilities that provide primary or comprehensive stroke services.
Geographical Limitations

By ground:
81% of the US population had 60-minute access to IV rt-PA capable hospitals
66% had access to PSCs

By ground
56% of US population have access to endo capable hospital

Adeoye Stroke 2014

Geographical Limitations
12 states and DC have enacted policies around the recognition of stroke facility designations.
Large-Vessel Occlusions (LVOs):

- Common: 33% to 40% of all ischemic stroke\textsuperscript{1,2}
- Severe: 5x higher mortality; 3-fold reduction in good outcome
- Respond poorly to intravenous thrombolytic (IV t-PA)
- Successful opening of occlusion by IV t-PA\textsuperscript{3}
  - Distal M1, M2, M3, and M4: 78% to 86%
  - Carotid terminus: \sim 28%

\textsuperscript{t-PA, tissue plasminogen activator.}
Stroke Systems Of Care- EMS Transport Protocol

• **Challenges**
  
  • What role can EMS play in rapidly identifying patients with LVAO?
  • Which stroke severity screen should be utilized?
  • What role do PSC and ASRH play in an Endovascular world?
  • When should patients be transported straight to a CSC?
  • Should PSCs and ASRHs be bypassed in favor of CSCs?
  • How can we fully utilize the ENTIRE Stroke System of Care?

• Drip and Ship or straight to the Mother Ship?
# Acute Ischemic Stroke: Treatment Options

## Medical Management
- IV t-PA is the thrombolytic drug used in stroke patients.
- Patients must be within the time window of 0 to 3 hours from symptom onset.
- There are other contraindications associated with use of the drug as well.

## Mechanical Thrombectomy
- This procedure uses a stent retriever that is placed in the occluded vessel through a catheter placed in the groin.
- The time window for mechanical thrombectomy is up to 6 hours from symptom onset.
- If the patient fails IV t-PA or is ineligible for IV t-PA, he/she may be eligible for mechanical thrombectomy.

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Stroke Triage and Destination Scenarios

ASRH, acute stroke–ready hospital; CSC, comprehensive stroke center; EMS, emergency medical services; PSC, primary stroke center.
## Stroke Severity Scales

<table>
<thead>
<tr>
<th>Score Scale</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Motor Scale (LAMS)</td>
<td>• Pure motor: easy to teach and perform</td>
<td>• Not validated</td>
</tr>
<tr>
<td></td>
<td>• High interrater reliability</td>
<td>• Facial droop interrater reliability</td>
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<tr>
<td></td>
<td>• Fast: 20 to 30 seconds to perform</td>
<td>• Caveat (present or absent)</td>
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<tr>
<td></td>
<td>• Predicts LVO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Correlated to NIHSS scores ( r = 0.75 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Performed by prehospital providers</td>
<td></td>
</tr>
<tr>
<td>3-Item Stroke Scale (3ISS)</td>
<td>• Prospective (171 patients)</td>
<td>Moderate sensitivity for LVO</td>
</tr>
<tr>
<td></td>
<td>• Fast: 20 to 30 seconds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Easy to perform</td>
<td>Not validated</td>
</tr>
<tr>
<td></td>
<td>• Reproducible; intraclass correlation coefficient (ICC): 0.947</td>
<td>Low derivation population</td>
</tr>
<tr>
<td></td>
<td>• Performed by stroke doctors</td>
<td>Not evaluated by EMS or in the prehospital setting</td>
</tr>
<tr>
<td></td>
<td>• Correlation with NIHSS: 0.954</td>
<td></td>
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<tr>
<td></td>
<td>• Only on 20 patients</td>
<td></td>
</tr>
<tr>
<td>Rapid Arterial Occlusion Evaluation (RACE)</td>
<td>• Derivation population: 654</td>
<td>Weakness both arms</td>
</tr>
<tr>
<td></td>
<td>• Validated in prehospital setting</td>
<td>Only LVO</td>
</tr>
<tr>
<td></td>
<td>• 357 patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Weights both hemispheres equally</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Most similar to NIHSS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High sensitivity</td>
<td></td>
</tr>
<tr>
<td>Cincinnati Stroke Triage Assessment Tool (C-STAT)</td>
<td>• Largest derivation/validation cohort</td>
<td>Moderate specificity of LVO</td>
</tr>
<tr>
<td></td>
<td>• Weighted scale: gaze getting 2 points</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Classification and regression tree (CART) analysis and neuroanatomy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• “Present” or “Absent” questions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not a graded analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fast: &lt;1 minute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High sensitivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ongoing, prospective EMS study</td>
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</tbody>
</table>

Lessons Learned from Utah’s Stroke System Development

• Inclusive system
• Avoid bypass, especially in rural areas: raise the level of care in all hospitals
  • Only 50% of strokes arrive by EMS
• Voluntary
• Criteria for Utah Stroke Receiving Facility very similar to AHA/JC ASRH
• Partner with hospital association
• Keep knocking on the doors of uncertified hospitals
  • “How can we help you meet the criteria?”
• Toolkit
Utah SRF Toolkit

www.health.utah.gov/ems/stroke
Content Development (ACEP and Medtronic Foundation)

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Questions?