Structuring Stroke Systems of Care in 2016

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What Has Changed??

- We now have approved endovascular treatment options for Acute Ischemic stroke (AIS) patients

- We have confusion amongst EMS in rural and urban areas about where to deliver a stroke patient

- There are now several tiers for stroke center designation.

WHAT DOES THIS ALL MEAN FOR THE PATIENT???
Need for Direction??
Many states are still adapting policy/legislation to include comprehensive stroke centers.

In most States – this is the Legal template for destination that EMS providers must follow:
  – Similar to trauma systems/levels of care.
Stroke Designation Public Policy to Date

• 12 states and Washington DC states have enacted public policies which recognize all three tiers of stroke facilities and require the development and implementation of transport protocol plans for acute stroke patients.

• These state successes were realized in: AZ, DC, IL, KY, LA, MN, NM, OK, NC, ND, RI, UT & WY.
We need to decide how to provide the right level of care to the right patient

1. Within geographic regions
2. Depending on resources

?? Access to a Comprehensive stroke centers
or
?? Primary stroke center with endovascular capability
Tiered Levels of Stroke Care

• 1. Acute Stroke Ready Hospital = **ASRH**
• 2. Primary Stroke Certified = **PSC**
• 3. Comprehensive Stroke Certified = **CSC**

- **ASRH**
  • Neurologist – 24/7 in person or via telemed
  • Telemed avail w/in 20 min
  • Transfer protocols with PSC or CSC
  • IV tPA available – anticipate transfer if treated
  • No stroke unit required
Tiered Levels of Stroke Care

**PSC**
1. Stroke unit or designated beds
2. CTA/MRA available 24/7
3. Neurologists 24/7 in person or via telemed
4. IV tPA treatment
5. Neurosurg avail within 2 hrs – if onsite neurosurg – OR staffed 24/7

**CSC**
1. Dedicated neuro ICU with 24/7 staffing
2. Catheter angio 24/7
3. Able to meet concurrent needs of multiple complex stroke patients
4. 24/7 neurointerventionalist, neurosurgeon, neurologists
5. Aneurysm clipping/coiling, carotid stenting/CEA, endovascular care
6. Patient centered stroke research
7. Additional volume requirements for IV tPA and SAH clip/coil volume
Treatment and Routing Options
**Systems of Care Metrics**

- **Patient with abnormal vital functions in need of acute resuscitation**
  - Transport to nearest hospital for stabilization of vital signs
  - Once vital functions stabilized, transfer to nearest CSC (or PSC if long distances)

- **Patient with acute onset of stroke symptoms within 6-8 hours**
  - Transport patient to closest PSC or CSC if <15-20 minutes transport time
  - If PSC and/or CSC >15-20 minutes away, go to closest ASRH

- **Patient with acute stroke and seen initially at an ASRH**
  - ASRH might use telemedicine to help evaluate the patient and to make transfer recommendations
  - Transfer to nearest PSC or CSC based on stroke type, patient's medical condition, treatment options

Rural vs Urban Dilemma

• **Urban settings** – more likely to have access to PSC and/or CSC

• **Rural**
  – Many more challenges in access to stroke care
  – Air transfer vs ground
  – Use of advanced imaging and/or telestroke will help in determination of most appropriate level of stroke care
  – Some PSC may offer endovascular capabilities
ALL HOSPITALS TREAT STROKE???
Questions to Consider??

- What clinical features might help us decide on the most appropriate destination??

- Are there better Prehospital scoring systems than the currently used prehospital scoring systems??
Identify Lg Vessel Occlusion – Using Severity Scores

1. Rapid Arterial Occlusion Evaluation Scale (RACE)
2. Los Ángeles Motor Scale (LAMS)
4. NIHSS Stroke Scale
5. Cincinnati Prehospital Stroke Severity Scale (CPSSS)

• All of these add additional assessment features to help make determination – all validated in the field.
Location of Vessel Occlusion is Important

Small vessel occl

Large vessel occl
A RACE score $\geq 5$ had a sensitivity of 0.85 and a specificity of 0.68 for detecting LVO.

**Additional assessment parameters**
Los Angeles Motor Scale (LAMS)

Face weak

- Absent 0
- Present 1

Arm weak

- Absent 0
- Drift 1
- Falls Rapidly 2

Grip Strength

- Normal 0
- Weak 1
- No grip 2

A LAMS score of >4 had a sensitivity of 0.81 and a specificity of 0.68 for detecting a LVO.

1. Validated across a variety of environments and providers

2. Gives data about severity and potentially location

3. **NIHSS ≥ 6 identifies** patients who should receive endovascular therapy (Class I, LOE A)

4. Can be utilized in selected Prehospital Providers

5. May be too complicated for generalized use

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NIHSS – Predicting LVO
Cincinnati Prehospital Stroke Severity Scale (CPSSS)

- First published in 1997
- Score ranges from 0 to 4
  - 2 points: Conjugate gaze deviation
  - 1 point: Incorrectly answers at least one of LOC (age or current month) and does not follow at least one or two commands (close eyes, open and close hand)
  - 1 point: Cannot hold arm (R or L) up for 10 seconds before arm falls to bed
- Score $\geq 2$ was 89% sensitivity and 73% specificity in identifying NIHSS $\geq 15$.

Katz et al., Stroke. Jun;46(6):1508-12
Time is Important

- Time remains most important variable affecting response to treatment

- Time to reperfusion metrics - includes both IV thrombolytics and intraarterial reperfusion in setting of LVO
  1. Predicts clinical outcomes
  2. Time is Brain must drive all system development
A good outcome from IV thrombolysis is more common in stroke due to small vessel disease than other subtypes 957 patients treated with IV tPA

<table>
<thead>
<tr>
<th>Stroke Subtype</th>
<th>n</th>
<th>Excellent outcome, mRS 0-1</th>
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</thead>
<tbody>
<tr>
<td>Large artery atherosclerosis</td>
<td>217</td>
<td>OR 0.69 [CI 0.5– 0.96]</td>
</tr>
<tr>
<td>Cardioembolic</td>
<td>389</td>
<td>OR 0.80 [CI 0.61 – 1.06]</td>
</tr>
<tr>
<td>Small vessel disease</td>
<td>101</td>
<td><strong>OR 2.48 [CI 1.63 – 3.79]</strong></td>
</tr>
<tr>
<td>Other</td>
<td>27</td>
<td>OR 0.32 [CI 0.11 – 0.94]</td>
</tr>
<tr>
<td>Undetermined</td>
<td>130</td>
<td>OR 1.85 [CI 1.27 – 2.70]</td>
</tr>
</tbody>
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Mustanoja et al., Stroke. 2011;42:102-106
Recommendations for Endovascular Interventions

1. Patients eligible for intravenous r-tPA should receive intravenous r-tPA even if endovascular treatments are being considered (Class I; Level of Evidence A). (Unchanged from the 2013)

2. Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria (Class I; Level of Evidence A). (New recommendation):
   a. Prestroke mRS score 0 to 1,
   b. Acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset according to guidelines from professional medical societies,
   c. Causative occlusion of the ICA or proximal MCA (M1),
   d. Age ≥18 years,
   e. NIHSS score of ≥6,
   f. ASPECTS of ≥6, and
   g. Treatment can be initiated (groin puncture) within 6 hours of symptom onset
Use of Telestroke May Assist with Decision Making

• Current models
  – Drip and ship vs. treat and keep
  – Access to imaging for HUB is essential
  – Is post tPA care is available – not required for ASRH
  – Evaluate the need for endovascular care

• How we can use telestroke to determine need for transfer
  – Stroke severity - NIHSS
  – Imaging criteria – ASPECTS, Hyperdense artery sign

• Other variables/options considered for:
  – Patients who present outside tPA window
  – Patient on oral anticoagulation (warfarin and NOA’s)
  – ICH/SAH
• We are still evolving to determine the best way to integrate new knowledge in to clinical practice
• One thing we know for sure - no hospital should stand alone as an island.
  – We ALL Need to partner and establish relationships/transfer agreements to ensure that evidence based care for the stroke patient is available.

• STAY TUNED!!!!!
Thank YOU

Questions???