The advantages and limitations of EMS field triage for acute stroke in light of the positive EVT trials.

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Florida Hospital Stroke program

Disclosures
Genentech speaker’s bureau
Outline

1) Disadvantages

2) Advantages

3) Likely Future directions

Getting acute LVO ischemic strokes promptly to CSC
Pursuit of this Obvious benefit…

odds patient gets intervention drop 2.5% each minute of PCS-to-CSC transport time¹

...Can lead to this intellectually lazy detrimental approach

- Some “Big city” EMS policies are to take ALL strokes to only CSC’s

A) “Plunder of our fine system of PSC’s…”

B) ASA GWTG/CSC = 50% of strokes brought by POV’s

A+B= weakened acute stroke readiness for PSC’s and POV strokes

Lack of regional stroke system planning

- Too many CSC’s in some affluent areas (South Florida Starbucks rule: 16 across 3 counties)

- Volume likely drives admin commitment and quality
State attestation and minimal oversite of CSC’s and EMS med directors

- “interventional centers” that “do everything except Aneurysms”
- Single interventionalist “CSC’s” that takes week-ends off
- EMS—likely attempting to help trauma centers—can take LVO strokes to “CSC’s” when they have no interventionalists

Suggestions:

- Revise guidelines to encourage EMS severity adjusted triage in the field and more selective bypass rather than “w/in 15-20 min bypass”
- Better supervision of EMS medical directors?---more realistic than “regional planning” of CSC’s
- Required third party CSC certification???
StrokeSeverityAdjustedEMSTriageHasBenefitsForBypassedPrimaryStrokeCenters

Stroke 2014; 45:A213


*Florida Hospital Neuroscience Institute, **Seminole County EMS ***Florida State University College Of Medicine ****Zeenat Qureshi Stroke Research Center

10 years of Florida EMS Severe Stroke Adjusted Triage (SAST) bypass coming to rest of USA, when feasible, soon

ASA 2016/7- An ambulance near you if feasible

ASA 2015- Lifeline Stroke National EMS Committee

Approx 50% of Florida EMS medical directors do SAST bypass

WCF 2005- Florida stroke act

Seminole County EMS 2005 (first on Earth)

WCF 2006- Tampa

Lake County EMS 2007

Dr. Paul Banerjee (Lake/Polk EMS)

Miami-Dade EMS 2012

Floridahospital
Neuroscience Institute
Study design

Seminole County EMS

Lake County EMS

310 severe

190 severe

500 suspected acute Severe strokes

Florida Hospital Orlando CSC

Retrospective analysis (2006-2012)

- Therapeutic Bypass yield
- EMS in field diagnostic accuracy
- Effect on bypassed PSC’s

We recommend LAMS

UCLA’s LA Motor Scale

LAMS ≥ 87% chance an ischemic stroke has a large vessel occlusion (intervention)
Results: Therapeutic yield

“Therapeutic Bypass Yield” Definition = percentage of patients that got Cranial Neurosurgery or Endovascular intervention during this admission not available at Bypassed PSC’s

Therapeutic Yield = 15% got a CSC-specific Intervention (77/500 CSC triaged patients)
- Acute endovascular intervention (ischemic stroke)=7.5%
- Neurosurgery for Intracranial bleed = 5%
- Neurosurgery for Intracranial tumor =2%
- Other: Aneurysm coiling + EC/IC bypass= 0.5%

Comparison of Therapeutic Bypass yields: Trauma vs Stroke

- **STROKE:** 15% got CSC-specific stroke procedure (77 of 526)
- **TRAUMA:** 18% got taken to Operating room in 1st 48 hrs at level one trauma center (35 of 193)
- No stat sig diff in therapeutic bypass yields for trauma and stroke
  - Odds Ratio 0.77, 95% CI = 0.5-1.2
EMS was pretty accurate

• Of 471 patients with known diagnoses
  --- 45% Ischemic Stroke
  --- 22% Transient Ischemic Attack
  --- 14% Intracranial Bleed (ICH, SDH, EDH, SAH)
  ---- 6% Seizure
  ---- 3% Tumor
  ---- 3% Metabolic Encephalopathy
  ---- 3% Functional Symptoms
  ---- 4% Other (Migraine, concussion, syncope, dementia)
  100%

Achtung!

“Hell hath no fury like a PSC scorned....”

Step 1: strongly facilitate rehab at the bypassed PSC choice
Use of EMS to Improve Triage of Stroke Patients

Evan Allen, MD, MBA

STEP 2: Benefits for bypassed PSC

<table>
<thead>
<tr>
<th>What Altamonte PSC got</th>
<th>What Altamonte PSC was spared</th>
</tr>
</thead>
<tbody>
<tr>
<td>643 direct-to-PSC patients</td>
<td>209 SAST bypass CSC patients</td>
</tr>
<tr>
<td>Major Complications**</td>
<td>13%</td>
</tr>
<tr>
<td>respiratory failure, infection, DVT, PE, MI or recurrent stroke in house</td>
<td></td>
</tr>
<tr>
<td>ICH, fatal or d/c hospice*</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

1 in 8 CSC patients were transferred for a CSC-SI

Fatal/Hospice ICH: Odds ratio =15.38, 95% CI =5.2 to 45.5, P<0.0001
Major Complications: Odds ratio =2.54, 95% CI =1.78 - 3.62), P<0.0001

Future directions for SAST and bypass

EMS often asks: “can we extend the window beyond 4.5 hrs?”
Use of EMS to Improve Triage of Stroke Patients

Evan Allen, MD, MBA

What % of Intervention strokes are missed with a 4.5 hr LKN in the field window?

No significant difference in Age, stroke severity or other factors known to predict outcome after Intervention

<table>
<thead>
<tr>
<th></th>
<th>&lt;6hr (n=106)</th>
<th>≥6hr (n=42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median time of image</td>
<td>128 minutes</td>
<td>480 minutes</td>
</tr>
<tr>
<td>% that got procedure</td>
<td>41%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Eligible for procedure if favorable CTP---ASPECTS not used for decision making

What % of Intervention strokes are missed with a 4.5 hr LKN in the field window?

<table>
<thead>
<tr>
<th>Percent of treated &lt;6+&gt;6 hr LVO strokes that would have been excluded at FH Orlando CSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5hr LKN in the field</td>
</tr>
<tr>
<td>6 hr LKN in the field</td>
</tr>
<tr>
<td>8 hr LKN in the field</td>
</tr>
<tr>
<td>10 hr LKN in the field</td>
</tr>
<tr>
<td>13 hr LKN in the field</td>
</tr>
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</table>
Outline

Future directions for SAST and bypass

For resource constrained counties:
Should we exclude patients with high chance of poor outcome from CSC triage and transport?

Typical case

A dedicated but mildly resource impaired EMS medical director wishes to send acute severe strokes 1.5 counties away to the CSC past 3 different closer PSC’s. A 89 year old woman with a severe stroke (NIHSS 20) and Glucose 200 is transported out of the county for CSC intervention. The response reminds the EMS med dir of the “Achtung! Hell hath no fury....” slide.
Is pursuing this outcome, or worse, a good use of EMS SAST bypass resources?

**Modified Rankin Scale**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No symptoms at all</td>
</tr>
<tr>
<td>1</td>
<td>No significant disability despite symptoms; able to carry out all usual duties and activities</td>
</tr>
<tr>
<td>2</td>
<td>Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance</td>
</tr>
<tr>
<td>3</td>
<td>Moderate disability; requiring some help, but able to walk without assistance</td>
</tr>
<tr>
<td>4</td>
<td>Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance</td>
</tr>
<tr>
<td>5</td>
<td>Severe disability; bedridden, incontinent and requiring constant nursing care and attention</td>
</tr>
<tr>
<td>6</td>
<td>Death</td>
</tr>
</tbody>
</table>

No PSC bypass if modified HIAT = 3, or 2 for intubating CSC > 1?

**HIAT Score**
- If Age $\geq 75$ years 1 point
- If NIHSS $\geq 18$ 1 point
- If glucose $\geq 150$ 1 point