Getting the Right Stroke Patient to the Right Hospital: Pre-hospital Assessment Tools

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University of Pittsburgh School of Medicine
Medical Director, STÂT MedEvac
Conflicts and Contributions

• Funded by DoD for Trauma Studies
  – Prehospital Plasma for Trauma
  – Prehospital TXA for Trauma
• ROC investigator
• The Medevac Foundation
  – Sleep and Fatigue in EMS

• Significant materials provided by Chris Martin-Gill MD, MPH and Ashutosh Jadhav MD, PhD
Objectives

• To describe new technology available for early recognition, triage and treatment of stroke patients

• To understand the limitations of the ACEP tPA clinical policy

• To review new data regarding stroke interventions

• To discuss the implications for regionalization of stroke care

• To consider options for improving access to interventional stroke care
• 800,000 strokes/yr
• Stroke continues to be the leading cause of permanent disability
• EMS is the most common access point for a stroke into the Healthcare System
  – Patients wait too long to present
  – EMS has difficulty recognizing stroke syndromes
  – Emergency physicians are conflicted about how to treat stroke
State of Art Prehospital Stroke Care

- Recognition of Stroke
- Establish “Last Seen Well”
- Treat glucose
- Prevent secondary injury
  - Hypotension
  - Hypoxia
  - Hypocarbia
- Provide notification
Primary Stroke Centers in Pennsylvania

• Established under Act 54 (signed by Gov. Corbett, May 2012)
  – Commonwealth must keep a list of accredited primary stroke centers
  – DOH must post an assessment tool for EMS
    • Cincinnati Prehospital Stroke Scale
  – DOH must establish protocols for treatment and transport of stroke patients to the closest primary stroke center
Criteria:

A. Patients may have the following clinical symptom(s):
   1. Altered level of consciousness
   2. Impaired speech
   3. Unilateral weakness / hemiparesis
   4. Facial asymmetry / droop
   5. Headache
   6. Poor coordination or balance
   7. Partial loss of peripheral vision
   8. Vertigo

Exclusion Criteria:

A. Consider hypoglycemia, trauma, and other etiologies of stroke symptoms, and follow applicable protocol if appropriate.

Treatment:

A. All patients:
   1. Initial Patient Contact – see Protocol # 201.
      a. If history of diabetes and signs of hypoglycemia, also follow Diabetic Emergency protocol #702
      b. Consider call for ALS if altered level of consciousness. See Indications for ALS Use protocol #210
   2. Maintain open airway.
      a. Use an oral or nasal airway as appropriate.
   3. Apply oxygen to keep \[\text{SpO}_2\] between 95-99%.
   4. Monitor pulse oximetry – See Pulse Oximetry Protocol #226
   5. Obtain patient history, (i.e. OPQRST) and examine patient.
      a. Exact time of symptom onset or time patient last seen in normal state is extremely important.
      b. Assess Cincinnati Stroke Scale
   6. If stroke indicated by the Cincinnati Stroke Scale AND patient can be delivered to the receiving facility within 3 hours of symptom onset, then
      a. Package patient and transport ASAP
      b. Contact medical command and receiving facility as soon as possible
   7. Transport to a certified primary stroke center if the patient can arrive at the stroke center within 45 minutes. It may be important for a family member to accompany the patient during transport to verify the time of symptom onset and provide consent for therapy.
   8. Transport in supine position.
      a. If patient can't tolerate being flat, avoid raising head and shoulders more than 30°.
Possible Medical Command Orders:

A. Medical command may divert patient to local hospital that is the most prepared to care for acute stroke patients.

Notes:

1. Attempt to identify the precise time of the onset of the patient’s first symptoms. The time of onset is extremely important information, and patient care may be different if patient can be delivered to a certified primary stroke center within 3 hours from onset of symptoms. Time of onset is based upon the last time that the patient was witnessed to be at his/her neurologic baseline.

2. **Cincinnati Prehospital Stroke Scale.** If any of the following is **abnormal** and **new** for the patient, he/she may have an acute stroke:

   a) Facial Droop (patient smiles or shows teeth) - abnormal if one side of the face does not move as well as the other.
   
   b) Arm Drift (patient holds arms straight out in front of him/her and closes eyes) – abnormal if one arm drifts down compared with the other.
   
   c) Speech (patient attempts to say “The sky is blue in Pennsylvania”) – abnormal if patient slurs words, uses inappropriate words, or can’t speak.
   
   d) Although not parts of the Cincinnati Prehospital Stroke Scale, sudden onset of unilateral leg weakness or sudden decrease in peripheral vision are also signs of acute stroke.

3. **In rural areas, if patient can be delivered by air (but not by ground) to receiving facility within 3 hours of symptom onset, consider contact with medical command for assistance in deciding upon the utility of air medical transport.** ***Consider air transport if ground transport to the closest certified stroke center is >45 minutes.***

4. Report time of symptom onset and abnormal findings from Cincinnati Prehospital Stroke Scale to medical command physician.

5. The current list of recognized certified Primary Stroke Centers (which also includes comprehensive stroke centers) is posted on the Pennsylvania Department of Health website. If the closest appropriate receiving facility is not a certified Primary Stroke Center, then the patient should be transported to the closest certified Primary Stroke Center if the patient can arrive at the stroke center within 45 minutes.

6. If patient can be delivered by air (but not by ground) to receiving facility within 3 hours of symptom onset, consider contact with medical command for assistance in deciding upon the utility of air medical transport. See Protocol #181.

Performance Parameters:

A. Review on scene time for all cases of suspected stroke with time of symptom onset less than 3 hours
PA BLS Protocol 761

• Emphasizes:
  – Transport to a primary stroke center if patient can arrive within 3 hours of symptom onset
  – Medical command may divert patient to a hospital that is most prepared to care for acute stroke patients

• Due to timing of protocol updates for 2015, insufficient time to consider new literature

• It does not address:
  – Optimal destination for patients who cannot arrive at a primary stroke center within 3 hours (e.g. 5 hours since onset at time of EMS arrival)
  – How to select patients to go to stroke facilities with different levels of care
tPA and the Primary Stroke Center

- Large investment by hospital systems to be recognized as PSCs
- Ensures processes are in place to mitigate risk associated with IV tPA
- Despite improvements in systems of care utilization of tPA remains low
  (intervention rate remains <10%)
What Window 3hrs or 4.5hrs?

• 3 hr established by original NINDS Trial (1995)

• 4.5 hr by ECASS III trail (2008)
  – Had a 10 fold higher incidence of hemorrhage but no difference in mortality between the groups
  – Severe strokes were excluded
  – Placebo group had a higher incidence of previous strokes (may have accounted for worse outcomes)
  – Criteria are more restrictive (18-80, no DM, no anticoagulants)
tPA and ACEP

• Published in 2012
  – Level A: tPA should be offered to patients that meet NINDS criteria within 3 hrs
  – Level B: IV tPA should be considered for patients who meet ECASS III between 3 and 4.5 hrs
  – Notes:
    1. The effectiveness of tPA has been less well established in institutions without the systems in place to safely administer the medication
    2. As of this writing, tPA for acute ischemic stroke in the 3-4.5 hr window is not FDA approved
tPA and ACEP 2015?

• Revised methodology
• New Level A recommendation
  – Clinicians must consider the 7% incidence of symptomatic hemorrhage (1% placebo)
• tPA within 3 hr window reduced level A to B
• tPA in the 3-4.5 hr remains B
• Level C recommends a shared decision making model between the patient and members of the team
What Does Comprehensive Stroke Center Offer?

- Catheter based interventional treatment
- Neurocritical Care Services
- Pathway to Rehab
- Volume Quality Relationship
• 5 randomized controlled trials recently published
  – All provide strong evidence of benefit of intra-arterial therapy for select stroke patients with large vessel occlusions
  – Therapy largely guided by imaging
  – All patients were eligible for tPA if within window prior to intra-arterial therapy

• Studies:
  – MR CLEAN
  – ESCAPE*
  – EXTEND-IA*
  – REVASCAT*
  – SWIFT PRIME*

  – *ESCAPE, EXTEND-IA, REVASCAT, and SWIFT PRIME all stopped early due to substantial treatment effect
Literature summary

• For patients with large vessel occlusion:
  – Intra-arterial intervention (removable stent or thrombectomy) beneficial in a subset of cases based on neuroimaging findings
  – True for patients with or without tPA treatment
  – NNT of 3 to 7

• Difference from prior trials that did not show a difference with IA treatment versus tPA alone (e.g. IMS III trial):
  – Eligible patients get IV tPA
  – Use of neuroimaging to guide patient selection
  – Newer IA treatment modalities (versus prior first generation devices)
Who Benefits from Interventional Therapy?

• For patients with large vessel occlusion:
  – Intra-arterial intervention (removable stent or thrombectomy) beneficial in a subset of cases based on neuroimaging findings
  – True for patients with or without tPA treatment

• Difference from prior trials that did not show a difference with IA treatment versus tPA alone (e.g. IMS III trial):
  – Use of neuroimaging to guide patient selection
  – Newer IA treatment modalities (versus prior first generation devices)


on behalf of the American Heart Association Stroke Council

Stroke. published online June 29, 2015;

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628
• Recommendations on Endovascular Interventions:
  1. Patients eligible for IV r-tPA should receive it even if endovascular treatments are being considered (Class I, LOE A)
  2. Patients should receive endovascular therapy with a stent retriever if they meet all of the following criteria:
     • NIHSS score ≥6
     • ASPECTS ≥6
     • Treatment can be initiated within 6 hours of symptom onset
• Recommendations on Systems of Stroke Care:
  1. Patients should be transported rapidly to the closest available certified primary stroke center or comprehensive stroke center
  2. Regional systems of stroke care should be developed (Class I, LOE A), consisting of:
     o Hospitals that can provide r-tPA (PSCs and CSCs)
     o Hospitals that can provide endovascular therapy
  3. It may be useful for PCPs to perform noninvasive intracranial vascular imaging to select and transfer patients for endovascular intervention, reducing time to endovascular treatment (Class IIb, LOE C)
Time for Action
How do we identify patients with stroke and especially those with large vessel occlusion?

• **Stroke Scales**
  1. Cincinnati Prehospital Stroke Scale (CPSS)
  2. Face Arm Speech Test (FAST)
  3. Los Angeles Prehospital Stroke Screen (LAPSS)
  4. Medic Prehospital Assessment for Code Stroke (Med PACS)
  5. Melbourne Ambulance Stroke Screen (MASS)
  6. Ontario Prehospital Stroke Screening Tool (OPSS)
  7. Recognition of Stroke in the Emergency Room Score (ROSIER)

• **Severity Scales**
  1. Rapid Arterial Occlusion Evaluation Scale (RACE)
  2. Los Angeles Motor Scale (LAMS)
  3. Kurashiki Prehospital Stroke Scale (KPSS)
  4. National Institutes of Health Stroke Scale (NIHSS)
  5. sNIHSS-8
  6. sNIHSS-5
  7. Cincinnati Prehospital Stroke Severity Scale (CPSSS)
## Stroke Recognition Scores

<table>
<thead>
<tr>
<th></th>
<th>CPSS</th>
<th>FAST</th>
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# Stroke Severity Scores

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<td><strong>Extinction &amp; Inattention</strong></td>
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<td>0 to 16</td>
<td>0 to 9</td>
<td>0 to 10</td>
<td>0 to 4</td>
<td>0 to 13</td>
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</table>
1. **Level of consciousness**
   a) Alertness
   b) Orientation
   c) Commands

2. **Best Gaze**

3. **Visual Fields**

4. **Facial Palsy**

5. **Motor Arms**

6. **Motor Legs**

7. **Limb Ataxia**

8. **Sensory**

9. **Best Language**

10. **Dysarthria**

11. **Extinction / Inattention**
• Validated across a variety of environments and providers
• Gives data about severity and potentially location.
• NIHSS $\geq 6$ identifies patients who should receive endovascular therapy (Class I, LOE A)
• Can be utilized in selected Prehospital Providers
• May be too complicated for generalized use
Cincinnati Prehospital Stroke Scale (CPSS)

• First published in 1997
• Primary stroke identification scale used in Pennsylvania

Exam:
– Facial palsy
– Arm drift
– Abnormal speech

• Any positive factor suggests stroke

Early Stroke Recognition: Developing an Out-of-hospital NIH Stroke Scale
Rashmi Kothari, MD, Kent Hall, MD, Thomas Brott, MD, Joseph Broderick, MD

ABSTRACT

Objective: To develop an abbreviated and practical neurologic scale that could assist emergency medical services or triage personnel in identifying patients with stroke.
Methods: A prospective, observational, cohort study was performed at university-based EDs. Participants were 74 patients treated in a thrombolytic stroke trial and 225 consecutive non-stroke patients evaluated during 4 random 12-hour shifts in the ED. Scores on the NIH Stroke Scale were obtained for all patients by physicians. Items of this scale were modified and recoded to a binomial (normal or abnormal) scale. Serial univariate analyses using $\chi^2$ were performed to rank items. Recursive partitioning was then performed to develop the decision rule for predicting the presence of stroke.
Results: Three items identified 100% of patients with stroke: facial palsy, motor arm, and dysarthria. An Abbreviated NIH Stroke Scale based on these items had a sensitivity of 100% and a specificity of 92%. A proposed Out-of-hospital NIH Stroke Scale consisting of facial palsy, motor arm, and a combination of dysarthria and best language items (abnormal speech) had a sensitivity of 100% and a specificity of 88%.
Conclusion: Using the derivation data set, a proposed Out-of-hospital NIH Stroke Scale had a high sensitivity and specificity for identifying patients with stroke when performed by physicians in this group of 299 ED patients. Prospective studies of other health care professionals using the scale in the out-of-hospital arena are needed.
Key words: out-of-hospital; emergency medical services; EMS; paramedic; stroke; cerebral ischemia; diagnosis; score.

Cincinnati Prehospital Stroke Scale (CPSS)

- Validated in several prehospital settings

<table>
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<th>Study</th>
<th>Sample</th>
<th>Ischemic Stroke Prevalence</th>
<th>Sensitivity</th>
<th>Specificity</th>
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<td>1,217</td>
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<td>80%</td>
<td>48%</td>
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<td>Purrucker 2014</td>
<td>689</td>
<td>29%</td>
<td>83%</td>
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<td>23%</td>
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<td>Kothari 1999</td>
<td>171</td>
<td>29%</td>
<td>59%</td>
<td>87%</td>
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</table>

- Sensitivity: 59-95%
- Specificity: 24-87%
Recognition of Mimics

- Stroke 62.37%
- Headache 12.0%
- Seizure 12.6%
- AMS 13.5%
- Other 21.62%
- Hemorrhage 6.18%
- Cardiovascular 9.85%
- Psychiatric 6.93%
- Toxological 4.93%
- Facial Palsy 4.74%
- Malignancy 4.56%
- Syncope 4.20%
- Infectious 3.47%
- Metabolic 2.12%
- Other diagnosis noted but not defined since frequency was less than 10 (less than 0.61%)

2562 Patients with + CPSS
• Designed based on elements of the NIHSS

• Thought to be simpler to assess by field providers than a full NIHSS

• Not currently utilized by EMS providers in Pennsylvania, but elements of the RACE score could be used in consultation to assist the medical command physician in knowing if patient is likely to have large vessel occlusion
RACE Score

Table 1. RACE Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>RACE Score</th>
<th>NIHSS Score Equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial palsy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate to severe</td>
<td>2</td>
<td>2–3</td>
</tr>
<tr>
<td>Arm motor function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal to mild</td>
<td>0</td>
<td>0–1</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Severe</td>
<td>2</td>
<td>3–4</td>
</tr>
<tr>
<td>Leg motor function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal to mild</td>
<td>0</td>
<td>0–1</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Severe</td>
<td>2</td>
<td>3–4</td>
</tr>
<tr>
<td>Head and gaze deviation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Present</td>
<td>1</td>
<td>1–2</td>
</tr>
<tr>
<td>Aphasia* (if right hemiparesis)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performs both tasks correctly</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Performs 1 task correctly</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Performs neither tasks</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Agnosia† (if left hemiparesis)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient recognizes his/her arm and the impairment</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Does not recognized his/her arm or the impairment</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Does not recognize his/her arm nor the impairment</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Score total</td>
<td>0–9</td>
<td></td>
</tr>
</tbody>
</table>

NIHSS, National Institutes of Health Stroke Scale; and RACE, Rapid Arterial Occlusion Evaluation.

* Aphasia: Ask the patient to (1) "close your eyes"; (2) "make a fist" and evaluate if the patient obeys.

† Agnosia: Ask the patient: (1) while showing him/her the paretic arm: "Whose arm is this" and evaluate if the patient recognizes his own arm. (2) "Can you lift both arms and clap" and evaluate if the patient recognizes his functional impairment.
RACE Score

- Score ≥5
  - Sens: 85%
  - Spec: 65%
  for LVO

Figure 1. Sensitivity (squares) and specificity (circles) of different cutoff values of the Rapid Arterial Occlusion Evaluation (RACE) scale for the detection of large vessel occlusion.
Large Vessel Occlusion

• Suspected in patients with either of the following:
  – NIH Stroke Scale of $\geq 8$
  – RACE Score $\geq 5$

  *Based on consensus of the UPMC group and existing literature

• Other stroke scales under review and consideration
  – CPSSS
  – LAMS
  – sNIHSS-8
  – sNIHSS-5
How do we recognize Large Vessel Occlusion in the Field

- RACE
- NIHSS
- Tele-Medicine
- Stoke Specialty Vehicle
Regionalization

- Last seen well <3hrs still goes to closest PSP?
- Patients >3hrs go to CSC?
- LVO’s go to CSC regardless of LSW?
- Reverse Triage of TIAs and Small Vessel Ischemic Stroke to PSC
Updated Stroke Triage recommendations in Southwestern PA (EMSI Region – SW PA)

• If patient can arrive within 3 hours of symptom onset → transport to closest PSC (consistent with state protocol)
  – Can decide from there if IA eligible after tPA treatment, based on telemedicine consult with tertiary center Neurologist
• If not → EMS should call medical command to discuss destination
• Medical command should direct patient to an interventional stroke center if:
  – Pt can arrive at the ISC within 12 hours of symptoms onset
  – Pt has a suspected large vessel occlusion (LVO)
• Large vessel occlusion suspected if:
  – NIHSS ≥8
  – RACE ≥5
Drip and Ship Thrombolytic Therapy for Acute Ischemic Stroke
Use, Temporal Trends, and Outcomes

Kevin N. Sheth, MD; Eric E. Smith, MD, MPH; Maria V. Grau-Sepulveda, MD, MPH; Dawn Kleindorfer, MD; Gregg C. Fonarow, MD; Lee H. Schwamm, MD

(Stroke. 2015;46:732-739.)

- Administering tPA and transferring to Tertiary Care

Table 2. Unadjusted Absolute Differences in Outcomes in Patients With Ischemic Stroke by tPA Treatment Paradigm

<table>
<thead>
<tr>
<th>Clinical Outcome</th>
<th>Front-Door Patients, n=34192</th>
<th>Drip and Ship Patients, n=10475</th>
<th>Absolute Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital mortality</td>
<td>9.67</td>
<td>10.93</td>
<td>1.26</td>
<td>0.0002</td>
</tr>
<tr>
<td>Symptomatic intracranial hemorrhage</td>
<td>5.22</td>
<td>5.79</td>
<td>0.57</td>
<td>0.001</td>
</tr>
<tr>
<td>Life threatening systemic bleeding</td>
<td>1.28</td>
<td>1.29</td>
<td>0.01</td>
<td>0.60</td>
</tr>
<tr>
<td>Other serious tPA–related complications</td>
<td>1.62</td>
<td>1.83</td>
<td>0.21</td>
<td>0.04</td>
</tr>
<tr>
<td>Independent ambulation at discharge</td>
<td>38.81</td>
<td>38.37</td>
<td>-0.44</td>
<td>0.002</td>
</tr>
<tr>
<td>Discharge destination home</td>
<td>40.33</td>
<td>40.59</td>
<td>0.26</td>
<td>0.66</td>
</tr>
<tr>
<td>Length of stay, d, mean (SD)</td>
<td>6.90 (7.11)</td>
<td>6.88 (7.57)</td>
<td>-0.02</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

tPA indicates tissue-type plasminogen activator.
Transfer Delay Is a Major Factor Limiting the Use of Intra-Arterial Treatment in Acute Ischemic Stroke

Shyam Prabhakaran, MD, MS; Edward Ward, MD, MPH; Sayona John, MD; Demetrius K. Lopes, MD; Michael Chen, MD; Richard E. Temes, MD, MS; Yousef Mohammad, MD, MS; Vivien H. Lee, MD; Thomas P. Bleck, MD

Background and Purpose—The development of comprehensive stroke centers within hub-and-spoke stroke networks offers the opportunity to increase the proportion of acute ischemic stroke patients treated with intra-arterial therapies (IAT). Interhospital transfer delays will be critical in evaluating the success of this strategy.

Methods—We collected data on consecutive patients who were transferred to our institution for possible IAT. We defined transfer time as time elapsed from initial transfer call to arrival at our hospital and assessed whether transfer time was a predictor of emergent treatments or medical care at the referring hospital.

Results—Of 81 patients, median age 64 years, median National Institutes of Health Stroke Scale score 18, 55% male, the remaining 79 (97.5%) patients were included in analysis. The hospital-to-hospital distance was 14.7 miles (interquartile range, 8.5–21.3 miles) and median transfer time was 104 minutes (interquartile range, 83–115 minutes).

T1-weighted magnetic resonance imaging was obtained at the referring hospital in 74 patients (94.9%). The median transfer time was 100.6 minutes versus 149.3 minutes (OR, 0.975; 95% CI, 0.956–0.995; P=0.014). The odds of treatment decrease by 2.5% for every minute of transfer time.

Conclusions—Delay in hospital-to-hospital transfer is a common reason that acute ischemic stroke patients are excluded from interventional therapy. The likelihood of receiving IAT decreases rapidly by increasing transfer time. Specific goals for transfer time should be considered in future quality standards for hub-and-spoke–organized stroke networks. (Stroke. 2011; 42:1626-1630.)

Key Words: comprehensive stroke center ■ health care access ■ medical transportation ■ revascularization ■ stroke systems
Prehospital Telemedicine Systems

Call from EMS Crew

Video or Telephonic Consult

Transmission of data to receiving teams

CPSS + RACE

Stroke Alert

Access to Stroke Neurologist Consultation

Activation of the Angiography Suite

UPMC Command Center

UPMC Command MD
Stroke Trucks

- Reduce time to CT, time to MD, and time to Drug
- Make tPA within 60 possible
- Very limited range (3-4 miles)
- Over $1 M unit for a relatively rare EMS call
- Recent CCF data demonstrated that they examined over 700 patients to admit <200 and identify 5 LVOs

www.uth.edu
• 5 new randomized controlled trials have identified a substantial treatment benefit of intra-arterial therapies for a select group of stroke patients with LVO, selected based on neuroimaging

• Possible Recommendations:
  – Stroke and can arrive in <3 hours → Closest Primary Stroke Center
  – If 3-12 hours and evidence of LVO → Interventional Stroke Center
  – Suspected stroke of any duration and not likely to have LVO → Closest Primary Stroke Center
  – Signs of LVO:
    • NIHSS ≥8*
    • RACE Score ≥5 (can be determined in consultation)
Next Steps in Advancing Early Stroke Care

• Ongoing research and quality improvement projects at UPMC and elsewhere on:
  – Prehospital stroke scales
  – Timing of stroke interventions
  – Regionalized care for stroke

• Statewide committee from AHA and DOH
  – Ongoing review of literature
  – Determine best practices for Pennsylvania
  – Identify how/when to update statewide EMS protocols

• Continued education and emphasis on optimal care for suspected stroke patients in Pennsylvania
Summary: Prehospital Triage for Suspected Stroke

• 5 new randomized controlled trials have identified a substantial treatment benefit of intra-arterial therapies for a select stroke patients
• We need new guidelines for prehospital stroke triage in PA
• Regional recommendations for Southwestern PA:
  – Stroke and can arrive in <3 hours → Closest Primary Stroke Center
  – If 3-12 hours and evidence of LVO → Interventional Stroke Center
  – Suspected stroke of any duration and not likely to have LVO → Closest Primary Stroke Center
  – Signs of LVO:
    • NIHSS ≥8
    • RACE Score ≥5
• Interventional stroke centers are: Presby, Mercy, and AGH
We should be familiar with stroke scales that can identify the severity of stroke.

Vascular studies are important but should not delay administration of IV r-tPA. Which study should be determined in collaboration with Neurology.

Primary Stroke Centers should have protocols that facilitate the rapid transfer of patients with large vessel occlusion.

Interventional stroke centers should have protocols to expedite the evaluation and treatment of patients who are candidates for endovascular therapy.
Example Case 1

• 52 yo male with onset of left-sided arm and leg weakness & aphasia 1 hour ago

• 15 min to primary stroke center or 30 minutes to interventional stroke center

• Key findings:
  – Stroke-like symptoms
  – Anticipated arrival < 3 hours from onset of symptoms

• Recommendation: Transport to closest Primary Stroke Center
Example Case 2

• 52 yo male with onset of left arm and leg weakness and facial palsy 4 hrs ago
  – 15 min to primary stroke center or 30 minutes to interventional stroke center
  – On questioning: Patient unable to move arm or leg against gravity

• Key Findings:
  – RACE score at least 5 by these Sx
  – Arrival at receiving center in 3-12 hour window

• Recommendation: Transport to closest Interventional Stroke Center
Example Case 3

- 52 yo male with onset of left arm numbness and facial palsy 4 hrs ago
  - 15 min to primary stroke center or 30 minutes to interventional stroke center
  - On questioning: No weakness, aphasia, agnosia, gaze deviation or other symptoms

- Key Findings:
  - Time to arrival >3 hours
  - RACE score <5
  - Unlikely to be LVO

- Recommendation: Transport to closest Primary Stroke Center
Example Case 4

• For a patient that is within 3 hours and has a suspected large vessel occlusion…

• Wouldn’t it be better to go 15 minutes farther and be able to get IV r-tPA and an endovascular procedure?
  – Time is brain!

• This is where we need more research
  – Impact of time on endovascular therapy versus IV r-tPA
  – Implementation of regionalized systems of care
  – Impact of changes in patient triage and treatment protocols
Thanks to the UPMC Stroke Institute, Prehospital Care, and Department of Emergency Medicine

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