Streamlining Interfacility Transfer of Stroke Patients

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Associate Medical Director
STAT MedEvac & UPMC Prehospital Care
Time is Brain
Advances in Endovascular Stroke Care

• 5 randomized controlled trials published since January 2015
  – 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 thrombolytics if within window prior to intra-arterial therapy

• Studies:
  – MR CLEAN
  – ESCAPE
  – EXTEND-IA
  – REVASCAT
  – SWIFT PRIME
Treatment Goals for Stroke Patients

Thrombolysis
- tPA Eligible
- Not tPA Eligible

Endovascular Therapy
- IA Eligible
- Not IA Eligible
Primary versus Comprehensive Stroke Centers

American Heart Association
American Stroke Association
CERTIFIED
Meets standards for
Primary Stroke Center

American Heart Association
American Stroke Association
CERTIFICATION
Meets standards for
Comprehensive Stroke Center
# Modified RACE Score

## Rapid Arterial Occlusion Evaluation

<table>
<thead>
<tr>
<th>EMS Service:</th>
<th>Patient Name:</th>
<th>DOB: / /</th>
<th>Date of Exam: / /</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS Unit:</td>
<td>Symptom Onset Date: / /</td>
<td>Time: /</td>
<td>Onset witnessed by:</td>
<td></td>
</tr>
</tbody>
</table>

### Speech*
Ask patient to repeat the phrase: "The sky is blue in Pennsylvania"
- No numerical value
- □ Normal Speech
- □ Abnormal Speech

### Facial Palsy*
Ask patient to smile and show their teeth
- Absent (no facial movement)
- Mild (some facial movement)
- Moderate to severe (little to no facial movement)

### Arm Motor Function*
Ask patient to raise both arms, palms up, for 10 seconds
- Normal (no drift to mild drift)
- Moderate (able to lift arm but unable to hold for 10 secs)
- Severe (unable to lift either arm against gravity)

### Leg Motor Function
Ask patient to raise each leg, one at a time, and hold for 5 seconds
- Normal (no drift to mild drift)
- Moderate (able to lift leg, unable to hold for 5 secs)
- Severe (unable to lift either leg against gravity)

### Head & Gaze Deviation
Ask patient to move their eyes horizontally by tracking your finger and assess gaze deviation
- Absent (moves both eyes to track finger)
- Present (fixed or unable to shift gaze past midline)

### Aphasia
Ask patient to follow 2 commands:
1. Close your eyes
2. Make a fist (on unaffected side)
- Performs both tasks correctly
- Performs 1 task correctly
- Performs neither task correctly

### Agnosia
Determine if patient recognizes deficit:
1. Ask the patient (while pointing at affected arm): "Whose arm is this?"
2. Ask the patient to clap their hands
- Recognizes arm & claps or recognizes inability to clap
- Cannot perform one of the tasks
- Cannot perform either task

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**If total score ≥5 and time from last known well to arrival at the closest Primary Stroke Center will be >3 hours, contact Medical Command for consideration of transport to a facility capable of performing endovascular interventions.**

**Total:**

<table>
<thead>
<tr>
<th>Patient’s Next of Kin:</th>
<th>Relationship:</th>
<th>Phone Number:</th>
</tr>
</thead>
</table>

Has the patient taken any direct thrombin inhibitors within last 48 hours? Yes [ ] No [ ]

Some examples include: Coumadin (Warfarin), Pradaxa, Xarelto, Eliquis.

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*Any abnormal finding in speech, facial palsy, or arm motor function is a positive finding for the Cincinnati Prehospital Stroke Screen.*

*A RACE score ≥ 5 is a strong indication of a large vessel occlusion (LVO). Treatment with tPA alone is not as effective as tPA and endovascular treatment.*
Updated Stroke Triage Protocol in Pennsylvania

**Is acute stroke suspected by Cincinnati Prehospital Stroke Scale** [5,6] (CPSS)?

- **Face** - facial droop present,
  
  **OR**

- **Arm** - upper extremity arm drift present (arms extended/palms up),
  
  **OR**

- **Speech** - inability to say, “The sky is blue in Pennsylvania” normally,
  
  **AND**

- **Time** - time since last known well < 12 hours [7]

Exclude patient if another history of a stroke within last 3 months, **OR** Major surgery within last 14 days.

**YES, ≤ 3 hours since last seen well**

- Package Patient ASAP [8]
  
  - Check Glucometer [9]
    
    - Transport to closest certified Primary Stroke Center (preferred), Comprehensive Stroke Center (preferred), or Acute Stroke Ready Hospital, if possible [10,11]
    
    - Transport in supine position [12]
    
    - Notify Receiving Facility ASAP
      
      - Initiate IV NSS [13]
        
        - Consider Drawing Bloods [13]
          
          - Assess RACE Score (Optional) [15]
            
            - Large Vessel Strokes may benefit from care at Comprehensive Stroke Center or Primary Stroke Center that is capable of endovascular treatment

**YES, 3-12 hours since last seen well AND RACE Scale (optional) > 5**

- Check Glucometer [9]
  
  - Initiate IV NSS [12]
    
    - Consider Drawing Bloods [13]
      
      - Assess RACE Score (Optional) [15]
        
        - Contact Medical Command [14]
          
          - Transport in supine position [12]

**NO**

- Initiate IV NSS
  
  - Check Glucometer [9]
    
    - Consider Drawing Bloods [14]
      
      - Assess RACE Score (Optional) [15]
        
        - Contact Medical Command [15]
          
          - Contact Medical Command [16]
            
            - for Destination

UPMC LIFE CHANGING MEDICINE
Treatment Goals for Stroke Patients

Thrombolysis

- tPA Eligible
- Not tPA Eligible

Endovascular Therapy

- IA Eligible
- Not IA Eligible
Interfacility Stroke Transfer

The Status Quo
## tPA and IA Eligible Patient Transfer

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Interval</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS Arrival</td>
<td>17:00</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>ED Arrival</td>
<td>17:25</td>
<td>0 min</td>
<td>10 minutes (Time to CT)</td>
</tr>
<tr>
<td>CT Scan</td>
<td>17:35</td>
<td>10 min</td>
<td></td>
</tr>
<tr>
<td>Telestroke</td>
<td>17:50</td>
<td>25 min</td>
<td></td>
</tr>
<tr>
<td>tPA Administration</td>
<td>18:15</td>
<td>50 min</td>
<td>50 min (Arrival to tPA)</td>
</tr>
<tr>
<td>Decision to Transfer</td>
<td>18:20</td>
<td>55 min</td>
<td></td>
</tr>
<tr>
<td>Call Transport Unit</td>
<td>18:25</td>
<td>60 min</td>
<td>35 minutes (Dispatch &amp; Arrival of Transport Unit)</td>
</tr>
<tr>
<td>Transport Unit Arrival</td>
<td>19:00</td>
<td>95 min</td>
<td></td>
</tr>
<tr>
<td>Leave Referring ED</td>
<td>19:15</td>
<td>110 min</td>
<td>15 minutes (Bedside Time)</td>
</tr>
<tr>
<td>Arrive CSC</td>
<td>20:50</td>
<td>145 min</td>
<td>35 minutes (Transport Time)</td>
</tr>
<tr>
<td>CTA Scan</td>
<td>21:00</td>
<td>155 min</td>
<td>10 minutes (Time to CT)</td>
</tr>
<tr>
<td>Endovascular Suite</td>
<td>20:30</td>
<td>175 min</td>
<td></td>
</tr>
<tr>
<td>Endovascular Procedure</td>
<td>20:50</td>
<td>195 min</td>
<td>60 minutes (Door to IA)</td>
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Taking A Lesson From the STEMI Playbook
2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Emergency Physicians and Society for Cardiovascular Angiography and Interventions

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MISSION: LIFELINE®
Not Just for STEMI Anymore

120 min
As a first responder/prehospital provider, you play a critical role. Click here to learn how you can participate in Mission: Lifeline.

You are a vital link in the lifeline. Click here to discover the benefits you can experience as a non-24/7 PCI center.
• 2013: Time to reperfusion for STEMI patients undergoing interhospital transfer for primary PCI suboptimal

<table>
<thead>
<tr>
<th>Median Time FMC to PPCI (Min)</th>
<th>PA</th>
<th>US</th>
<th>Goal</th>
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<tbody>
<tr>
<td>Overall</td>
<td>85.0</td>
<td>85.0</td>
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<tr>
<td>Non-Transfer</td>
<td>82.0</td>
<td>82.0</td>
<td>90</td>
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<tr>
<td>Transfer In</td>
<td>138.5</td>
<td>138</td>
<td>120</td>
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<table>
<thead>
<tr>
<th>Median LOS at Referral Facility (Min)</th>
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<th>US</th>
<th>Goal</th>
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<tr>
<td></td>
<td>54.0</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Event</td>
<td>Time</td>
<td>Clock</td>
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<td></td>
</tr>
<tr>
<td>Patient Arrival</td>
<td>18:00</td>
<td>0 min</td>
<td></td>
</tr>
<tr>
<td>EKG</td>
<td>18:08</td>
<td>8 min</td>
<td></td>
</tr>
<tr>
<td>MD Evaluation</td>
<td>18:10</td>
<td>10 min</td>
<td></td>
</tr>
<tr>
<td>MD Orders</td>
<td>18:25</td>
<td>20 min</td>
<td></td>
</tr>
<tr>
<td>MD Call to Receiving</td>
<td>18:30</td>
<td>25 min</td>
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<tr>
<td>Cardiologist Call</td>
<td>18:35</td>
<td>35 min</td>
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<tr>
<td>Call for Transport Unit</td>
<td>18:40</td>
<td>40 min</td>
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<tr>
<td>Arrival Transport Unit</td>
<td>19:15</td>
<td>75 min</td>
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<tr>
<td>Leave Referring</td>
<td>19:25</td>
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<tr>
<td>Arrive Receiving</td>
<td>19:55</td>
<td>115 min</td>
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<tr>
<td>Arrival at cath lab</td>
<td>20:05</td>
<td>125 min</td>
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<tr>
<td>Balloon Time</td>
<td>20:35</td>
<td>155 min</td>
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</table>

**Door In Door Out Time** (85 minutes)

**Transport** (30 minutes)

**Door to Balloon** (40 minutes)

**TOTAL TIME** 155 minutes
The Problem: Serial Processing of Interhospital STEMI Transfers

1. **Patient Arrives**
2. **12-Lead EKG**
3. **MD EKG Review**
4. **Patient Evaluation**
5. **Call to Receiving Hospital**
6. **Discuss with Cardiologist / Hospitalist**
7. **Dispatch Transport Unit**
8. **Transport Arrival**
9. **Transport**
3 Key Interventions for improving transfer time

• Parallel processing
  – Dispatch of transport unit immediately after identifying STEMI

• Automatic acceptance to receiving facility
  – Transport unit arrives while assessment is completed and transfer coordination is completed

• Optimizing mode of transport, considering:
  – Availability of transport units
  – Distance to referring hospital
  – Distance between hospitals
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</tr>
<tr>
<td>Call for Transport Unit</td>
<td>18:08</td>
<td>8 min</td>
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<tr>
<td>MD Evaluation</td>
<td>18:08</td>
<td>8 min</td>
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<td>18:18</td>
<td>18 min</td>
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</tr>
<tr>
<td>Leave Referring</td>
<td>18:50</td>
<td>50 min</td>
</tr>
<tr>
<td>Arrive Receiving</td>
<td>19:20</td>
<td>80 min</td>
</tr>
<tr>
<td>Arrival at cath lab</td>
<td>19:25</td>
<td>85 min</td>
</tr>
<tr>
<td>Balloon Time</td>
<td>19:55</td>
<td>115 min</td>
</tr>
<tr>
<td>TOTAL TIME</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Door In Door Out Time (50 minutes)

Transport (30 minutes)

Door to Balloon (35 minutes)

102 minutes

155 minutes vs 102 minutes
Defining the interventions:

- Triage of CP patients with goal of EKG within 5 min of arrival
- Direct activation of the transfer system by ED physician
- Uniform and simple initial treatment protocol
  - Aspirin
  - Plavix / Brillinta
  - Heparin bolus (no infusion)
  - Nitroglycerin / Fentanyl for pain
- Eliminate drips for ease of transfer
- Assistance with lysis if needed
Managing uncertainty:

- If “STEMI” or “not sure”, activate the transport first BEFORE calling the cath lab team or the cath lab attending
  - Ok to send helicopter away
  - Low incidence of false positives

- Once transport pathway initiated, conference in receiving physicians
  - Almost invariably, conversations occur prior to transport unit arrival
  - Minimizes delay substantially
UPMC Interhospital STEMI Transfer System

UPMC EMS Navigator

Location

GPS Location

Latitude: 40°27'25.3860" N
Longitude: 79°54'58.2915" W

Last Updated: 12/23/11 1:06 PM
Accuracy: 61.0 m

Navigate
Request Helicopter

STATMedEvac

UPMC Life Changing Medicine
Interfacility Stroke Transfer

The Future
<table>
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<td>0 min</td>
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<td>17:30</td>
<td>5 min</td>
</tr>
<tr>
<td>Call Transport Unit</td>
<td>17:35</td>
<td>10 min</td>
</tr>
<tr>
<td>CT / CTA Scan</td>
<td>17:35</td>
<td>10 min</td>
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<td>17:50</td>
<td>25 min</td>
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<td>19:25</td>
<td>120 min</td>
</tr>
</tbody>
</table>

| 3 hours 25 minutes vs 2 hours        |          |                   |
Key Knowledge Transfer: STEMI to Stroke Care

• Parallel processing is the key

• Rapid identification of patient with severe stroke
  – Often need to transfer whether ischemic or hemorrhagic
  – Based on stroke severity scale (e.g. NIHSS vs RACE)

• Rapid activation of transport unit
  – Established process in place
  – Occurs before “acceptance”

• CTA at referring facility

• Transport straight to angio suite at receiving facility