EMS “Best Practices”
For Stroke Care,
Outcome Feedback QA & QI

John Nankervis, Deputy Chief
Shoreline Fire Department / Medic One

Andy McCoy, MD MS
University of Washington Department of Emergency Medicine
Shoreline Medic One Medical Medical Director
Disclosures

- No Financial Conflicts of Interest

- We are not your Medical Director / Deputy Chief
The Shoreline Stroke Experience

- Objectives
  - Understand how we have changed care in our region
  - Understand the latest in prehospital stroke care for patients
  - Weave outcome data and QI activities into decision making for prehospital stroke care
Shoreline Demographics

Part of the King County “tiered” EMS response system. KC is made up of BLS & ALS providers, not always from the same agency.

Shoreline is just north of Seattle, approximately 13 square miles, 65,000 people, 3 fire stations, and 4 operational shifts (120 fulltime employees).

We provide both BLS & ALS services within the City of Shoreline.

Shoreline Medic One provides ALS coverage for three additional fire departments, as well as provide the EMS training, education, and QA/QI activities.
Shoreline Service Area
Shoreline ALS Service Area Challenges

Total annual call volume for Shoreline is around 10,500 alarms, for ALS Service Area 25,000.

- 85% of responses are EMS
- Stroke makes up less than 1% total call volume

In King County, we dispatch BLS & ALS resources separately. Every ALS response also has a BLS crew assigned. (tiered response concept)

- Each agency creates their own patient care report
- Each agency has their own transport policy
A Patient

- 48 y/o M
- HTN, DM
- Awakens 06:00 with right sided hemiparesis, facial droop, and difficulty speaking
- HR 75, BP 160/85, RR 14, SPO2 95%, glucose 104
- Last known well when he went to bed at 2am
Our patient’s journey into the stroke system of care
Activation of 911

- How accurate is dispatch?
- How accurate are EMS providers?
## TABLE 1. Symptoms Described to the Telecommunicator during the 9-1-1 Call for Patients with a Discharge Diagnosis of Stroke or Transient Ischemic Attack and Arriving by Ambulance (n = 104)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Number of Reports (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered mental status</td>
<td>42 (40)</td>
</tr>
<tr>
<td>Trouble walking</td>
<td>33 (32)</td>
</tr>
<tr>
<td>Impaired speech</td>
<td>28 (27)</td>
</tr>
<tr>
<td>Abnormal breathing</td>
<td>28 (27)</td>
</tr>
<tr>
<td>Falling or dizziness</td>
<td>22 (21)</td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>19 (18)</td>
</tr>
<tr>
<td>Facial numbness (including difficulty swallowing)</td>
<td>19 (18)</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Sweatiness or clamminess</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Lethargy</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Headache</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Loss of vision</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Other</td>
<td>21 (20)</td>
</tr>
</tbody>
</table>

*Percentages do not add to 100 because patients could report more than one symptom.*
**Table 2. Accuracy of Stroke Recognition by Emergency Medical Dispatchers and Paramedics in City of San Diego during the year 2005.**

<table>
<thead>
<tr>
<th>Diagnosis of Stroke by Emergency Medical Dispatchers (EMD)</th>
<th>Diagnosis of Stroke by Physicians/Hospital Discharge Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>73</td>
</tr>
<tr>
<td>TOTAL</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>83%*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis of Stroke by Paramedics</th>
<th>Diagnosis of Stroke by Physicians/Hospital Discharge Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>247</td>
</tr>
<tr>
<td>TOTAL</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>44%*</td>
</tr>
</tbody>
</table>

True Positive—Patients with EMD determinant or paramedic assessment of stroke and discharge diagnosis of stroke
False Negative—Patients with EMD determinant or paramedic assessment other than stroke and a discharge diagnosis of stroke
False Positive—Patients with EMD determinant or paramedic assessment of stroke and a discharge diagnosis other than stroke.

*Sensitivity of stroke recognition = True Positive / True Positive + False Negative
* Positive Predictive Value of stroke recognition = True Positive / True Positive + False Positive
* Speci city and Negative Predictive values not calculated in this study.
How does EMS Assess our patient?

When Stroke Strikes, Act F.A.S.T.

**FACE**
Smile.
Does one side of the face droop?

**ARMS**
Raise both arms.
Does one arm drift downward?

**SPEECH**
Repeat a sentence.
Are they able to speak clearly? Can they repeat the sentence?

**TIME**
Time is critical.
Call 911. Get to the hospital immediately. Brain cells are dying. Every Minute Counts!
Stroke Care circa 2014

- Stroke care almost 100% a BLS only activity
  - Seen only by EMTs
  - No ALS involvement unless “unconscious” or chest-pain, etc.
  - No on-scene time parameters, no auto-dispatch of a transport unit
  - Transport – By fire agency @10%, Private Ambulance 90%
  - Treated no differently than any other BLS activity, not-time sensitive

- Occasional formal QA reviews for “bad outcome”
  - (Typically generated from a complaint)

- Sharing of “lessons learned” with others in hopes that the same issues don’t repeat themselves
What has changed?
New way to assess severity

- Large Vessel Occlusion patients deserve different care
  - Transport to endovascular center

- How can we separate them from non-LVO?
# Which Stroke Scale?

## TABLE 1 Characteristics of included studies or scales with their items

<table>
<thead>
<tr>
<th></th>
<th>NHSS-R6</th>
<th>LAMS15</th>
<th>PASS6</th>
<th>PISS13</th>
<th>VAN15</th>
<th>LEGS15</th>
<th>LVOS6</th>
<th>MPSS6</th>
<th>NHSS-EMS20</th>
<th>FAST-ED7</th>
<th>G-FAST29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>retro</td>
<td>retro</td>
<td>retro</td>
<td>prop</td>
<td>prop</td>
<td>prop</td>
<td>prop</td>
<td>prop</td>
<td>retro</td>
<td>prop</td>
<td>prop</td>
</tr>
<tr>
<td>Sample size</td>
<td>300</td>
<td>328</td>
<td>357</td>
<td>848</td>
<td>2151</td>
<td>328</td>
<td>328</td>
<td>531</td>
<td>2112</td>
<td>119</td>
<td>1194</td>
</tr>
<tr>
<td>N of tests</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>1-4</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Mean age</td>
<td>72</td>
<td>73</td>
<td>71</td>
<td>66</td>
<td>66</td>
<td>72</td>
<td>72</td>
<td>66</td>
<td>72</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Mean NIHSS at</td>
<td>7</td>
<td>8</td>
<td>16</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>11</td>
<td>7</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>admission</td>
<td>US</td>
<td>France</td>
<td>Spain</td>
<td>Switzerland</td>
<td>Switzerland</td>
<td>France</td>
<td>France</td>
<td>US</td>
<td>US</td>
<td>US</td>
<td>US</td>
</tr>
<tr>
<td>Item</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Consciousness</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Gaze</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Hemiseglect</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Visual</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Facial palsy</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Motor arm</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Motor leg</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Grip strength</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Ataxia</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Sensory</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Language</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>History stroke</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>NIHSS score</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Gender</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>mRS ≥ 2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Test performer</td>
<td>N</td>
<td>D/P</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

D, Non-Neurologist Doctor; N, Neurologist; P, Paramedics.

*Data referred to Turc et al.12*
Accuracy of Stroke Scales

FIGURE 2  Forest plots for sensitivity of all included scales, applied in prospective (A) or retrospective (B) studies.
## Rapid Arterial Occlusion Evaluation (RACE) Scale

An EMS Assessment Tool for Acute Ischemic Stroke  
(Sensitivity 85%, Specificity 68%)

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Score = 0</th>
<th>Score = 1</th>
<th>Score = 2</th>
<th>Patient Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial Palsy</td>
<td>Absent</td>
<td>Mild</td>
<td>Moderate/Severe</td>
<td></td>
</tr>
<tr>
<td>Arm Motor</td>
<td>Normal/Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td></td>
</tr>
<tr>
<td>Leg Motor</td>
<td>Normal/Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td></td>
</tr>
<tr>
<td>Head/Gaze Deviation</td>
<td>Absent</td>
<td>Present</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Aphasia* (if righthemiparesis)</td>
<td>Performs Both Tasks</td>
<td>Performs 1 Task</td>
<td>Performs Neither Tasks</td>
<td></td>
</tr>
<tr>
<td>Agnosia* (if lefthemiparesis)</td>
<td>Patient Recognizes Arm and Impairment</td>
<td>Unable to Recognize Arm or Impairment</td>
<td>Unable to Recognize BOTH Arm and Impairment</td>
<td>TOTAL SCORE = (0-9)</td>
</tr>
</tbody>
</table>

* *Aphasia: Ask the patient to: 1. “Close your Eyes” AND 2. “Make a Fist”  
* *Agnosia: Ask the patient and evaluate recognition of deficit:  
1. While showing paretic arm: “Whose arm is this?”  
2. Ask patient: “Can you lift both arms and clap?”

If RACE Score = 5 or greater, patient may have an ischemic stroke with a large vessel occlusion

Reference:  
Natalia Pérez de la Ossa, et al. (2014). Design and Validation of a Prehospital Stroke Scale to Predict Large Arterial Occlusion: The Rapid Arterial Occlusion Evaluation Scale. Stroke, 45, 87-91. Retrieved from [http://stroke.ahajournals.org/content/45/1/87.full](http://stroke.ahajournals.org/content/45/1/87.full)
Table 1. The FAST-ED Scale and Its Correspondence to the NIHSS

<table>
<thead>
<tr>
<th>Item</th>
<th>FAST-ED Score</th>
<th>NIHSS Score Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial palsy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal or minor paralysis</td>
<td>0</td>
<td>0–1</td>
</tr>
<tr>
<td>Partial or complete paralysis</td>
<td>1</td>
<td>2–3</td>
</tr>
<tr>
<td>Arm weakness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No drift</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Drift or some effort against gravity</td>
<td>1</td>
<td>1–2</td>
</tr>
<tr>
<td>No effort against gravity or no movement</td>
<td>2</td>
<td>3–4</td>
</tr>
<tr>
<td>Speech changes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mild to moderate</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Severe, global aphasia, or mute</td>
<td>2</td>
<td>2–3</td>
</tr>
<tr>
<td>Eye deviation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Partial</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Forced deviation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Denial/Neglect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Extinction to bilateral simultaneous</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>stimulation in only 1 sensory modality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does not recognize own hand or</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>orients only to one side of the body</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FAST-ED indicates Field Assessment Stroke Triage for Emergency Destination; and NIHSS, National Institutes of Health Stroke Scale.
<table>
<thead>
<tr>
<th>Los Angeles Motor Scale (LAMS)²²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face</strong></td>
</tr>
<tr>
<td>0  Both sides move normally</td>
</tr>
<tr>
<td>1  One side is weak or flaccid</td>
</tr>
<tr>
<td><strong>Arm</strong></td>
</tr>
<tr>
<td>0  Both sides move normally</td>
</tr>
<tr>
<td>1  One side is weak</td>
</tr>
<tr>
<td>2  One side is flaccid/doesn’t move</td>
</tr>
<tr>
<td><strong>Grip</strong></td>
</tr>
<tr>
<td>0  Both sides move normally</td>
</tr>
<tr>
<td>1  One side is weak</td>
</tr>
<tr>
<td>2  One side is flaccid/doesn’t move</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>0–5</td>
</tr>
</tbody>
</table>
Protocol Changes

- Severe stroke (LAMS > 4) and onset within 24 hours
  - ALS call and transport to endovascular center

- LAMS < 4 to closest stroke center

- Change meant paramedics seeing more ischemic strokes
  - Change is uncomfortable!
Back End Changes

- Sometimes things other than clinical care make a huge difference....
- Hospital Feedback – direct and automatic
- Improved QI Processes and Workflows
Stroke QI Case Review
EMS ←→ Harborview

Date Of Service: 11/26/2018
EMS Triage Agency: 
EMS Triage ID #: 
EMS Transporting Agency: Shoreline FD
EMS Transporting ID #: 2018-00009223

Detail Times (minutes)
- Last Seen Normal to EMS Call: -10
- EMS Call to First Vitals: 17
- On Scene Time: 10
- Depart Scene to HMC Door: 16 (Goal < 15 min) 6 Door to CT: 6 (Goal < 15 min)
- Door to IVtPA: N/A (Goal < 45 min)
- Door to Puncture: 67 (Goal < 60 min)
- CT Begin: 11/26/2018 19:09
- LVO: Yes
- tPA Admin: No
- Mech Intervention: Yes, 11/26/2018 20:10
- Revascularization: Yes, 11/26/2018 20:24
- Interv. Success: Yes
- NIH Score: 24
- FAST Documented: Yes
- Medical Hx: Yes
- Medications: Yes
- Family Contact Phone #: No
- Last Known Well: Yes
- FS Glucose: Yes
- Pre-notification/Call Ahead: Yes

Summary Times (minutes)
- Last Seen Normal to HMC Door: 33
- First Vitals to HMC Door: 26
- First Vitals to IVtPA: N/A
- First Vitals to Puncture: 93

Brief Clinical Summary/Outcomes
77 yo F with history of Afib on warfarin, prior stroke, HTN presented with L sided weakness. LAMS 5. NIHSS 24. CT angiogram showed a right MCA occlusion.

Final Diagnosis:
Ischemic Stroke

Treatments or Reasons for Exclusion:
Patient was excluded for tPA because of her use of warfarin at home, but she was taken for thrombectomy.

Early Clinical Outcomes:
Thrombectomy was successful with TICI 3 (full) reperfusion. She regained modest strength in her left lower extremity, but her left upper extremity remains paralyzed. She was discharged to a skilled nursing facility.

Comments on EMS Care:
Thanks for rapid transport to Harborview, overall great care!
Try to remember to get a family contact phone number for urgent consent and medical history issues.
Thanks for documenting the last known well time - your input helps helps us greatly in providing efficient care.
Shoreline ALS LVO Patient #1
ESO HDE (Health Data Exchange)
Quality Assurance Process since ESO and HDE

- Medical Director has full access to entire electronic record, ECG rhythms, 12-lead, including transmission times. Full voice and ECG of event for cardiac arrests as well as elective Intubation events.

- We can now send secure QA feedback through ESO to the EMS provider for timely feedback.

- No longer is only the individual provider reading their report. We can now project it on the “big screen” for all to see! Peer pressure does work!
What data is shared through the HDE?:

Patient Information
- Demographics
- Billing Details

Emergency Department and Hospital Data
- Admit/Discharge Diagnosis
- Dispositions

How we are using the information?:

- Individual crews receive feedback on clinical & transport decisions. Currently, limited to transport unit.

- Our agency is able to view comparisons of EMS provider impressions verses hospital diagnosis, providing “system surveillance”. Especially for Stroke & STEMI.
All documented “Assessment of Stroke” is formally reviewed for 7 performance measures.

- On-Scene time & patient contact noted (2)
- FAST & LAMS Scoring
- Glucose documentation
- Last known well & family contact number documented (2)
- “Stroke alert” notification
- Destination decision based on algorithm
Shoreline QA for all clinical decisions as well as performance measure feedback

The “big 4” receive timely & thorough review for all cases:

- Cardiac Arrest
- STEMI
- Acute Stroke (CVA/TIA)
- ALS Transported Trauma Patients

The remainder of incidents receive “surveillance” to identify these components:

- Review of ALS vs. BLS transport decisions based on ER diagnosis
- Was the initial level of care dispatched appropriately?
- Differences between BLS & ALS provider impressions to ER diagnosis
- Overall system effectiveness and identify any patient safety issues

This is where we use the HDE information as a system
Best Practices for Acute Stroke

“Performance Measures”

- Immediate dispatch of “transport capable” vehicle when dispatcher identifies “less than 6 hours of onset” (Now moving to 24-hours)
- Patient contact identified for all cases (starts the clock)
- Total on scene time less than 15 minutes
- FAST exam completed as well as LAMS scoring
- Glucometry completed
- Documentation of last known well (and symptoms onset if known)
- Minimum 2 sets of vitals
- Triage decision for Stroke Center destination (Primary vs. Comprehensive)
- Stroke alert provided to receiving facility
Future of EMS Stroke Care

- Faster / Easier Notification
- CT capability?
- Stroke-type detector
Pulsara

- App that connects EMS to the care team at the destination hospital (other products are similar Twiage, TrackEMS, etc.)
- Multiple case reports of systems that have seen significant optimization via parallel processing
- Already in use in Seattle at one hospital, in Vancouver, more to come
Pulsara

NEW Pulsara
New STROKE Case, Potential LVO.

Intervention
Suspected LVO?
- Yes
- Change

Interventionalist
- Sarah Burke
- Change

Anesthesiologist
- Not Assigned
- Change

Activate IR Team
- Yes
- No

IR Ready?
- Yes
- No

Activation to IR Ready

Times
- Last Known Well
- Door

Assigned Physicians
- Jack Dayton
- Marc August

EMS
- Bill Richardson - 85M
- Pulsara Health EMS
- 05:40 PM

ETA
- 04:17 PM

Details
- Team
- Contacts

Emergency Department
- Door Time
- 05:30 PM
- 05:36 PM

NIHSS
- 15
- 05:30 PM

NIHSS Timer
- 06:00
- 05:30 PM

Cancel
- Go

Transfer
Top Innovation for 2015?

Top 10 for 2015

#1 Mobile Stroke Treatment Unit
Each year in the United States, nearly 800,000 people suffer a stroke, or a brain attack.

#2 Dengue Vaccine
All it takes is one bite. Dengue is a debilitating virus that’s transmitted to humans by the bite of an Aedes aegypti mosquito that has previously bitten a person infected with the dengue virus.

#3 The New Art of Blood Collection and Diagnosis
With the advent of science, blood became a key diagnostic element. Withdrawn from the body, it was isolated and studied.

#4 PCSK9 Inhibitors for Cholesterol Reduction
Cholesterol, a soft, waxy substance present in cells throughout the body, serves many important functions.
Steps in Establishing the MSU

**Staffing**

**Who is inside?**

- Licensed Vascular Neurologist with an ACLS Certification
- Critical Care/ER trained Registered Nurse with ACLS certification
- Licensed Paramedic with ACLS certification
- Licensed CT radiology technician with BLS certification
- Telemedicine Doc!
Taking Hyperacute TPA to the Patient

- What happens when we treat ischemic stroke VERY early?

- Cost is 1 million to buy, ongoing higher with current staffing models

- Efficacy not yet proven
Other Technology

- Is there another technology that can detect clot vs bleed?

- Stroke Finder MD100
A Patient

- 48 y/o Male
- HTN, DM
- 06:00, Awakens with right sided hemiparesis, facial droop, and difficulty speaking
- HR 75, BP 160/85, RR 14, SPO2 95%
- Last known well when he went to bed at 2am
2019

- How does our patient enter the system?

- What is different for the patient? The EMS crew? The hospital?
Summary

- Prehospital Stroke Care has evolved significantly
- Continued change is coming
- All interventions must be evaluated to determine benefits to the patient and risks/costs to the system
- There is no low hanging fruit, only hard work
Questions?

- John Nankervis
  - jnankervis@shorelinefire.com

- Andy McCoy
  - amccoy@shorelinefire.com
  - @andymcccoymd