Interhospital Transfers of the Acute Stroke Patient
EMS Grand Rounds: February 21, 2018

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PeaceHealth Sacred Heart Medical Center RiverBend
Objectives

• Know the basic pathophysiology of acute stroke subtypes
• Understand the time sensitive nature of acute stroke
• Review inter-hospital transfer guidelines to mediate transport risks
• Explain the new ASA stroke guidelines
• Explore new proposals for triage and stroke systems of care
Stroke Definitions:

- Stroke = Acute disruption of blood flow to the brain leading to focal neurologic deficits

- TIA (transient ischemic attack) = acute disruption of blood flow of the brain leading to focal neurological symptoms last less than 24 hours (MOST CONSIDER TIA when less than ONE HOUR duration)
Acute Stroke
(What do you see?)

• **Deficits:**
  – Unilateral (though not always) weakness
  – Unilateral sensory deficit
  – Visual deficits (blindness, gaze palsy, double)
  – Speech (slurred – a motor dysfunction)
  – Language (aphasia – damage to the brain’s speech center)
  – Ataxia (lack of coordinated movement)
  – Cognitive impairment

• **Like real estate**—Location, Location, Location
Cerebrovascular Disease: Pathogenesis

Hemorrhagic Stroke (17%)

Intracerebral Hemorrhage (59%)

Subarachnoid Hemorrhage (41%)

Clinical Presentation similar to ischemic stroke

Clinical Presentation “WORSE HEADACHE OF MY LIFE”

Ischemic Stroke: 83%
Types of Strokes
Large artery territory

CT scan initially normal
CT scan shows changes after 6 hours
Types of Strokes
(Middle Cerebral Artery – MCA)

- The most common artery occluded in AIS—can be proximal or from carotid circulation.

- Features:
  - Motor/Sensory Deficit: face, arm, leg
  - Speech deficit – dysarthria (slurred speech)
  - Language deficit – if in dominant hemisphere
  - Gaze palsy – eyes directed towards side of AIS
  - Blindness – visual field cut (homonymous hemianopsia)
Lacunar Strokes

- These strokes are ischemic in nature.
  - Occurs in the small penetrating arteries of the brain.
  - Presentation – affects the arm, leg, and face, equal to all areas.
PENUMBRA
(That tissue surrounding the infarct that is salvageable, but at risk.)
Early EMS Notification of Possible Stroke Patient

FAST/Cincinnati Stroke Scale to assess a patient for stroke:

- Facial droop
- Arm drift
- Speech
- Time Sensitive
Percent of stroke cases of advanced notification by EMS for patients transported by EMS from scene.

Data source: AHA Get With the Guidelines.
Aggregate measure from all participating Oregon hospitals.
OREGON 2010-2015
Percentage of Ischemic Stroke Patients Receiving any Reperfusion Therapy

Data source: AHA Get With The Guidelines.
Aggregate measure from all participating Oregon Hospitals, 2015.
RAPID ADVANCEMENT IN STROKE CARE

Symptoms → 911 → EMS → Primary Stroke Center → Imaging

Early NP

Multi-modal imaging → Comp Stroke Center → EMS → IV Lytic

Late NP

Cath Lab → Angiogram → IA Mechanical or Lytic → Stroke Unit
INTERHOSPITAL TRANSFER—
“DRIP AND SHIP”
Rapid Initial Report and Assessment

• Age, name, DOB, pertinent past history
• Neurological deficits (NIHSS if available)
• Last Seen Well (witnessed or non-witness onset)
• IV Access ($\geq 20$ gauge) at least one above the wrist
• VS
• Family contact cell number
ACTIVASE- tPA (1mg/ml)
Ischemic stroke dose- 0.9mg/kg iv
First 10% given as bolus over 1 minute, the remainder over 60 minutes
( maximum dose 90mg)

TPA
TOTAL DOSE: 72 mg
BOLUS DOSE: 7.2 mg
INFUSION DOSE: 64.8 mg
AMOUNT DISGARDED: 28 mg
TPA infusions- Do and Don'ts

• Avoid transferring pumps but if necessary take care to minimize drug loss and minimize infusion interruptions
• When pump alarms to signify infusion complete
• WATCH for the drip chamber to empty, to confirm tPA bag is empty
• Remove tPA bag (or bottle) and hang 50mL normal saline at same rate as tPA.

Note: There is still tPA in the tubing that needs to be infused.
### Table 7. Treatment of AIS: IV Administration of Alteplase

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>HR</th>
<th>BP</th>
<th>RR</th>
<th>SaO2</th>
<th>ETCO2</th>
</tr>
</thead>
</table>

If tPA given, then:
- Vital signs & abbreviated NIHSS every 15 min after tPA infusion x 2 hours then,
- Vital signs & abbreviated NIHSS every 30 min for 6 hours then,
- Vital signs & abbreviated NIHSS every 1 hour x 15 min then every 4 hours

*Keep systolic less than or equal to 180 and diastolic less than or equal to 105*

<table>
<thead>
<tr>
<th>Table</th>
<th>LOC Questions</th>
<th>LOC Comasments</th>
<th>Lh - Left Arm Motor</th>
<th>Rh - Right Arm Motor</th>
<th>Lh - Left Leg Motor</th>
<th>Rh - Right Leg Motor</th>
<th>Left Pupil Size</th>
<th>Right Pupil Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 = Alert, responsive</td>
<td>2 = Not alert, requires stimulation</td>
<td>0 = No drift</td>
<td>0 = No drift</td>
<td>0 = No drift</td>
<td>0 = No drift</td>
<td>0 = Normal</td>
<td>0 = Normal</td>
</tr>
<tr>
<td></td>
<td>1 = Not alert, requires stimulation</td>
<td>1 = Answers one correctly</td>
<td>1 = Difficult before 10 sec</td>
<td>1 = Difficult before 10 sec</td>
<td>1 = Difficult before 10 sec</td>
<td>1 = Difficult before 10 sec</td>
<td>1 = Normal</td>
<td>1 = Normal</td>
</tr>
<tr>
<td></td>
<td>2 = Not alert, requires stimulation</td>
<td>1 = Answers two correctly</td>
<td>1 = No effort against gravity</td>
<td>1 = No effort against gravity</td>
<td>1 = No movement</td>
<td>1 = No movement</td>
<td>0 = Normal</td>
<td>0 = Normal</td>
</tr>
<tr>
<td></td>
<td>3 = Reflex or no response</td>
<td>2 = Perform no task correctly</td>
<td>2 = Difficult to keep upright</td>
<td>2 = Difficult to keep upright</td>
<td>2 = Difficult to keep upright</td>
<td>2 = Difficult to keep upright</td>
<td>0 = Sluggish</td>
<td>0 = Sluggish</td>
</tr>
</tbody>
</table>

**NIHSS Scale Definition / Function**

- **LOC (level of consciousness)**
  - 0 = Alert, responsive
  - 1 = Not alert, requires stimulation
  - 2 = Not alert, requires stimulation
- **LOC Questions**
  - 0 = Answers both correctly
  - 1 = Answers one correctly
  - 2 = Perform no task correctly
- **LOC Comasments**
  - 0 = Performs both tasks correctly
  - 1 = Performs one task correctly
  - 2 = Performs no task correctly
- **Lh - Left Arm Motor**
  - 0 = No drift
  - 1 = Difficult before 10 sec
  - 2 = Difficult to keep upright
- **Rh - Right Arm Motor**
  - 0 = No drift
  - 1 = Difficult before 10 sec
  - 2 = Difficult to keep upright
- **Lh - Left Leg Motor**
  - 0 = No drift
  - 1 = Difficult before 10 sec
  - 2 = Difficult to keep upright
- **Rh - Right Leg Motor**
  - 0 = No drift
  - 1 = Difficult before 10 sec
  - 2 = Difficult to keep upright

**Pupil Reaction**

- Normal
- Sluggish
- Fixed

**Pupil Size**

- Small
- Mid-Position
- Large

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

**Note:** Keep systolic less than or equal to 180 and diastolic less than or equal to 105.

*Infuse 0.9 mg/kg (maximum dose 90 mg) over 60 min, with 10% of the dose given as a bolus over 1 min.*

Admit the patient to an intensive care or stroke unit for monitoring.

If the patient develops severe headache, acute hypertension, nausea, or vomiting or has a worsening neurological examination, discontinue the infusion (if IV alteplase is being administered) and obtain emergency head CT scan.

Measure BP and perform neurological assessments every 15 min during and after IV alteplase infusion for 2 h, then every 30 min for 6 h, then hourly until 24 h after IV alteplase treatment.

Increase the frequency of BP measurements if SBP is >180 mmHg or if DBP is >105 mm Hg; administer antihypertensive medications to maintain BP at or below these levels (Table 5).

Delay placement of nasogastric tubes, indwelling bladder catheters, or intra-arterial pressure catheters if the patient can be safely managed without them.

**< 180/105**
Table 5. Options to Treat Arterial Hypertension in Patients With AIS Who Are Candidates for Acute Reperfusion Therapy*

<table>
<thead>
<tr>
<th>Class IIB, LOE C-E0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient otherwise eligible for acute reperfusion therapy except that BP is &gt;185/110 mm Hg:</td>
</tr>
<tr>
<td>Labetalol 10–20 mg IV over 1–2 min, may repeat 1 time; or</td>
</tr>
<tr>
<td>Nicardipine 5 mg/h IV, titrate up by 2.5 mg/h every 5–15 min, maximum 15 mg/h; when desired BP reached, adjust to maintain proper BP limits; or</td>
</tr>
<tr>
<td>Clevidipine 1–2 mg/h IV, titrate by doubling the dose every 2–5 min until desired BP reached; maximum 21 mg/h</td>
</tr>
<tr>
<td>Other agents (e.g., hydralazine, enalaprilat) may also be considered</td>
</tr>
<tr>
<td>If BP is not maintained ≤185/110 mm Hg, do not administer alteplase</td>
</tr>
<tr>
<td>Management of BP during and after alteplase or other acute reperfusion therapy to maintain BP ≤180/105 mm Hg:</td>
</tr>
<tr>
<td>Monitor BP every 15 min for 2 h from the start of alteplase therapy, then every 30 min for 6 h, and then every hour for 16 h</td>
</tr>
<tr>
<td>If systolic BP &gt;180–230 mm Hg or diastolic BP &gt;105–120 mm Hg:</td>
</tr>
<tr>
<td>Labetalol 10 mg IV followed by continuous IV infusion 2–8 mg/min; or</td>
</tr>
<tr>
<td>Nicardipine 5 mg/h IV, titrate up to desired effect by 2.5 mg/h every 5–15 min, maximum 15 mg/h; or</td>
</tr>
<tr>
<td>Clevidipine 1–2 mg/h IV, titrate by doubling the dose every 2–5 min until desired BP reached; maximum 21 mg/h</td>
</tr>
<tr>
<td>If BP not controlled or diastolic BP &gt;140 mm Hg, consider IV sodium nitroprusside</td>
</tr>
</tbody>
</table>

AIS indicates acute ischemic stroke; BP, blood pressure; IV, intravenous; and LOE, Level of Evidence.
*Different treatment options may be appropriate in patients who have comorbid conditions that may benefit from acute reductions in BP such as acute coronary event, acute heart failure, aortic dissection, or preeclampsia/eclampsia.

Data derived from Jauch et al.¹

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<table>
<thead>
<tr>
<th>3.2. Blood Pressure</th>
<th>COR</th>
<th>LOE</th>
<th>New, Revised, or Unchanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hypotension and hypovolemia should be corrected to maintain systemic perfusion levels necessary to support organ function.</td>
<td>I</td>
<td>C-E0</td>
<td>New recommendation.</td>
</tr>
</tbody>
</table>
Case #1

- 72 year old woman present to her local hospital with aphasia and mild right sided weakness onset 0700.
- In ED, BP 220/110. Head CT was normal. CTA showed a left middle cerebral artery thrombus. She was started on a nicardipine drip to control her BP. IV tpa was started at 0915.
- Upon request, you arrive at 0930 to transfer the patient to the closest endovascular center.
En Route

• VS: BP 110/50  P 100, R 12, sat 100%
• Neuro exam: Awake, alert, calm but globally aphasic (can’t speak or follow commands), but now the right arm is completely paralyzed

Next Step?

• Stop Nicardipine- Allow BP to rise (but not over 180/105)
• Call receiving hospital with changes and await additional instructions
INTERHOSPITAL TRANFER
“DRIP AND SHIP”
Complications En Route

1. Secondary Hemorrhage
2. Allergic reaction
3. BP and/or exam fluctuations
4. Aspiration
Signs of secondary intracranial hemorrhage

1. Sudden Severe headache
2. New onset vomiting
3. Sudden decline in neurological condition
4. Sudden spike in BP

- Secure Airway
- Stop vomiting
- Control BP
- Call Receiving facility
Table 9. Management of Orolingual Angioedema Associated With IV Alteplase Administration for AIS

<table>
<thead>
<tr>
<th>Class</th>
<th>LOE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIb, C-EO</td>
<td></td>
<td>Maintain airway</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endotracheal intubation may not be necessary if edema is limited to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>anterior tongue and lips.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Edema involving larynx, palate, floor of mouth, or oropharynx with rapid</td>
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<tr>
<td></td>
<td></td>
<td>progression (within 30 min) poses higher risk of requiring intubation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Awake fiberoptic intubation is optimal. Nasal-tracheal intubation may be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>required but poses risk of epistaxis post-IV alteplase. Cricothyroidotomy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is rarely needed and also problematic after IV alteplase.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discontinue IV alteplase infusion and hold ACEIs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administer IV methylprednisolone 125 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administer IV diphenhydramine 50 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administer ranitidine 50 mg IV or famotidine 20 mg IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there is further increase in angioedema, administer epinephrine (0.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3 mL subcutaneously or by nebulizer 0.5 mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Icatibant, a selective bradykinin B1 receptor antagonist, 3 mL (30 mg)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>subcutaneously in abdominal area; additional injection of 30 mg may be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>administered at intervals of 6 h not to exceed total of 3 injections in 24 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and plasma-derived C1 esterase inhibitor (20 IU/kg) has been successfully</td>
</tr>
<tr>
<td></td>
<td></td>
<td>used in hereditary angioedema and ACEI-related angioedema</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supportive care</td>
</tr>
</tbody>
</table>

ACEI indicates angiotensin-converting enzyme inhibitor; AIS, acute ischemic stroke; IV, intravenous; and LOE, Level of Evidence.

Sources: Foster-Goldman and McCarthy,159 Borski and Schmidt,160 Lewis,161 Lin et al.162 Correia et al.163 O’Carroll and Aguilar,164 Myslimi et al.165 and Pahs
Prevent Aspiration

NPO

Nothing to eat or drink by mouth, including pills.
Most frequent errors

- NO family contact obtained
- Failure to verify total and remaining dose
- Lost tpa in tubing
- Long tpa interruptions
- Lack of BP checks
- Lack of Neuro checks
- Failure to maintain BP within parameters
- Failure to call ahead with status changes
Case # 2

32 year old previously healthy man presents to her local hospital with sudden severe headache without a history of trauma. Initially his BP is elevated 240/120. Head CT reveals a “head bleed”. He has severe headache but GCS is 14 and he is neurologically intact. He received one dose of Labetolol 20mg iv and his BP drops to 160/80. You are transferring a higher level of care to a hospital 2 hours away
What kind of head bleed?

**Intracerebral hemorrhage (ICH)**
- Focal symptoms, risk for seizure, hydrocephalus or worsening neurological symptoms
- Maintain BP < 150/90, q 5 BP until stable than 15 min

**Subarachnoid hemorrhage (SAH)**
- Usually non-focal, severe headache and meningismus
- Maintain BP < 160/90, q 5 BP until stable then 15 min
- Pain control, low stimulation, avoid Valsalva and vomiting
- Re-bleeding (aneurysm rupture) risk is high with poor outcomes

**Subdural Hematoma or Other traumatic hemorrhage**
- Covered under head trauma guidelines
Classic “Star Pattern” of Subarachnoid Hemorrhage

Aneurysmal bleed
En Route

• VS: BP 175/95 P100
  • ? BP Goal (for SAH <140/90)

• Neuro examination- Sleepy but arouses quickly, is oriented flows commands and moves all 4 extremities

• Then....

• Suddenly he begins vomiting profusely
Emergent stabilization

• ABCs
• Rapid Sequence intubation
• CALL receiving facility with change
  – BP control
  – Vomiting control
  – Seizure Control
  – Mannitol
ELVO ↔ STEMI
Patients with LVO have better outcomes with timely endovascular reperfusion.

- **MR CLEAN**: Onset-groin 260 min, 33% Good Outcome
- **REVASCAT**: Onset-groin 269 min, 44% Good Outcome
- **ESCAPE**: Onset-1st reperfusion 241 min, 53% Good Outcome
- **SWIFT PRIME**: Onset-groin 224 min, 60% Good Outcome
- **EXTEND-IA**: Onset-groin 210 min, 71% Good Outcome

**Endovascular** vs **Control**
- **Endovascular**: 33%, 44%, 53%, 60%, 71%
- **Control**: 19%, 28%, 29%, 36%, 40%
<table>
<thead>
<tr>
<th></th>
<th>DAWN</th>
<th>DEFUSE-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Age Limit</td>
<td>None</td>
<td>90 years</td>
</tr>
<tr>
<td>NIHSS</td>
<td>10+</td>
<td>6+</td>
</tr>
<tr>
<td>Pre-Stroke Disability</td>
<td>mRS 0-1</td>
<td>mRS 0-2</td>
</tr>
<tr>
<td>Time</td>
<td>6 to 24 hours</td>
<td>6 to 16 hours</td>
</tr>
<tr>
<td>Advanced Imaging</td>
<td>Core</td>
<td>Core and Penumbra</td>
</tr>
<tr>
<td>Selection</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CIM (Clinical Imaging</strong></td>
<td>≥ 80 years old if</td>
<td><strong>TMM (Target Mismatch)</strong></td>
</tr>
<tr>
<td><strong>Mismatch)</strong></td>
<td>core ≤20 cc</td>
<td>Core &lt;70 ml</td>
</tr>
<tr>
<td>≥ 80 years old:</td>
<td></td>
<td>Mismatch ≥1.8</td>
</tr>
<tr>
<td></td>
<td>&lt; 80 years old:</td>
<td>Mismatch volume ≥15 ml</td>
</tr>
<tr>
<td></td>
<td>• NIHSS 10-19: ≤30 cc core</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• NIHSS ≥20: 31-50 cc</td>
<td></td>
</tr>
</tbody>
</table>
Results: Primary Outcome

### Score on Modified Rankin Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Endovascular (n=92)</th>
<th>Medical (n=90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>26</td>
</tr>
</tbody>
</table>

### Odds Ratio

- Odds ratio: 2.8 (1.6 - 4.7)  P<0.0001
- Adjusted odds ratio: 3.4 (2.0 - 5.8)  P=0.0004
- Number needed to treat: 2
AHA/ASA Guideline

2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons

Endorsed by the Society for Academic Emergency Medicine

3.7. Mechanical Thrombectomy (Continued)

<table>
<thead>
<tr>
<th>7. In selected patients with AIS within 6-24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended.</th>
<th>COR</th>
<th>LOE</th>
<th>New, Revised, or Unchanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A</td>
<td>New recommendation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended.</th>
<th>COR</th>
<th>LOE</th>
<th>New, Revised, or Unchanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIa</td>
<td>B-R</td>
<td>New recommendation.</td>
<td></td>
</tr>
</tbody>
</table>
Renewed Focus on Work Flow

- Faster times
- Careful selection
- Better studies
- Innovative devices

Improved Outcome
US Stroke Centers and Endovascular Treatment Centers

- 1645 stroke centers
  - 1068: non-EVT
  - **577: EVT** capable
- 2016 Medicare updates volumes now indicate 797

- Ground access:
  - 30 minutes: 137 million/44%
  - 60 minutes: 195 million/63%
  - 90 minutes: 234 million/76%

- Air access:
  - 30 minutes: 172 million/56%
  - 60 minutes: 268 million/87%
  - 90 minutes: 296 million/96%
Oregon Hospitals

Endovascular Treatment Centers

**Portland Metro**
- Kaiser Sunnyside
- Legacy Emanuel
- Legacy Meridian Park
- OHSU
- PeaceHealth SW - Vancouver WA
- Providence Portland
- Providence St Vincent

**Central and Southern Oregon**
- PeaceHealth Riverbend - Springfield
- Providence Medford
- St Charles - Bend
Average time intervals of patients LKW< 6 hours EMS arrival

Transported first to...

To closest non-CSC
- LKW at EMS assessment: 186 min
- Imaging to IV-PA: 14 min
- Door to Imaging: 18 min
- Transfer Delay: 23 min
- CSC Door to CTA: 110 min
- Transfer to CSC: 34 min
- Imaging to IA: 15 min
- LKW to IA: 68 min
- Total: 349 min (5.8 hrs)

Direct to CSC
- LKW at EMS assessment: 195 min
- Imaging to IV-PA: 21 min
- Door to Imaging: 29 min
- IV-PA to IA: 12 min
- LKW to IA: 92 min
- Total: 468 min (7.8 hrs)

STROKE SEVERITY SCALES

- RAPID ARTERIAL OCCLUSION EVALUATION [RACE]
- LOS ANGELES MOTOR SCALE [LAMS]
- FIELD ASSESSMENT STROKE TRIAGE FOR EMERGENCY DESTINATION [FAST-ED]
- PREHOSPITAL ACUTE STROKE SEVERITY SCALE [PASS], AND
- CINCINNATI PREHOSPITAL STROKE SEVERITY SCALE [CPSII] = CSTAT
- MARIA PREHOSPITAL STROKE SCALE (MPPS)
- RECOGNITION OF STROKE IN THE EMERGENCY ROOM (ROSIER)
- 3-ITEM STROKE SCALE (3I-SS)
- VAN
- SHORTENED VERSIONS OF THE NIHSS (SNIHSS-1, SNIHSS-5, AND SNIHSS-8)
- G-FAST

At this time, there is insufficient evidence to recommend one scale over the other, or a specific threshold of additional travel time for which bypass of a PSC or ASRH is justifiable.

ISC 2018 AHA/ASA Systems of Care Guideline Presentation
What is an ELVO?
EMERGENT LARGE ARTERY OCCLUSION
Cortical Findings

- Aphasia
- Neglect
- Visual field cut
- Gaze palsy
**C-STAT – CINCINNATI STROKE TRIAGE ASSESSMENT TOOL**

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gaze Preference</strong> – Deviation of eyes away from side of weakness, toward side of stroke.</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td>Present</td>
<td>2</td>
</tr>
<tr>
<td><strong>Arm Weakness</strong> – Cannot hold up arm(s) for 10 seconds</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td>Present</td>
<td>1</td>
</tr>
<tr>
<td><strong>Level of Consciousness</strong> – Incorrectly answers at least one of two LOC questions AND does not follow at least one of two commands.</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td>Present</td>
<td>1</td>
</tr>
</tbody>
</table>

***** POSITIVE C-STAT SCORE IS ≥ 2 *****

**Thrombo-embolic Lesion of The Right Middle Cerebral Artery**

- Lesion of the right hemisphere
- Eye deviation towards the lesion
- Symptoms & signs:
  - Conjugated eye deviation
  - Left sided hemiplegia
  - Unconsciousness
WHY NOT JUST TRANSFER ALL STROKES TO ENDOVASCULAR TREATMENT CENTER?

- Iv tpa remains the mainstay for most ischemic strokes
- LVO make up ~10% of all acute stroke
- Many tertiary stroke center have capacity issues
- Our ability to predict LVO using in-the-field scales is limited
- Long transport times could exclude some patient from getting iv tpa

ANSWER?

DEVELOP LOCAL AND REGIONAL TRIAGE PROTOCOLS
# PORTLAND METRO

**PPSS - PORTLAND PREHOSPITAL STROKE SCREEN**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age over 45 years</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2. No prior history of seizure disorder</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>3. New onset of neurologic symptoms in last 24 hours</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>4. Patient was ambulatory at baseline (prior to event)</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>5. CBG between 60 &amp; 400</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**Neurological examination**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Normal</th>
<th>Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACIAL SMILE/GRIMACE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARM DRIFT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAND GRIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEECH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **ARM DRIFT** (patient closes eyes and holds both arms out palms up)
  - **Normal**: both arms move the same or do not move at all
  - **Abnormal**: one arm does not move or drifts down compared to other

- **HAND GRIP** (have patient squeeze both hands simultaneously)
  - **Normal**: equal grip strength
  - **Abnormal**: unequal grip strength

- **SPEECH** (have patient repeat "You can't teach an old dog new tricks")
  - **Normal**: no difficulty in repeating
  - **Abnormal**: patient has difficulty finding words, speaks in long meaningless sentences, and/or cannot understand or follow simple verbal instructions

If questions 1 – 5 are all answered “Yes” or “Unknown” and at least 1 of the 4 neurological examination findings are abnormal the patient is considered to have a **POSITIVE** screen. **Continue to C-STAT evaluation.**

**Treatment:**

A. Start Oxygen per *Airway Management* protocol.
B. Monitor vital signs and oxygen saturation.
C. Check CBG and treat per *Altered Mental Status and Coma* protocol.
D. Complete Portland Prehospital Stroke Screen.
E. If PPSS is positive, perform C-STAT evaluation.
F. If PPSS and C-STAT is positive, transport to nearest Intervention Stroke Center if it does NOT add more than 20 minutes of transport time. If the difference is greater than 20 minutes, transport to nearest Primary Stroke Center.
G. If PPSS is positive and C-STAT is negative, transport to nearest Primary Stroke Center.
H. Establish IV access (16-18 gauge in proximal site if possible).
I. Transport patient in supine position with < 15 degree head elevation if tolerated.
J. Document serial neurologic examinations.

**C-STAT – CINCINNATI STROKE TRIAGE ASSESSMENT TOOL**

<table>
<thead>
<tr>
<th>Points</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GAZE: Condition where both eyes move differently to each other.</td>
</tr>
<tr>
<td>2</td>
<td>ARM WEAKNESS: Cannot hold up arm(s) for 10 seconds.</td>
</tr>
<tr>
<td>0</td>
<td>LEVEL OF CONSCIOUSNESS: Incorrectly answers at least one of two LOC questions AND does not follow at least one of two commands.</td>
</tr>
<tr>
<td>1</td>
<td>ARM WEAKNESS: Cannot hold up arm(s) for 10 seconds.</td>
</tr>
</tbody>
</table>

***C-STAT positive is defined as a score ≥ 2***

**Specific Precautions:**

A. Do not treat hypertension or administer aspirin.
B. Acute interventions, if indicated, generally must begin within 4.5 hours of symptom onset. All potential stroke patients should go to an appropriate stroke center.
13:10  79 y/o healthy woman while walking with her husband had a witnessed collapsed with left hemiplegia and rightward gaze deviation
1311  911 activated
1318  EMS arrives – Primary survey and VS ok
Cincinnati stroke scale is positive

? CSTAT

? Where to transport
CASE # 3

WILL PATIENT ARRIVE at EVT center within 2 hours from LSW?

13:24 Medical air transport contacted
13:25 Patient loaded in ambulance and began driving to rendezvous location (high school football field)
13:47 Rendezvoused with helicopter
1404 Lift-off
14:25 Helipad Arrival at EVT center ED
14:34 ED arrival
  NIHSS 19
  Cortical signs:
    Right-sided eye deviation
    Left-sided hemiplegia
    Neglect
    Left-sided visual field cut
1442 CT: Hyperdense MCA
1443 CT Angiography: Right ICA/MCA occlusion
14:57 IV tPA (Door to Needle: 23 minutes; Onset to Needle Time 1 hour 47 minutes)
14:49 ELVO Alert initiated
Case # 3

• 15:08 Cath Lab arrival
• 15:10 Groin puncture (door to groin: 36 minutes)
• Right ICA terminus occlusion

• Second pass revascularization 1536
Case # 3

- LSW to revascularization (2 hours and 26 minutes)

Discharged home day 3 with mild residual neglect
Acute ischemic strokes patient who are C-STAT positive and up to 24 hours from LSW should be treated as a Code 3.

All C-STAT positive patients should receive IV tPA if eligible.
ACUTE STROKE CHAIN OF SURVIVAL

1. Patient has sudden stroke symptoms
2. 911 dispatch
3. EMS transport
4. Stroke Ready Hospital
5. ED assess
6. Head CT
7. Iv tpa initiated
8. Transport to EVT Center
9. CTA/CTP
10. To Cath lab Mechanical thrombectomy

Time:
- 1 hr
- 2 hrs
- 3 hrs

Poor communication, inefficiencies, travel delays
TIME IS BRAIN
Questions

- Elaine Skalabrin, MD-Stroke Program Medical Director
- Diane Soik, NP, MSN,ANP- Stroke Program Manager

RESOURCES ONLINE:
- https://www.peacehealth.org/RBstroke
- https://www.peacehealth.org/EMSstroke
Next EMS Grand Rounds

Wednesday, March 21, 2018 from 1100-1200

Trauma Update-TXA, Whole blood in EMS, tourniquets, Stop-the-bleed

Free sign up at www.peacehealth.org/egr
Thanks for Attending

The American Heart Association/American Stroke Association recognizes this hospital for achieving 85% or higher compliance with all Get With The Guidelines®-Stroke Achievement Measures and 75% or higher compliance with five or more Get With The Guidelines®-Stroke Quality Measures for two or more consecutive years and achieving Thrombolytic Therapy ≤ 60 minutes 75% and ≤ 45 minutes 50% or more of applicable acute ischemic stroke patients to improve quality of patient care and outcomes.