Stroke Systems Of Care:
Considerations for Optimizing Patient Care and Improving Patient Outcomes

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Disclosures

• Sharon Hammond-Heaton: None
• Jean Luciano: Genentech Speakers Bureau
Objective

• Recognize components of a stroke system of care and describe interactions among elements.
Systems of Care: Recommendations

- Systems serve 3 functions
  - Effective communication and collaboration
  - Promote organized standards approach
  - Identify performance measures
- Provide patients and providers tools needed for prevention, treatment and rehab
- Decisions and protocols are patient centered and focused
- Identify and address barriers to success
- Must be customized for each area
  - State, region or local to ensure appropriate transitions of care

Components:

- Primordial and Primary Prevention
- Community Education
- Notification and Response of EMS
- Acute Treatment
- Subacute Stroke Care and Secondary Prevention for Stroke
- Rehabilitation for Stroke
- CQI
Stroke Systems of Care

The goal of a stroke system of care is to ensure that all stroke patients are rapidly identified, transported, or transferred in a timely fashion to a hospital that care provide the most appropriate level of care for the particular clinical situation.

Primordial and Primary Prevention

- **Primordial**: Focus on entire population
  - Smoking cessation, obesity increase exercise
  - Efforts have broad impact on health

- **Primary Prevention**: treatment of risk factors
  - Hypertension, hyperlipidemia, diabetes, atrial fib other *modifiable risk factors*

- **Initiatives**:
  - Community Based: Primary Prevention
  - Enhancement: post event, antithrombotic, statins, anti-hypertensives
Community Education

• Need for improved knowledge in the community for stroke signs and symptoms
• Education for all
  • Target high risk populations
  • Community based organizations, policy makers and stakeholders

Notification and Response of EMS

• Knowledgeable dispatchers
• Knowledgeable EMS Providers
• Assessment tools
  • Many
• Destination Protocols
  • Bypass?
  • Air VS Ground
• rtPA Checklists
EMS Navigating Stroke Systems of Care

1. Requires Clinical Decision Support Tools
2. Relationships within Regional Stroke Systems
3. Data to drive performance and care delivery

Systems of Care
The Rapid Arterial Occlusion Evaluation (RACE)

1. Aim to develop and validate a simple prehospital stroke scale to predict the presence of large vessel occlusion (LVO)
2. Designed based on elements of the NIHSS
3. Simpler than a full NIHSS to assess by field providers

**RACE**

A RACE score ≥5
- Sensitivity of 0.85
- Specificity of 0.68

**Table 1. RACE Scale**

<table>
<thead>
<tr>
<th>Item</th>
<th>RACE Score</th>
<th>NIHSS Score Explanation</th>
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<tbody>
<tr>
<td>Facial palsy</td>
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<td>0</td>
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<tr>
<td>Absent</td>
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<td>1</td>
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<tr>
<td>Moderate to severe</td>
<td>2</td>
<td>2–3</td>
</tr>
<tr>
<td>Arm motor function</td>
<td>2</td>
<td>3–4</td>
</tr>
<tr>
<td>Normal to mild</td>
<td>0</td>
<td>0–1</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Severe</td>
<td>2</td>
<td>3–4</td>
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<tr>
<td>Leg motor function</td>
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<td>3–4</td>
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<tr>
<td>Moderate</td>
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<td>2</td>
</tr>
<tr>
<td>Severe</td>
<td>2</td>
<td>3–4</td>
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<tr>
<td>Head and gaze deviation</td>
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<td>0</td>
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<td>Aphasial of right hemisphere</td>
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<tr>
<td>Agnosia of left hemisphere</td>
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<tr>
<td>Patient recognizes his/her arm and the impairment</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Does not recognize his/her arm or the impairment</td>
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<td>1</td>
</tr>
<tr>
<td>Does not recognize his/her arm and the impairment</td>
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<tr>
<td>Score total</td>
<td>0–9</td>
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Interactions Within Stroke Systems of Care
A Policy Statement From the American Heart Association/American Stroke Association

Patient with abnormal vital functions in need of acute resuscitation
- Transport to nearest hospital for stabilization of vital signs
- Once vital functions stabilized, transfer to nearest CSC (or PSC if long distances)

Patient with acute onset of stroke symptoms within 6-8 hours
- Transport patient to closest PSC or CSC if <15-20 minutes transport time
- If PSC and/or CSC >15-20 minutes away, go to closest ASRH

Patient with acute stroke and seen initially at an ASRH
- ASRH might use telemedicine to help evaluate the patient and to make transfer recommendations
- Transfer to nearest PSC or CSC based on stroke type, patient's medical condition, treatment options

CQI

- % of people presenting in treatment window
- % arriving by EMS
- EMS Metrics:

EMS Target Times

- Dispatch time is <1 minute
- Turnout time (call received to in route) is <1 minute.
- EMS response time is <8 minutes (time elapsed from the receipt of the call by the dispatch entity to the arrival on the scene of a properly equipped and staffed ambulance).
- The on scene time is <15 minutes (barring extenuating circumstances such as extrication difficulties)
- Travel time is equivalent to trauma or acute myocardial infarction calls

Implementation strategies for Emergency Medical Services Within Stroke Care Systems of Care
### Stroke Times

<table>
<thead>
<tr>
<th></th>
<th>Current Period</th>
<th>Year-To-Date</th>
<th>Goals</th>
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<tr>
<td></td>
<td>Avg</td>
<td>Median</td>
<td>Avg</td>
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<tr>
<td>Disp to Enroute</td>
<td>1.02</td>
<td>0.94</td>
<td>1.04</td>
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<td>Enroute to OnScene</td>
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<td>4.04</td>
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<tr>
<td>On Scene Time</td>
<td>15.59</td>
<td>15.48</td>
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<td>Transport Time</td>
<td>9.89</td>
<td>9.55</td>
<td>9.70</td>
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<tr>
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<td>P25=6.05 / P75=13.76</td>
<td>P25=6.00 / P75=13.27</td>
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<tr>
<td>Total Prehospital Time</td>
<td>30.55</td>
<td>29.90</td>
<td>30.11</td>
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<td>Drop Time</td>
<td>27.53</td>
<td>25.93</td>
<td>28.55</td>
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- **Disp to Enroute Time**: Time from Dispatch to On Scene.
- **Enroute to OnScene Time**: Time from On Scene to Departed Scene.
- **On Scene Time**: Time from Departed Scene until Time to Leave Scene.
- **Transport Time**: Time from Departed Scene until At Destination.
- **P25 and P75 times** are the 25th and 75th percentiles for the distribution of times.

### Stroke LAMS Score

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**Total # of LAMS Scores Recorded**: 25

- **LAMS Score**: A measure of performance in stroke care, indicating the quality of care provided to patients.
Need for Direction

Acute Care

• A stroke system should determine the acute stroke treatment capabilities and limitations of all hospitals and make these available to primary care providers, EMS, and the public.
• A stroke system should identify the roles played by each type of hospital in the system and define the responsibilities inherent in those roles.
Treatment and Routing Options

Tiered Levels of Stroke Care

1. Acute Stroke Ready Hospital = ASRH
2. Primary Stroke Certified = PSC
3. Comprehensive Stroke Certified = CSC

**ASRH**
- Neurologist –24/7 in person or via telemed
- Telemed avail w/in 20 min
- Transfer protocols with PSC or CSC
- IV tPA available –anticipate transfer if treated
- No stroke unit required
Tiered Levels of Stroke Care

**PSC**
- Stroke unit or designated beds
- CTA/MRA available 24/7
- Neurologists 24/7 in person or via telemed
- IV tpa treatment
- Neurosurg available within 2 hrs–if onsite neurosurg–OR staffed 24/7

**CSC**
- Dedicated neuro ICU with 24/7 staffing
- Catheter angio 24/7
- Able to meet concurrent needs of multiple complex stroke patients
- 24/7 neurointerventionalist, neurosurgeon, neurologists
- Aneurysm clipping/coiling, carotid stenting/CEA, endovascular care
- Patient centered stroke research
- Additional volume requirements for IV tPA and SAH clip/coil volume

By ground 56% of patients had access to an endovascular capable hospital within 60 minutes. By air 85% had access to an endovascular-capable hospital within 60 minutes.
Large Vessel Occlusive (LVO) Ischemic Strokes Promptly to CSC

- Longer times from stroke onset to initiation of IA therapy and revascularization are associated with lower chances of good clinical outcomes
- Achieving reperfusion at 310 minutes, compared to 280 minutes, corresponds to a 10.6% decrease in the probability of a good outcome.

Khatri et al., Neurology 2009; 73 (13): 1066-1072

Systems of Care: Subacute Care and Secondary Prevention

- The treatment of stroke patients during the subacute phase, including the early implementation of secondary prevention regimens, is critical to optimizing patient outcomes. Well established evidence-based guidelines are focused on subacute care and secondary prevention for stroke.
A stroke system should use organized approaches to optimize subacute care

• Stroke teams
• Stroke units
• Written protocols
• Order Sets
  • Neuroscience nurses, educated in the optimal management of the stroke patient.
• Clinical research

Secondary Prevention

A stroke system should adopt approaches to secondary prevention that address all major modifiable risk factors and that are consistent with the national guidelines for all patients with a history or suspected history of stroke or transient ischemic events.
Secondary Prevention of Ischemic Stroke

What is the cause of the initial cerebrovascular event?

- Large vessel athero
  - Carotid endarterectomy
  - Stent
  - Antiplatelet agent
- Cardioembolism
- Small vessel dz
  - Anticoagulation
  - Antiplatelet agent

Risk factor modification
- Statin
- ACEI / ARB

Patient Education

- All patients need to know the signs and symptoms of stroke.
- Reduction of risk factors
- Education about the hidden deficits of stroke: depression and cognitive deficits
- Lifestyle modification
- Medication compliance
Family Assessment

• Respite care
• Depression
• Stress
• Coping
Subacute and Secondary Prevention CEQI

- Length of stay
- Readmissions
- Seven day phone calls.
- Outcomes: Modified Rankin and Quality of Life scales

Systems of Stroke Care: Rehabilitation

Stroke rehabilitation should be provided by an appropriately trained and staffed multi-disciplinary team, including
- Neurorehabilitation physicians
- Rehabilitation nurses
- Physical and Occupational therapists
- Speech-language pathologists,
- Recreational therapists, social workers, neuropsychologists
- Vocational counselors
- Families and the patient should be a fully involved member of this team.
Benefits

• The intensity of rehabilitation services often is a critical determinant in the recovery of stroke patients.
• The use of coordinated, multidisciplinary stroke rehabilitation teams has been shown to diminish mortality rates for stroke patients.
• In addition, stroke patients who receive care in an inpatient rehabilitation facility are more likely to return to the community and to recover their ability to perform ADLs.

Stroke Rehabilitation CEQI

Performance measures to evaluate patient outcomes
• Mortality
• Functional status
• Community discharge
• Percentage of stroke patients who receive the appropriate level of rehabilitation services in the system
Communication

The number one problem and the number one answer!
Communication between:
Patient – EMS
EMS- Hospitals and Hospitals back to EMS
Among the multidisciplinary teams.
Between providers and the patients and families.
To the next level of care providers.
To the primary care providers.
Coming together is a beginning. Keeping together is progress. Working together is success.

- Henry Ford

Thank you for your attention!

Sometimes the questions are complicated and the answers are simple.

~ Dr. Seuss