Welcome to the Target: Stroke Webinar Series

We thank you for joining us!

The webinar will begin shortly.
TARGET: STROKE
TIME LOST IS BRAIN LOST.

STROKEASSOCIATION.ORG/TARGETSTROKE
Target: Stroke Webinar Series

Integrating stroke teams and EMS Systems: Working together to improve stroke outcomes

Presenters:
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Dr. Eric Smith, MD, MPH, FRCPC, FAHA
University of Calgary

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• Joint Assistant Professor, Dept of Radiology
• Member, Hotchkiss Brain Institute University of Calgary
• Medical Director, Cognitive Neurosciences Clinic
• Stroke Neurologist, Calgary Stroke Program
• Chair of the Stroke Work Group of Get With The Guidelines-Stroke
• Member of the Get With The Guidelines National Steering Committee
Target: Stroke Goal

Achieve a Door to Needle (DTN) Time within 60 minutes in at least 50% of ischemic stroke patients treated with IV tPA

Progress to date:

1,228 unique hospitals registered
133 honor roll hospitals
Improving Stroke Outcomes

Current guidelines for the management of patients with acute ischemic stroke published by the AHA/ASA include specific recommendations for the administration of IV rt-PA.

Despite its effectiveness in improving neurological outcomes, many patients with ischemic stroke are not treated with rt-PA, because they arrive late or because of delays in assessment/administration of IV rt-PA.

Earlier administration of IV rtPA after the onset of stroke symptoms is associated with greater functional recovery.

One of the potential approaches to increase treatment opportunities and improve stroke outcomes is to provide this treatment in a more timely fashion after patient arrival (reduce the door to needle time for IV rt-PA).
Intravenous rt-PA is recommended for selected patients who may be treated within 3 hours of onset of ischemic stroke (Class I Recommendation, Level of Evidence A).

Patients who are eligible for treatment with rt-PA within 3 hours of onset of stroke should be treated as recommended in the 2007 Guidelines.

Although a longer time window for treatment with rt-PA has been tested formally, delays in evaluation and initiation of therapy should be avoided, because the opportunity for improvement is greater with earlier treatment.

rt-PA should be administered to eligible patients who can be treated in the time period of 3 to 4.5 hours after stroke (Class I Recommendation, Level of Evidence B).
EDs should establish standard operating procedures and protocols to triage stroke patients expeditiously (Class I, Level of Evidence B).

Standard procedures and protocols should be established for benchmarking time to evaluate and treat eligible stroke patients with rt-PA expeditiously (Class I, Level of Evidence B).

Target treatment with rt-PA should be within 1 hour of the patient’s arrival in the ED (Class I, Level of Evidence A).

Comprehensive overview of nursing and interdisciplinary care of the acute ischemic stroke patient: a scientific statement from the American Heart Association. Stroke 2009;40;2911-2944
Substantial Opportunity to Improve Timeliness of IV rt-PA in Ischemic Stroke

Door-to-IV rt-PA within 60 minutes

GWTG-Stroke Database, data on file DCRI
Best Practice Strategies

1. **Advance Hospital Notification by EMS**: EMS providers should, when feasible, provide early notification to the receiving hospital when stroke is recognized in the field. Advance notification of patient arrival by EMS can shorten time to CT and improve the timeliness of treatment with thrombolysis.

2. **Rapid Triage Protocol and Stroke Team Notification**: Acute triage protocols facilitate the timely recognition of stroke and reduce time to treatment. Acute stroke teams enhance stroke care and should be activated as soon as the stroke patient is identified in the emergency department or after notification from pre-hospital personnel.

3. **Single Call Activation System**: A single call should activate the entire stroke team. A single-call activation system for the stroke team is defined here as a system in which the emergency department calls a central page operator, who then simultaneously pages the entire stroke team, including notification for stroke protocol imaging.
## Why Focus on EMS?

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Door to Dr Evaluation</th>
<th>Door to CT</th>
<th>Door to needle</th>
<th>Chance of Reperfusion Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdullah</td>
<td>2008</td>
<td>--</td>
<td>17% shorter</td>
<td>--</td>
<td>41% vs 21% (among patients &lt;6 hrs)</td>
</tr>
<tr>
<td>Bae</td>
<td>2010</td>
<td>--</td>
<td>34% shorter</td>
<td>29% shorter</td>
<td>--</td>
</tr>
<tr>
<td>Bray</td>
<td>2005</td>
<td>52% shorter</td>
<td>35% shorter</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Goodacre</td>
<td>2004</td>
<td>--</td>
<td>--</td>
<td>21% shorter</td>
<td>--</td>
</tr>
<tr>
<td>Quain</td>
<td>2008</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>21.4% vs. 4.7%</td>
</tr>
</tbody>
</table>
AHA/ASA Recommendations for EMS Systems of Care for Stroke

Exec Summary

1. Rapid dispatch.
2. Use algorithms/protocols.
3. Involve ER physicians, EMS and acute stroke team.
4. Transport to acute-stroke capable hospital.
5. Establish assessments for thrombolysis eligibility.
Other Target: Stroke Resources available on www.strokeassociation.org/targetstroke

Target: Stroke Manual

Target: Stroke EMS Guide
Dr. Jane Brice, MD, MPH
University of North Carolina at Chapel Hill School of Medicine

• Associate Professor of Emergency Medicine
• Orange County EMS Director
• Medical Student Research Director
• Chair UNC Hospital Disaster Committee
• Director EMS Fellowship
Objectives

- To review each of the AHA EMS recommendations for stroke systems of care
- To present methods for integration of EMS within the stroke plan of care
- To discuss models of information flow
EMS Stroke Plan of Care

Provide Education and Guidelines

Measure Performance

Provide Feedback
Recommendations for the Establishment of Stroke Systems of Care: Recommendations From the American Stroke Association's Task Force on the Development of Stroke Systems

1. A stroke system should include processes that provide rapid access to EMS for patients with acute stroke and that dispatch EMS in the shortest time possible, given local resource availability.

Stroke 2005;36;690-703
Eh?

– We need 9-1-1 and EMS to be there when we call.
9-1-1 Centers

– First 9-1-1 Call in the US - Haleyville, AL - February 16, 1968

– Brits beat us to it – first universal emergency number - 1937 (999)

– As of August 2011, the United States has 6,138 primary and secondary 9-1-1 Centers
9-1-1 Centers

– An estimated 240 million calls are made to 9-1-1 in the U.S. each year.
– Population Covered: 99% (at least basic 9-1-1)
– Counties/Parishes Covered: 96% (at least basic 9-1-1)
What about EMS?

– 15,276 Ambulance Services
– 48,384 Ground Ambulance Vehicles
– 840,669 EMS Personnel

– Ambulance Staffing:
  - Both career and volunteer personnel: 40%
  - Career personnel: 38%
  - Volunteer personnel: 22%
EMS

- EMS Practitioner Types:
  - First Responder: 11%
  - EMT-B: 53%
  - EMT-I: 9%
  - EMT-P: 41%

- In North Carolina as an example:
  - 548 EMS agencies – 54% volunteer
  - 34,011 EMS professionals – 60% Basic EMT
  - 1.2 million calls each year – 1% are for stroke
Take Home Points

– Most but not all of the US has access to centralized EMS dispatch
– EMS Is very large and very diverse
  • Many volunteers
  • Many basic personnel
Recommendations for the Establishment of Stroke Systems of Care: Recommendations From the American Stroke Association's Task Force on the Development of Stroke Systems

2. A stroke system should promote the use of diagnostic algorithms and protocols by EMS dispatchers that reflect the most current stroke treatment recommendations and should dispatch EMS responders for suspected strokes with the most rapid emergency response and within the same time limits/goals established for other acute events (eg, myocardial infarction [heart attack] and trauma).

Stroke 2005;36;690-703;
Eh?

- 9-1-1 dispatchers need to recognize stroke
- Use of validated, evidence-based algorithms are encouraged
Can 9-1-1 dispatchers recognize stroke?

- Yes, but not well
- Recognize about a third of strokes (stable number over years of study)
- Efforts to improve recognition
  - Stroke Diagnostic Tool (MPDS)
I want you to get close enough to ask her/him three questions. Tell me when you're ready.

Ask her/him to smile.
(Wait) Was the smile equal on both sides of her/his mouth?
- Normal smile
- Only one side of mouth or face shows a smile (obvious difference)
- Slight difference in smile (possible difference)
- Doesn't seem to understand request

Ask her/him to raise both arms above her/his head.
(Wait) What was s/he able to do?
- Both arms raised equally
- Only one arm raised
- One arm higher than other
- Doesn't seem to understand request

Ask her/him to say, "The big red rat jumped over the yellow fox."
(Wait) Was s/he able to repeat it correctly?
(Clarify) Was it slurred, garbled, or not understandable?
- Said correctly
- Slurred speech
- Garbled speech
- Speech not understandable
- Doesn't seem to understand request

Finished
Close
ProQA Entry Recommendations

© 2004-2005 Priority Dispatch Corp. Patents pending. All rights reserved.
Use of validated, evidence-based algorithms

– Remember 9-1-1 dispatchers are laypersons
– Emergency Medical Dispatch transforms them into skilled first responders
– Provides standardized algorithm for assessing the nature of the problem and sending the right resources efficiently
– Several vendors with validated algorithm
– Example – National Academies of Dispatch
Emergency Medical Dispatch

– In United States
  • Not known how many 9-1-1 centers provide EMD

– In North Carolina
  • 31% of centers are fully EMD-certified
  • 28% of centers have some personnel certified
  • 41% have no personnel certified
  • 44% of centers use dispatch algorithms
Take Home Points

– Emergency Medical Dispatch is important
  • It is also costly and politically charged
Recommendations for the Establishment of Stroke Systems of Care: Recommendations From the American Stroke Association's Task Force on the Development of Stroke Systems

3. A stroke system should ensure the direct involvement of emergency physicians and stroke experts in the development of stroke education materials, communications and field assessment protocols, treatment protocols, and transport protocols for EMS providers. Such training and protocols should focus on stroke recognition, triage/transport decisions, and early notification to the receiving hospital.
Eh?

– Stroke experts should **partner** with EMS in **collaborative development** of:
  - Stroke education materials
  - EMS protocols
  - Transport decision-making
EMS Stroke Education

– Most EMS providers operate on a 4-year certification cycle
– Typically require 96 hours of continuing education in those 4 years
– Most EMS personnel get stroke education
Stroke Education for 911 and EMS in North Carolina

Telecommunications
- 27%
- Median hours of training = 4.0
- Topics:
  - 87% Risk factors
  - 100% Signs and sx
  - 44% Pathophysiology
  - 48% Recognition scales
  - 44% Thrombolytics

EMS
- 89%
- Median hours of training = 4.0
- Topics:
  - 91% Risk factors
  - 98% Signs and sx
  - 91% Pathophysiology
  - 69% Recognition scales
  - 62% Thrombolytics
• Stroke represents 1% of EMS calls
• EMS must also train to respond to trauma, cardiac arrest, acute MI, kids with fever, snake bites, allergic reactions, broken bones, mentally ill folks, rashes, headaches, .............
• Helping set stroke as a priority requires collaboration and consistent engagement
• Also requires understanding the EMS environment
• Poor funding
• Much continuing education done on-duty
  – Start-Stop nature of on-duty training
  – Cost factor
  – EMS focused – their lingo, their environment
Saving Lives: Understanding Stroke

MODULE 1: What is Stroke?
• Saving Lives, Understanding Stroke Courses


• Free, EMS-focused, developed in collaboration with EMS and stroke experts
Protocols

- EMS personnel operate from standardized protocol
  - Provides guidance and standardized care
  - Allows for measurement of performance

- Typically each EMS system medical director creates patient care protocols

- We reviewed North Carolina EMS stroke protocols prior to implementation of state-wide protocols.
## Results – Protocol Analysis

Monitoring and treating patients in the field

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>42</td>
<td>91.3</td>
</tr>
<tr>
<td>Monitor</td>
<td>50</td>
<td>98.0</td>
</tr>
<tr>
<td>IV</td>
<td>47</td>
<td>92.2</td>
</tr>
<tr>
<td>Glucose Check</td>
<td>44</td>
<td>88.0</td>
</tr>
</tbody>
</table>
# Results – Protocol Analysis

Communication and transport procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>General instruction to transport ASAP</td>
<td>37</td>
<td>72.5</td>
</tr>
<tr>
<td>Specific instruction to minimize scene time</td>
<td>25</td>
<td>50.0</td>
</tr>
<tr>
<td>Contact medical control</td>
<td>48</td>
<td>94.1</td>
</tr>
<tr>
<td>Hospital Prenotification</td>
<td>21</td>
<td>41.1</td>
</tr>
</tbody>
</table>
Results – Protocol Analysis

Documentation of stroke specific scales and screening tools

<table>
<thead>
<tr>
<th>Documentation – Stroke Scales</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>24</td>
<td>47.0</td>
</tr>
<tr>
<td>Cincinnati Prehospital Stroke Scale</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>Los Angeles Prehospital Stroke Screen</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>Home Grown Scale</td>
<td>7</td>
<td>13.7</td>
</tr>
</tbody>
</table>
Several states have developed State-wide EMS protocols

- Several advantages
  - Uniformity
  - Evidence base
  - Current standards of care
  - Standardization beyond protocols
    - Education, Equipment, Medications
    - Benchmarking across systems
  - Disaster preparedness
STROKE—ADULT & PEDIATRIC

BASIC STANDING ORDERS
- Routine Patient Care.
- Perform Prehospital Stroke Scale, or equivalent nationally recognized stroke scale.
- Clearly determine time of onset of the symptoms.
  - If the patient wakes from sleep or is found with symptoms of stroke, the time of onset of first symptoms is defined as the last time the patient was observed to be normal.
- Notify the emergency department as soon as possible.
- Obtain glucose reading via glucometer.
- Elevate the head of the stretcher 30 degrees.
- Do not delay for ALS intercept.
- 12-lead EGCG available and it does not delay transport.
- Consider transporting a witness, family member, or caregiver with the patient to verify the time of the onset of stroke symptoms.
- If the onset of signs and symptoms plus transport time is <4.5 hours, consider transport to a facility specializing in stroke care.

INTERMEDIATE (ADULT ONLY)/PARAMEDIC (ADULT & PEDIATRIC) STANDING ORDERS
- Consider underlying causes.

PREHOSPITAL STROKE SCALE
Abnormal findings on any part of the exam may indicate an acute stroke.
(Interpretation: If any 1 of these 3 signs is abnormal, the probability of a stroke is 7.2%)

<table>
<thead>
<tr>
<th>FACIAL DROOP</th>
<th>Normal</th>
<th>Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HAYE THE PATIENT SMILE AND SHOW TEETH</td>
<td>Both sides of the face move equally well. One side of the face does not move as well as the other side.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARM DRIFT</th>
<th>Normal</th>
<th>Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HAYE THE PATIENT CLOSE HIS HER EYES AND HOLD HIS HER ARMS EXTENDED</td>
<td>Both arms move the same, or both arms don't move at all. One arm doesn't move, or one arm drifts down compared to the other.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPEECH</th>
<th>Normal</th>
<th>Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASK THE PATIENT TO REPEAT A PHRASE SUCH AS, “YOU CAN’T TEACH AN OLD DOG NEW TRICKS!”</td>
<td>Patients says the correct words without slurring. Patients slurs words, says the wrong words, or is unable to speak.</td>
</tr>
</tbody>
</table>
STROKE
STATEWIDE ALS PROTOCOL

Initial Patient Contact - See Protocol #201
Administer Oxygen \( \text{infrared to } \text{SpO}_{2} \geq 94\% \)
Manage Airways/Ventilation, if needed \(^4\)
Monitor ECG/Pulse Oximetry \(^4\)

\[ \text{Altered Mental Status} \quad \text{YES} \rightarrow \text{Also, proceed with \text{Altered LOC} Protocol \#7002A} \]

\[ \text{NO} \rightarrow \text{Current Seizure Activity} \quad \text{YES} \rightarrow \text{Also proceed with \text{Seizure Protocol} \#7007} \]

\[ \text{NO} \]

Is acute stroke suspected by Cincinnati Prehospital Stroke Scale \(^5,6\) (CPSS)?

- Face - facial droop present,
- Arm - upper extremity arm drift present (arms extended/ palms up),
- Speech - inability to say, “The sky is blue in Pennsylvania” normally,
- Time - time of symptom onset definitely < 3 hours \(^7\)

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

\[ \text{YES} \rightarrow \text{Package Patient ASAP} \quad \text{Transport in supine position} \quad \text{Also, proceed with \text{IV NSS Protocol} \#7006} \]

\[ \text{NO} \rightarrow \text{Initiate IV NSS} \quad \text{Consider Drawing Bloods} \; \text{Check Glucometer} \]

Transport to certified primary Stroke Center, if possible

- Notify Receiving Facility ASAP
- Initiate IV NSS 250 mL bolus \(^8,12\)
- Consider Drawing Bloods \(^13\)
- Check Glucometer \(^14\)

Contact Medical Command \(^11\)
Suspected Stroke

History
- Previous CVA, TIA’s
- Previous cardiac / vascular surgery
- Associated diseases: diabetes, hypertension, CAD
- Atrial fibrillation
- Medications (blood thinners)
- History of trauma

Signs and Symptoms
- Altered mental status
- Weakness / Paralysis
- Blindness or other sensory loss
- Aphasia / Dysarthria
- Syncope
- Vertigo / Dizziness
- Vomiting
- Headache
- Seizures
- Respiratory pattern change
- Hypertension / hypotension

Differential
- See Altered Mental Status
- TIA (Transient ischemic attack)
- Seizure
- Hypoglycemia
- Stroke
  - Thrombotic Embolic (~85%)
  - Hemorrhagic (~15%)
- Tumor
- Trauma

Universal Patient Care Protocol

Prehospital Stroke Screen

Screen Positive

If Positive and Symptoms < 5 hours, transport to the destination as per the EMS System Stroke Plan. Limit Scene Time to 10 Minutes Provide Early Notification

Screen Negative

IV Protocol
- Blood Glucose
  - Glucose <60
    - 50% Dextrose
    - Glucagon if no IV

12-Lead ECG

Consider other protocols as indicated
- Altered Mental Status
- Hypertension
- Seizure
- Overdose/Toxic Ingestion

Notify Destination or Contact Medical Control

Legend
- MR
- EMT
- EMT- I
- P
- Medical Control

Pearls
- Recommended Exam: Mental Status, HEENT, Heart, Lungs, Abdomen, Extremities, Neuro
- Items in Red Text are key performance measures used in the EMS Acute Stroke Care Toolkit
- The Reperfusion Checklist should be completed for any suspected stroke patient. With a duration of symptoms of less than 5 hours, scene times should be limited to 10 minutes, early destination notification/activation should be provided and transport times should be minimized based on the EMS System Stroke Plan.
- Onset of symptoms is defined as the last witnessed time the patient was symptom free (i.e. awakening with stroke symptoms would be defined as an onset time of the previous night when the patient was symptom free)
- The differential listed on the Altered Mental Status Protocol should also be considered.
- Elevated blood pressure is commonly present with stroke. Consider treatment if diastolic is > 110 mmHg.
- Be alert for airway problems (swallowing difficulty, vomiting, aspiration).
- Hypoglycemia can present as a localized neurologic deficit, especially in the elderly.
- Document the Stroke Screen results in the PCR.
- Document the 12 Lead ECG as a procedure in the PCR.

Protocol 33
Any local EMS System changes to this document must follow the NC EMS Protocol Change Policy and be approved by OEMS 2009
Transport Decision Making

- Spur of the moment
- GPS driven
- Supervisor driven
- Driven by system needs
- Patient preference
Preplanning for transport decisions is unusual

- Need to consider BOTH
  - the time/distance to the nearest hospital AND
  - the time/distance to the most appropriate hospital

- More on this in the next recommendation
Take Home Points

– A strong state office of EMS can make a difference

– Partner with other time-critical illness groups (cardiac, trauma, EMS for Children) to advocate for standardized education, protocols, preplanning for transport

– Partner with EMS
Recommendations for the Establishment of Stroke Systems of Care: Recommendations From the American Stroke Association's Task Force on the Development of Stroke Systems

4. A stroke system should ensure that all patients having signs or symptoms of stroke be transported to the nearest primary stroke center or hospital with an equivalent designation, given the available acute therapeutic interventions… Stroke patients who are not candidates for hyperacute interventions should be evaluated at the closest hospital and considered for transfer, if appropriate…
Eh?

If the stroke is acute, EMS should know where to take the patient
Transport decision making is complicated

- Political
- Resource constrained
- Culture constrained
Stroke Triage Destination Plan

• Effective January 1, 2010
  – All North Carolina EMS Systems must have a plan to address the triage and destination of:
    • Stroke
    • STEMI
    • Trauma
    • Pediatrics
Stroke Destination Determinants

• Stroke Center or Stroke Capable Hospital within 2 hours from onset of patient’s symptoms?
  
• YES
  – Transport to Primary Stroke Center or Stroke Capable Hospital with pre-arrival notification

• NO
  – Transport to normal hospital destination
Stroke
EMS Triage and Destination Plan

**Stoke Patient**
- A patient with symptoms of an acute stroke as identified by the EMS Stroke Screen

**Time of Symptom Onset**
- Defined as the last witnessed time the patient was symptom free (i.e., the time of onset for a patient awakening with stroke symptoms would be the last time he/she was known to be symptom free before the sleep period)

**The Purpose of this plan is to:**
- Rapidly identify acute Stroke patients who call 911 or present to EMS
- Minimize the time from onset of Stroke symptoms to definitive care
- Quickly diagnose a Stroke using validated EMS Stroke Screen
- Complete a reperfusion checklist (unless being transported directly to a Stroke Capable Hospital) to determine thrombolytic eligibility
- Rapidly identify the best hospital destination based on symptom onset time, reperfusion checklist, and predicted transport time
- Early activation/notification to the hospital prior to patient arrival
- Minimize scene time to 10 minutes or less
- Provide quality EMS service and patient care to the EMS Systems citizens
- Continuously evaluate the EMS System based on North Carolina’s Stroke EMS performance measures

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**Symptoms of Acute Stroke Positive Stroke Screen**

**Transport to closest Primary Stroke Center or Stroke Capable Hospital Listed Early Notification/Activation**

- **Yes**
  - Insert:
    - Stroke Capable Hospital Name(s) Here
    - No Stroke Capable Hospitals within 50 minutes
  - Air Medical SCTP within 30 minutes of patient's location and patient clearly a NEW onset stroke patient?
    - **Yes**
      - Consider Activating Air or Ground SCTP
      - Transport to closest Primary Stroke Center Listed Early Notification/Activation
      - Insert:
        - Community Hospital Name(s) Here
    - **No**
      - Transport to closest Community Hospital Listed
      - Insert:
        - Community Hospital Name(s) Here

---

**Pearls and Definitions**
- All Stroke Patients must be triaged and transported using this plan. This plan is in effect 24/7/365
- All Patient Care is based on the EMS Suspected Stroke Protocol
- Primary Stroke Center = a hospital that is currently accredited by the Joint Commission as a Primary Stroke Center. Free standing emergency department and satellite facilities are not considered part of the Primary Stroke Center.
- Stroke Capable Hospital = a hospital which provides emergency care with a commitment to Stroke and the following capabilities:
  - CT availability with in-house technicain availability 24/7/365
  - Ability to rapidly evaluate an acute stroke patient to identify patients who would benefit from thrombolytic administration
  - Ability and willingness to administer thrombolytic agents to eligible acute Stroke patients
  - Accepts all patients regardless of bed availability
  - Provides outcome and performance measure feedback to EMS including case review
- Community Hospital = a local hospital within the EMS System's service area which provides emergency care but does not meet the criteria for a Primary Stroke Center or Stroke Capable Hospital
- Specialty Care Transport Program = an air or ground based specialty care transport program which can assume care of an acute Stroke patient from EMS or a Hospital and transport the patient to a Primary Stroke Center

---

(Inset Name Here) EMS System

2009

This protocol has been developed by the North Carolina Office of EMS (Final Version 11-1-2009)
Take Home Points

- Efficient triage of stroke patients to stroke centers is possible
- Requires patient and consistent engagement with EMS at both the local and state levels
5. A stroke system should ensure that EMS personnel perform and document agreed-upon stroke patient assessments and screening of candidates for thrombolysis or other hyperacute interventions, as such interventions become available.
Eh?

– We need to know what EMS is doing and provide feedback
• Performance Improvement is a two-way street
  – Must be flow of information from EMS
  – Flow of information to EMS
• Must be benchmarks
• Must be collaborative support and engagement
• Many models of collaborative performance improvement

• North Carolina example
  – Performance improvement tool
  – Draws information from statewide EMS electronic medical record
  – Provide direct feedback to agencies and personnel about their performance
EMS Acute Stroke Care Toolkit

• Overview of EMS Acute Stroke Care
• Performance feedback on:
  – Data Quality
  – EMS System
  – EMS Personnel Performance
  – EMS Patient Outcomes
  – EMS Education and Community Outreach
County Statistics

CDC Cerebrovascular Disease Death Rates

6M/2010 - 11/30/2010

<table>
<thead>
<tr>
<th>Category</th>
<th>Rates</th>
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<tbody>
<tr>
<td>SAMPLE</td>
<td>48.8</td>
</tr>
<tr>
<td>North Carolina</td>
<td>65.9</td>
</tr>
<tr>
<td>United States</td>
<td>65.3</td>
</tr>
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## System Capabilities

<table>
<thead>
<tr>
<th>EMS Capabilities</th>
<th>EMS System</th>
<th>Population Group Average</th>
<th>Area Group Average</th>
<th>State Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Highest Level of Service</td>
<td>EMT-P</td>
<td>100% EMT-P</td>
<td>89% EMT-P</td>
<td>87% EMT-P</td>
</tr>
<tr>
<td>* % of Population covered by First Responders</td>
<td>100%</td>
<td>80%</td>
<td>69%</td>
<td>69%</td>
</tr>
<tr>
<td>* % of 911 Dispatch Center Trained in Stroke Recognition</td>
<td>100%</td>
<td>69%</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>* % of EMS Personnel Trained in Stroke Recognition and Treatment</td>
<td>100%</td>
<td>73%</td>
<td>90%</td>
<td>71%</td>
</tr>
<tr>
<td>* Written Stroke Plan addressing patient destinations</td>
<td>Yes</td>
<td>3 (12%) Yes</td>
<td>4 (11%) Yes</td>
<td>8 (8%) Yes</td>
</tr>
</tbody>
</table>

### Dispatch Center

| * Basic 911                                                                     | No         | 6 (24%) Yes              | 7 (19%) Yes        | 18 (18%) Yes  |
| * Enhanced 911                                                                  | Yes        | 20 (80%) Yes             | 27 (75%) Yes       | 81 (80%) Yes  |
| * EMD                                                                           | Yes        | 22 (88%) Yes             | 25 (69%) Yes       | 63 (62%) Yes  |
| * Phase 2 Compliance                                                            | Yes        | 18 (72%) Yes             | 25 (69%) Yes       | 55 (54%) Yes  |
Patient Demographics

- Gender:
  - Female: 80
  - Male: 54

- Age Group:
  - 36-44: 4 (2.99%)
  - 45-54: 19 (14.18%)
  - 55-64: 25 (18.66%)
  - 65+: 86 (64.18%)

Total Patients: 124

- Pie chart showing:
  - 60% in older age group
  - 40% in middle age group
Symptom Duration/Onset

Acute Stroke Patient's Symptom Duration

6/1/2010 - 11/30/2010

- > 24 Hours: 4 patients
- 12 - 24 Hours: 2 patients
- 8 - 12 Hours: 0 patients
- 6 - 8 Hours: 2 patients
- 4 - 6 Hours: 1 patient
- 3 - 4 Hours: 1 patient
- 2 - 3 Hours: 2 patients
- 90 - 120 Minutes: 0 patients
- 60 - 90 Minutes: 5 patients
- < 60 Minutes: 15 patients
## EMS Response Times

<table>
<thead>
<tr>
<th>System</th>
<th>Events (n)</th>
<th>Min Value</th>
<th>Max Value</th>
<th>Avg Value</th>
<th>90% Fractile</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS System (All Emergent)</td>
<td>5,530</td>
<td>0:00:00</td>
<td>0:38:00</td>
<td>0:08:06</td>
<td>0:14:00</td>
<td>0:04:18</td>
</tr>
<tr>
<td>EMS System (Acute Stroke)</td>
<td>122</td>
<td>0:00:00</td>
<td>0:25:00</td>
<td>0:08:05</td>
<td>0:13:00</td>
<td>0:04:21</td>
</tr>
<tr>
<td>State</td>
<td>27,203</td>
<td>0:00:00</td>
<td>1:54:02</td>
<td>0:06:39</td>
<td>0:12:00</td>
<td>0:04:30</td>
</tr>
<tr>
<td>Similar EMS System (by Pop)</td>
<td>6,584</td>
<td>0:00:00</td>
<td>1:54:02</td>
<td>0:06:31</td>
<td>0:12:00</td>
<td>0:04:26</td>
</tr>
<tr>
<td>Similar EMS System (by Area)</td>
<td>11,966</td>
<td>0:00:00</td>
<td>1:54:02</td>
<td>0:06:36</td>
<td>0:12:00</td>
<td>0:04:47</td>
</tr>
</tbody>
</table>
## Personnel Performance

<table>
<thead>
<tr>
<th>Personnel ID</th>
<th>Patients</th>
<th>Stroke Screen</th>
<th>Glucose Level</th>
<th>Thrombolytic Screen</th>
<th>Scene Time of &lt;10 minutes</th>
<th>Documentation of Symptom Onset</th>
<th>Cardiac Rhythm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PXXXXXXX</td>
<td>3</td>
<td>3 (100%)</td>
<td>3 (100%)</td>
<td>1 (33%)</td>
<td>2 (67%)</td>
<td>3 (100%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>PXXXXXXX</td>
<td>5</td>
<td>5 (100%)</td>
<td>4 (80%)</td>
<td>3 (60%)</td>
<td>2 (40%)</td>
<td>5 (100%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>PXXXXXXX</td>
<td>1</td>
<td>1 (100%)</td>
<td>1 (100%)</td>
<td>1 (100%)</td>
<td>0 (100%)</td>
<td>1 (100%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>EMS System Average</td>
<td>134</td>
<td>129 (96%)</td>
<td>97 (72%)</td>
<td>59 (44%)</td>
<td>40 (30%)</td>
<td>134 (100%)</td>
<td>129 (96%)</td>
</tr>
<tr>
<td>State Average</td>
<td>5198</td>
<td>4836 (93%)</td>
<td>4521 (87%)</td>
<td>214 (4%)</td>
<td>1985 (38%)</td>
<td>2850 (55%)</td>
<td>3399 (65%)</td>
</tr>
</tbody>
</table>
Destination Decisions

Destination (Count)

SAMPLE REGIONAL MEDICAL CENTER (1)
SAMPLE REGIONAL MED CTR (1)
SAMPLE REGIONAL MED CTR (21)
SAMPLE REGIONAL MED CTR (108)
SAMPLE REGIONAL MEDICAL CENTER (1)

Time (h:mm:ss)

0:00:00
0:16:40
0:33:20
0:50:00

90% Fractal Time

0:17:00
0:23:00
0:21:00
0:19:00
0:44:00
Patient Outcomes

Sample Acute Stroke Patient Outcome Information

1/1/2007 - 3/31/2008

<table>
<thead>
<tr>
<th>Patient PCR Number</th>
<th>Date of Care</th>
<th>Symptom Onset Time Noted</th>
<th>Stroke Screen Obtained</th>
<th>Glucose Checked</th>
<th>Scene Time = &lt;10 min.</th>
<th>Emergency Dept. Disposition</th>
<th>Hospital Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXX-XXX</td>
<td>XX/XX/XX</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>TRANSFERRED</td>
<td>TRANSFER TO HOSPITAL</td>
</tr>
<tr>
<td>XXX-XXX</td>
<td>XX/XX/XX</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>TRANSFERRED</td>
<td>TRANSFER TO HOSPITAL</td>
</tr>
</tbody>
</table>

For every 12 patients who are treated optimally by EMS, one bad outcome will be avoided.
Data Linkages

– EMS hamstrung by inability to receive consistent patient feedback
– Difficulty to get better at recognizing stroke without feedback
– To allow EMS personnel to track their patient through the continuum of care
– To allow hospital personnel to track their patient back to the first medical encounter
– To improve care and collaboration
Take Home Points

– Managing information flow into and out of the stroke center is TOUGH
– Requires a plan and a system ALL can agree upon
– Is a statewide data system required – NO
– Requires BOTH sides of the equation understanding the needs of the other side and receiving equal flow
Parting Shots

– Most of US covered by EMS and 9-1-1
  • EMS is VERY diverse – often volunteer and basic
– Be a 9-1-1 advocate
  • Think Emergency Medical Dispatch as your end goal
– Partner with EMS and other time-critical illness groups to advocate for standardized education, protocols, preplanning for transport
Parting Shots

– Patient and consistent engagement with EMS at both the local and state levels reaps rewards

– Performance Improvement is a two way street – must give to take – often have to give first in order to receive
Questions and Answers

Any questions that do not get answered here can be posted on the Target: Stroke Online Forum or emailed to Erica McCaslin at t-erica.mccaslin@heart.org
TARGET: STROKE
TIME LOST IS BRAIN LOST.

STROKEASSOCIATION.ORG/TARGETSTROKE