Assessment and Treatment of the Stroke Patient

Clinical Guidelines and Routing Criteria for EMS in Iowa

February 2014
Stroke - Goals

Understand our shortfalls

- Healthcare providers are not as good at stroke recognition as we should be
- Healthcare in the rural setting creates different challenges to time driven care

Review the disease process
Stroke - Goals

- Apply stroke screening process
- Understand current treatment practices
  - Treatment windows
  - Primary stroke center destination
Stroke in the U.S.

Fourth leading cause of death in the U.S.

Leading cause of disability in the U.S., affecting over 700,000

4.4 million stroke survivors

85% ischemic

Less than 25% of eligible thrombolytic candidates are receiving therapy
Stroke in Iowa

Deaths – 4th leading cause

- 5 Iowans die from stroke each day
- 3rd most common cause of death in women
- 14% of men dying of stroke are <65

Money

- In 2009, 8140 admissions for stroke in Iowa hospitals
- In 2008, average inpatient costs for stroke were $9282
- Total inpatient hospital costs $78.2 million
Stroke identification

How easy is it to identify a stroke?

- 90% in tertiary care hospitals (stroke centers, teaching institutions)
- 78% in community hospitals

*Cerebrovasc Dis* 1999;9:224-230 (DOI: 10.1159/000015960)
Stroke identification

Study of 1045 patients transported by EMS; 440 with diagnosis of stroke

Paramedics correctly diagnosed 193 (49%)

Paramedics missed 247 (56%)

Stroke identification

Study of 1247 patients; 441 diagnosed with stroke

Paramedic PPV 47%
Paramedic NPV 58%

Stroke 2007;38:501
Stroke Identification

Paramedics demonstrated 61 – 66% sensitivity for identifying stroke after traditional training methods.

Sensitivity increased to 86 – 97% after receiving training in using a stroke assessment tool, such as the CPSS or LAPSS.

2010 CPR & ECC Guidelines; Circulation, October 18, 2010
What causes a stroke?

77% – 94% ischemic
- Thromboembolic
- Cardioembolic

6%-23% hemorrhagic
- Intracerebral bleed
- Sub-arachnoid hemorrhage
Atrial Fibrillation
Cerebral Anatomy

- Motor cortex
- Sensory cortex
- Parietal lobe
- Wernicke's area
- Broca's area
- Occipital lobe
- Temporal lobe
- Cerebellum
- Brain stem
Anterior Circulation

Internal Carotid (ICA)

[* Ascends through base of skull to give rise to the anterior and middle cerebral arteries, and connect with the posterior half of circle of Willis via posterior communicating artery *]
Anterior Cerebral Artery
Anterior Cerebral Artery
Middle Cerebral Artery – M 1, 2, & 3 Segments
Cerebral Anatomy

- Frontal lobe
- Motor cortex
- Sensory cortex
- Parietal lobe
- Wernicke's area
- Broca's area
- Occipital lobe
- Temporal lobe
- Cerebellum
- Brain stem
Vertebral ascends from the subclavian arteries, through the transverse foramen of the cervical vertebrae to enter the cranial cavity via the foramen magnum. Gives branch to basilar which terminates into the posterior cerebral arteries
Posterior Circulation
Stroke Symptoms

Right Hemisphere
- Left sided paralysis
- Spatial/perception problems.
  - Distance, size position
  - Judgment of own abilities
- Impulsive behavior
- Left sided neglect
- Left visual field cut

Left Hemisphere
- Right sided paralysis
- Speech / language problems
  - Expressive
  - Receptive
- Slow, cautious behavior
- Good judgment about ability / disability
- Right visual cut
Visual Field Deficits

- Blindness in R eye
- Bitemporal hemianopsia
- L homonymous hemianopsia
- Upper quadrant hemianopsia
- Homonymous hemianopsia with macular sparing
Thrombolytic Therapy

Dissolve the clot...fix the brain!

- Several studies conducted
- Not universally accepted

Why?
Clinical Trials

1950’s – 70’s – early thrombolytic trials using streptokinase and urokinase

- ECASS
- MAST-I
- MAST-E
- ASK
- NINDS
Current Treatments

**Thrombolytics**
- 3 hours
- Risk factors

**Mechanical Clot Removal**
- 8 hours
- Risk factors
Current Treatments

ECASS 3

- Extends time window to 4.5 hours for IV tPA

- Published Sept. 2008 in New England Journal of Medicine
- Not yet FDA approved
- Check with local hospitals / regional stroke centers
Hemorrhagic Transformation

Small Infarct
Mechanical Clot Retrieval
Current Treatments
(Not FDA Approved)

- **Intra-arterial t-PA**
  - 6 hours
  - Risk factors

- **Other Studies**
  - Desmotoplase
  - Neuroprotective agents
    - FAST-MAG – released last week
So Now What?!
Evidence Based Approach


Pre-Hospital Intervention

- **Good assessments**
  - Physical exams
  - History taking

- **Stroke centers**
  - NIH Stroke Scale
Stroke Assessment

**NIH stroke scale**

- A 42 point scale to look at neurological deficits
- Great baseline – creates a uniform exam that can be reproduced
  - Good for transition of care
  - Easier to track statistically
Stroke Assessment – NIH Scale

Complete assessment is great tool for baseline

Tests all cranial nerves, peripheral nerves for sensation, movement, spatial perception, coordination…

TOO LONG FOR PRE-HOSPITAL SCENES
Cincinnati Prehospital Stroke Scale... a history

- Facial Droop
- Arm Drift
- Speech
Stroke Assessment

Cincinnati Pre-Hospital Stroke Score (CPSS)
- Facial droop
- Speech
- Arm drift

Los Angeles Pre-Hospital Stroke Scale (LAPSS)

Miami Emergency Neurologic Deficit Exam (MEND)
CPSS Limitations

- Recognizes anterior circulation distribution
- 2012 retrospective chart survey of PSC in Des Moines
  - 64% strokes recognized with CPSS exam criteria
  - 88% strokes recognized with MEND exam criteria
### Stroke Alert
#### EMS - Hospital - Patient
- EMS Service #: [ ]
- Hospital #: [ ]
- Patient ID: [ ]

#### Dates & Times
- Last Known Well Date: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]
- Symptoms Discovered Date: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]
- Dispatch Date: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]
- Arrival On Scene: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]
- Depart Scene: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]
- Arrived At ED: [ ]/ [ ]/ [ ]
- Time (24 hours): [ ]

#### Patient Data
- Age: [ ] [ ] years
- Gender: □ male □ female □ unknown
- Accu-check: [ ]
- Blood Pressure: [ ]/ [ ]
- Repeat Blood Pressure: [ ]/ [ ]
- Pulse: [ ]
- CO2 Saturation: [ ]%

#### History
- Severe headache: □ Yes □ No □ Unknown
- Head trauma at onset: □ Yes □ No □ Unknown
- Bleeding/ clotting problems, or on blood thinners: □ Yes □ No □ Unknown
- LMWH (Heparin, Coumadin, Pradaxa, Argatroban, (or), Inr, Apixaban, Fondaparinux, Xarelto): □ Yes □ No □ Unknown
- Seizure at the onset of stroke: □ Yes □ No □ Unknown
- Previous stroke, serious head trauma, or intracranial surgery in the past 3 months: □ Yes □ No □ Unknown

#### Examination - Perform On Scene
- Speech (repeat "You can't teach an old dog new tricks")
- Facial droop (show teeth or smile)
- Arm drift (close eyes and hold out both arms)

#### MEND Exam - Perform En-Route if Time Allows
- Level of consciousness (AVPU)
- Speech (repeat "You can't teach an old dog new tricks")
- Questions (age, month)
- Commands (close, open eyes)
- Facial droop (show teeth or smile)
- Visual fields (four quadrants)
- Horizontal gaze (side to side)
- Motor - arm drift (close eyes and hold out both arms)
- Motor - leg drift (open eyes and lift each leg separately)
- Sensory - arm and leg (close eyes and touch, pinch)
- Coordination - arm and leg (finger to nose, heel to shin)

#### Pre-Notification and Change in Status
- Hospital Pre-notification: □ Yes □ No
- Change in Status: □ No Change □ Improving □ Worsening
### Stroke Alert
EMS Run Sheet

**EMS - Hospital - Patient**

- **EMS Service #**: [ ]
- **Hospital #**: [ ]
- **Patient ID** (numeric): [ ]

**Dates & Times**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Known Well Date</td>
<td>/ / YYYY</td>
<td>/ : /</td>
</tr>
<tr>
<td>Dispatch Date</td>
<td>/ / YYYY</td>
<td>/ : /</td>
</tr>
<tr>
<td>Depart Scene</td>
<td>/ / YYYY</td>
<td>/ : /</td>
</tr>
<tr>
<td>Symptoms Discovered Date</td>
<td>/ / YYYY</td>
<td>/ : /</td>
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<tbody>
<tr>
<td>Blood Pressure</td>
<td>□ scene □ route □ arrival</td>
<td>Repeat Blood Pressure</td>
</tr>
<tr>
<td>Pulse:</td>
<td>□ □ □</td>
<td>O2 Saturation</td>
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### History

- **Severe headache** □ Yes □ No □ Unknown
- **Head trauma at onset** □ Yes □ No □ Unknown
- **Bleeding/clothing problems, or on blood thinners** (LMW Heparin, Coumadin, Pradaxa, Argatroban, Iprivask, Arixtra, Refludan, Xarelto) □ Yes □ No □ Unknown
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<td>Cincinnati pre-hospital stroke scale</td>
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<td>Speech (repeat &quot;You can't teach an old dog new tricks&quot;)</td>
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Completed EMS Runsheets

Send to:
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Lead Database Administrator
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Strock Assessment

Differential Diagnoses

- Seizure / postictal
- Hypoglycemia
- Bell’s Palsy
- Migraine
- Tumor
Oxygenate the brain – there still may be some left!
Treatment Goals

BP management (?)

CPP = MAP – ICP

If hypertensive crisis in conjunction with stroke, call medical control before lowering pressure

AHA guidelines – drop systolic BP by increments – no more than 25% of initial value, or diastolic approaches 100
Treatment Goals

- Oxygen
- Blood Glucose check
- Cardiac Monitor
  - **A-fib** common cause of emboli
  - **AMI** another cause
- IV access
- Elevate head – facilitate venous drainage
- Aspirin?
What about Stroke Centers?

Positive effects of stroke center are comparable to the effects of timely administration of tPA...

Preferential routing to stroke centers
Iowa EMS Protocol

Utilize CPSS or other reproducible stroke assessment

If stroke symptoms are present with an onset of less than 4.5 hours

▲ Transport to primary stroke center if transport is 30 minutes or less

▲ Transport to closest stroke capable hospital if greater than 30 minutes
Iowa Primary Stroke Centers

Iowa Healthcare Collaborative

www.ihconline.org
Iowa: Primary Stroke Center and Stroke Capable Hospital Service Area
2013 AHA/ASA Pre-Hospital Stroke Guidelines

- To increase both the number of patients who are treated and the quality of care, educational stroke programs for physicians, hospital personnel, and EMS personnel are recommended ([Class I; Level of Evidence B](#)). (Unchanged from the previous guideline)

- Activation of the 9-1-1 system by patients or other members of the public is strongly recommended ([Class I; Level of Evidence B](#)). 9-1-1 Dispatchers should make stroke a priority dispatch, and transport times should be minimized. (Unchanged from the previous guideline)

- Prehospital care providers should use prehospital stroke assessment tools, such as the Los Angeles Prehospital Stroke Screen or Cincinnati Prehospital Stroke Scale ([Class I; Level of Evidence B](#)). (Unchanged from the previous guideline)

- EMS personnel should begin the initial management of stroke in the field, as outlined in Table 4 ([Class I; Level of Evidence B](#)). Development of a stroke protocol to be used by EMS personnel is strongly encouraged. (Unchanged from the previous guideline)

- Patients should be transported rapidly to the closest available certified PSC or CSC or, if no such centers exist, the most appropriate institution that provides emergency stroke care as described in the statement ([Class I; Level of Evidence A](#)). In some instances, this may involve air medical transport and hospital bypass. (Revised from the previous guideline)

- EMS personnel should provide prehospital notification to the receiving hospital that a potential stroke patient is en route so that the appropriate hospital resources may be mobilized before patient arrival ([Class I; Level of Evidence B](#)). (Revised from the previous guideline)
Educational programs are recommended for all levels of providers, from pre-hospital through physician.

*(unchanged from previous guideline)*
Educational programs are recommended for all levels of providers, from pre-hospital through physician

(unchanged from previous guideline)

2006 Continuing Education Survey for EMS Services in Iowa indicated only 17% of had conducted any stroke education in the previous year.
General Public Perception of What to do in case of Stroke

90% would seek medical attention

▶ 43% call 911 immediately

▶ 26% call their family doctor

▶ 11% go straight to the ED
However...

Out of the 750 people surveyed, many did not recognize the signs/symptoms of stroke

- 58% recognized weakness in extremities
- 32% recognized speech difficulties
- 21% either did not know or believed it was an unresponsive episode
- 40% planned to drive themselves to the hospital...
Educational Impact

Before educational programs – 37% of stroke patients presented within 24 hours of symptom onset

After mass educational program (including a big chunk of EMS providers), 86% of stroke patients presented within 24 hours
911 dispatchers should make stroke a priority dispatch, and transport times should be minimized

(unchanged from previous guideline)
911 dispatchers should make stroke a priority dispatch, and transport times should be minimized

(unchanged from previous guideline)

NAEMD protocols rank stroke as an emergent call

EMS agencies should be able to measure this...

Westcom agencies currently reporting 42 seconds
Patients should be transported rapidly to the closest available certified Primary Stroke Center or Comprehensive Stroke Center, or most appropriate institution that provides emergency stroke care
(revised from previous guideline)
EMS personnel should provide pre-hospital notification to the receiving hospital in advance to allow receiving facility opportunity to prepare for treatment.

(revised from previous guideline)
What do we have to do now?

Ensure data is being reported to state – only ~70% of agencies are reporting data

- Look at quality indicators within your own service:
  - Are you performing a reproducible stroke assessment?
  - Are you checking a glucose?
  - Are you taking to appropriate destination (stroke centers)?
  - Did you document time of onset?
  - Did you articulate / foster transfer of care to hospital / call stroke alert if appropriate?
Other Clinical Challenges

Glycemic Control

- Protocols must allow for / promote gradual increases in blood glucose levels in the context of stroke

Data Collection

- Need mechanism for EMS data to get to stroke registry

QA/QI

- Are stroke exams being done (correctly?)
What do we have to do now?

Learn / use MEND exam – stroke task force is strongly encouraging this specific exam

Have you had an update in assessment / stroke treatment for your crews recently? Do you have the current info?

Have you been in contact with your receiving hospital and medical director about stroke routing?
Questions????