Management of Acute Ischemic Stroke

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Disclosures/Relationships

Dr. Cumbler serves on the AHA/ASA Pacific/Mountain Stroke Quality Speakers Bureau.

No commercial conflict of interests in the last 3 years

OBJECTIVES

1. Use validated risk stratification tools to determine which TIA patients need admission
2. Identify appropriate means to manage co-morbid illness after stroke
3. Describe mechanisms to reduce the risk of complications following stroke
4. Institute evidence based secondary prevention therapies.

Ischemic Stroke

- 700,000 ischemic strokes yearly
  - Approximately one stroke every 45 seconds
- 200,000 are recurrent events
- Leading cause of disability in the US
- Quality stroke care attractive to hospitals
  - Ischemic stroke treated with tPA pays extra $6000

Heart Disease and Stroke Statistics-2007 Update.

How Diagnosis-Related Group 559 Will Change the US Medicare Cost Reimbursement Ratio for Stroke Centers.
Stroke 2007;38:1309-1312

Presented by Dr. Don Smith at Rocky Mountain Stroke Summit Dec 2008
Non-contrast Head CT negative
The patient's symptoms begin improving in the Emergency Department

* tPA not given due to mild and resolving symptoms
* Complete resolution 90 minutes after onset

*Should she be admitted?

TIAs
- Within 3 months 10% will have had a stroke
- Half will occur in the first 48 hours
- 2/3 of second strokes cause disability
- 21% are fatal

Rationale for Hospitalization
1. Allows rapid initiation of tPA for 2nd CVA
2. Facilitates evaluation and 2nd prevention
   - MRI
   - Carotid U/S
   - Echo
   - Telemetry
   - Lipids
   - Antiplatelet OR Anticoagulant
   - Statin
   - Carotid Endarterectomy
   - Better outcomes in 1st 2 wks

- National Stroke Association Guidelines
  - Evaluation should occur in 24-48 hours

Theoretically This Could Occur

Outpatient……

Three fourths of TIAs in the ED are sent home
- Subsequent delays in evaluation
- 1/3 not discharged on antithrombotic

Only 2% of TIAs seen in clinic are admitted
- Less than half with afib started on warfarin
- 1/3 did not have workup for > 30 days

Hospitalization associated with decreased risk of second stroke (HR 0.73)
- But increases resource utilization

Predicting Early Second Stroke

**ABCD² Score**

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&gt; 60 years</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>SBP &gt; 140 or DBP &gt; 90</td>
</tr>
<tr>
<td>Clinical Deficit</td>
<td>Unilateral Weakness OR</td>
</tr>
<tr>
<td>Duration</td>
<td>Speech Impairment</td>
</tr>
<tr>
<td></td>
<td>&gt; 60 min OR</td>
</tr>
<tr>
<td></td>
<td>10-59 min</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Present</td>
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</tbody>
</table>

Predicting Early Second Stroke

**ABCD² Score**

<table>
<thead>
<tr>
<th>ABCD² Score</th>
<th>0-3</th>
<th>4-5</th>
<th>6-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Stratification</td>
<td>Low</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td>2 day stroke risk</td>
<td>1%</td>
<td>4.1%</td>
<td>8.1%</td>
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</tbody>
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Low Risk - Outpatient Evaluation
Intermediate Risk - Inpatient, Hospital Observation, or Outpatient Evaluation
High Risk - Hospitalize
Case Continued

Day after hospitalization she wakes from nap with right hemiplegia and aphasia. Last documented normal at noon.

Nurse calls the physician listed on admission orders.
- No answer after three attempts.
- Nursing eventually determines the correct physician to call.

Physician evaluates and orders non-contrast head CT.

Head CT read as negative for bleed. Based on continued symptoms:
- Neurology called for consultation.

Neurologist explains that she is covering multiple hospitals and cannot physically see the patient.
- Recommends MRI with diffusion.

MRI/MRA ordered.

Radiology indicates MRI no longer available as technician has gone home.

Changed to CT perfusion / CTA.

Read as L MCA clot with downstream infarct.

Did this represent exceptional care, standard care, or sub-standard care?
Treatment

Time Thresholds

– Previously 3 hours for IV thrombolysis
  → ASA now recommends 4.5 hours based on ECASS III

– 6 hours for IA thrombolysis

– 8 hours for mechanical thrombolysis

4. Lansberg MG et al. Efficacy and Safety of tPA 3 to 4.5 hours after Acute Ischemic Stroke. Stroke 2009;2438-2441

Time to Evaluation for In-Hospital Strokes

1. 1993 study
  → Median time from recognition to neurology evaluation of 2.5 hours

Albers. Evaluation Times for Patients with In-hospital Strokes. Stroke 1993;24:1817-1822

Admittedly this was 1993—prior to the t-PA era

How Are We Doing Now?
Quality of Care
Evaluation Time for In-Hospital Stroke
Goal is 25 minutes to CT scan

In the Modern Era:
- In only 25% was neurology eval considered an emergency
- Only 15% evaluated by MD within 3 hrs of symptoms
- Only 3% of pts received imaging within benchmark 25 min

Inpatient “Stroke Alert” Program
“Code Gray”
“Code Stroke”
“Code Neuro”
“Code Brain Attack”

- Education of all staff on stroke symptoms
- Any staff member can trigger a stroke alert
- Single alert number
- Rapid mobilization of staff
  - Acute Stroke Team or stroke trained Rapid Response Team
  - Authority to proceed with evaluation

Improving Hospital Processes
In-hospital Stroke Evaluation Team

Evaluation Time for In-hospital Ischemic Strokes

1. Nolan S. Crit Care Nurs Q 2003
2. Farooq MU. Cerebrovasc Dis 2008
3. In-hospital Stroke Evaluation Team
4. Candisio EC. J Stroke and Cerebrovascular Dis in press
Our Patient Has now Suffered an Ischemic Stroke Following Her TIA

*How can we reduce the chance of complications which would risk survival and promote disability?*

Management of Co-morbidities

**Glycemic Control**

- Hyperglycemia present in 1/3 of strokes
- Correlates with worsened outcomes
- Recommendation is to control to <200 with goal of 80-140
- How to achieve this goal and whether intensive insulin drip therapy will end up proving beneficial is not clear

**PEARLS**

- Rarely a need for dextrose in IVF in the first 24 hours
- Metformin problematic-contrast/lactic acidosis
- Sulfonylurea medications associated with hypoglycemia when oral intake interrupted

Management of Co-morbidities

**Hypertension**

*Ischemic Penumbra*

- Zone of at risk tissue susceptible to reduction below the threshold of viability in response to relatively small drops in MAP.
Objective of Blood Pressure Control

- Maximize perfusion to the ischemic penumbra
- Minimize the hypertensive risk of hemorrhagic transformation.

Management of Co-morbidities

Acute Blood Pressure Control

- 80% of stroke admissions have elevated BP.
- Even without intervention, the pressure tends to fall 10-15% in the first 24 hours.
- By day 10 BP will fall 13-20%

Ischemic Stroke Pre-tPA

BP must be <185/110 for tPA

Recommended Steps:

- Labetalol 10-20mg IV (may repeat x1) or
- Nitropaste 1-2 inches
Post-tPA

Goal BP<180/105

- Monitor BP closely.
- BP q15min x 2 hrs then
- q30min x 6 hrs then
- qhr x 16 hrs

**Choice of agent?**
- Nitroprusside
- Labetolol
- Nicardipine
- Fenoldopam
- Nitroglycerin

Avoid sublingual nifedipine and clonidine

*About 1/3 of patients who receive tPA require antihypertensive therapy in the first day.*

Ischemic Stoke Without tPA

**Withhold treatment until BP >220/120**

*“Permissive Hypertension”*

- Titratble
- Avoid overcorrection
- If BP lowered it is generally safe as long as not exceeding 10-15%

Lower targets being investigated
Timing of initiation of antihypertensive therapy controversial

Chronic Blood Pressure Control

- UK TIA study demonstrated a 28% decrease in long term stroke risk for every 10mm drop in systolic BP.

- By comparison- How much risk reduction do you get with aspirin?
  - 15%
Complications

- 64% of stroke patients in a modern stroke unit have a complication in the first week
  - Fever 24%
  - UTI 16%
  - Pneumonia 11%
  - Myocardial injury 16%
  - PE 0.6%

Urinary Tract Infection

- 80% of nosocomial UTIs are associated with catheters
- Infection is directly related to duration of use
- Remove ASAP/use alternatives if possible
- Physicians unaware of catheter
  - 28% of cases

Aspiration Pneumonia

- to > of stroke patients have dysphagia
- One third of patients with aspiration will develop pneumonia
- 50% reduction in risk with formal program:
  - Swallow screen prior to diet/meds
  - Aspiration precautions
  - Oral care
  - Pneumonia/Influenza vaccine
Deep Venous Thrombosis

- Without prophylaxis, up to 75% of patients with hemiplegic stroke will have evidence of DVT
- Effective prophylaxis can reduce the VTE rate by 50-70%
- With prophylaxis- 1% symptomatic VTE rate

Effective prophylaxis can reduce the VTE rate by 50-70%

Stockings and SCDs- non-significant reduction

- Anti-platelet therapy alone is NOT sufficient
- Lower potency heparin prophylaxis (heparin 5000 U bid) less effective than higher potency
- Higher efficacy prophylaxis does not appear to confer increased risk for ICH – Studies have mixed results on this issue

Work-up reveals:
- LDL 120
- Sinus rhythm
- Heart structures normal
- <50% stenosis of both carotids

How do we optimize her chances of avoiding another stroke?
Lipid Management

- SPARCL trial 16% RRR with statin over 5 yrs following CVA
- No change in mortality
- Small increase in hemorrhagic strokes*.
- High-dose, high-potency cholesterol lowering therapy recommended for LDL>100
  - Optional goal of <70

Secondary Prevention
Anti-thrombotics-101

- JCAHO requires anti-thrombotics to be started within 48 hours
- Warfarin for atrial fibrillation
- Antiplatelet therapy if non-cardioembolic
  - Clopidogrel
  - ASA/Dipyridamole ER
  - ASA

Secondary Prevention
Anti-thrombotics-201

- Acute use of heparin has never been proven to improve outcomes.
  - Early second ischemic stroke equally balanced by early hemorrhagic strokes
- Higher doses of aspirin do not provide greater benefit than low doses- UK TIA trial
- For arterial strokes- warfarin is not superior to aspirin- WARSS Trial
- Combination of clopidogrel and aspirin does not provide benefit over monotherapy- MATCH Trial