Stroke Centers and the Brain Attack Coalition: A Model for Improving Cardiac Arrest Care

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Disclosures

- Dr. Alberts is a consultant (unpaid) and member of various technical expert panels (unpaid) for the Joint Commission
Motivational Speaker??
Case

• “Maria”
• 26 year old woman
• 16 weeks pregnant—first child
• Sudden onset of global aphasia, forced R gaze deviation, R hemiplegia
• Care options in 2016 vs 1996
Hypothesis

• A national network of Cardiac Arrest Centers (CACs) will improve the care and outcomes of patients with CA
## Applying Lessons from Trauma and Stroke Centers

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Trauma</th>
<th>Stroke</th>
<th>Cardiac Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>Sudden without warning</td>
<td>Sudden without warning</td>
<td>Sudden without warning</td>
</tr>
<tr>
<td>Time Frame for Treatment</td>
<td>Golden Hour</td>
<td>ASAP but up to 8 hours in some cases</td>
<td>Immediate</td>
</tr>
<tr>
<td>Care Paradigm</td>
<td>Multidisciplinary Team</td>
<td>Multidisciplinary Team</td>
<td>Multidisciplinary Team</td>
</tr>
<tr>
<td>Initial Goals of Care</td>
<td>Stabilize, repair damage</td>
<td>Reperfuse brain</td>
<td>Maintain brain perfusion; Restart heart</td>
</tr>
</tbody>
</table>
# Effects of Trauma Centers on Mortality

**Table 4. Effect of state trauma systems on MVC-related mortality**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted Incidence Rate Ratio (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of a state trauma system</td>
<td>0.91 (0.89–0.94)</td>
</tr>
<tr>
<td>Primary enforcement of restraint laws</td>
<td>0.94 (0.91–0.97)</td>
</tr>
<tr>
<td>65 mph speed limit</td>
<td>1.37 (1.30–1.44)</td>
</tr>
<tr>
<td>Rural population</td>
<td></td>
</tr>
<tr>
<td>&lt;18%</td>
<td>1</td>
</tr>
<tr>
<td>18–31%</td>
<td>1.08 (1.05–1.11)</td>
</tr>
<tr>
<td>32–43%</td>
<td>1.28 (1.24–1.32)</td>
</tr>
<tr>
<td>&gt;43%</td>
<td>1.53 (1.47–1.59)</td>
</tr>
</tbody>
</table>

Nathens et al., J Trauma, 2000, vol 48
### TABLE 5. Effect of state trauma systems on MVC-related mortality by age stratum

<table>
<thead>
<tr>
<th>Age Stratum (yr)</th>
<th>Adjusted Incidence Rate Ratio (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ages</td>
<td>0.91 (0.89–0.94)</td>
</tr>
<tr>
<td>1–14</td>
<td>0.83 (0.76–0.92)</td>
</tr>
<tr>
<td>15–54</td>
<td>0.93 (0.90–0.96)</td>
</tr>
<tr>
<td>55–74</td>
<td>0.88 (0.83–0.94)</td>
</tr>
</tbody>
</table>

Nathens et al., J Trauma, 2000, vol 48
Distribution of Level I and Level II Trauma Centers

Access to Level I or II Trauma Centers

Within 45 min

Within 60 min

### Effects of Stroke Centers on Mortality

#### Table 3. Mortality at Designated Stroke Centers and Nondesignated Hospitals

<table>
<thead>
<tr>
<th></th>
<th>Designated Stroke Center (n = 15297)</th>
<th>Nondesignated Hospital (n = 15650)</th>
<th>Adjusted Mortality Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 d</td>
<td>90 (0.6)</td>
<td>134 (0.9)</td>
<td>-0.3 (-0.6 to -0.0)</td>
<td>.04</td>
</tr>
<tr>
<td>7 d</td>
<td>665 (4.3)</td>
<td>842 (5.4)</td>
<td>-1.3 (-2.1 to -0.6)</td>
<td>.001</td>
</tr>
<tr>
<td>30 d</td>
<td>1543 (10.1)</td>
<td>1951 (12.5)</td>
<td>-2.5 (-3.6 to -1.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>1 y</td>
<td>3412 (22.3)</td>
<td>4067 (26.0)</td>
<td>-3.0 (-4.4 to -1.5)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Xian et al., JAMA, 2011, vol 305
### Effects of Stroke Centers on Outcomes

**Table 4. Outcome of Finnish Patients With Ischemic Stroke**

<table>
<thead>
<tr>
<th></th>
<th>CSC (n=20,045)</th>
<th>PSC (n=10,749)</th>
<th>GH (n=30,891)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unadjusted outcome, no. (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case-fatality by 1 year</td>
<td>3321 (16.6)</td>
<td>2051 (19.1)</td>
<td>8428 (27.3)</td>
</tr>
<tr>
<td>Institutional care at 1 year</td>
<td>1773 (8.8)</td>
<td>1037 (9.6)</td>
<td>4071 (13.2)</td>
</tr>
<tr>
<td>Home at 1 year</td>
<td>14,951 (74.6)</td>
<td>7661 (71.3)</td>
<td>18,392 (59.5)</td>
</tr>
</tbody>
</table>

**Outcome adjusted for patient demographics, OR (95% CI)**

|                                |                |                |              |
| Case-fatality by 1 year         | 0.84 (0.80–0.89)| 0.89 (0.84–0.94)| 1            |
| Institutional care at 1 year    | 0.87 (0.82–0.93)| 0.89 (0.83–0.96)| 1            |
| Home at 1 year                  | 1.22 (1.17–1.28)| 1.16 (1.10–1.23)| 1            |

Meretoja et al., Stroke, 2010, vol 41
Lessons Learned from the Stroke Center Experience

1. Assemble a multidisciplinary group with expertise and experience
   - **Brain Attack Coalition**

<table>
<thead>
<tr>
<th>AAN</th>
<th>AANN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEP</td>
<td>ASNR</td>
</tr>
<tr>
<td>NAEMSP</td>
<td>CNS</td>
</tr>
<tr>
<td>SBC</td>
<td>VA</td>
</tr>
<tr>
<td><strong>NINDS/NIH</strong></td>
<td><strong>CDC</strong></td>
</tr>
<tr>
<td>AHA</td>
<td>NSA</td>
</tr>
<tr>
<td>NCS</td>
<td>SNIS</td>
</tr>
</tbody>
</table>
More BAC Partnerships

• BAC asked for advice and cooperates with:
  – CMS
  – The Joint Commission
  – FDA
  – NIH

• This provided the BAC with a certain level of ‘gravitas’, which aided its initiatives
Advantages of the BAC

• Instant expertise in all major areas
• Credibility of recommendations
• Buy-in from all major organizations
• No one left to object
Disadvantages of the BAC

• Large number of member organizations
• Slows decision making
• Can cause disagreements for some recommendations
  – Can lead to lowest common denominator
• Competing priorities
Stroke Centers in the U.S. in 2016

• Currently at least 1500 Primary Stroke Centers
• About 200-250 Comprehensive Stroke Centers
• Most states have a Stroke System of Care
• Most states have some type of stroke triage or diversion paradigm

• HOW DID WE GET THIS DONE??
Key Steps

- Verification of Stroke Centers
  - Prove staffing, infrastructure, care protocol, and outcomes
  - BIG STEP: Joint Commission begins formal a certification program in 2005
    - Instant credibility
    - Actual competition in some cities and regions
  - Then other groups begin certification programs
    - HFAP, DNV, etc.
State Designation

- Many states then designated hospitals as Stroke Centers based on JC certification
- This motivated/allowed EMS to by-pass non-stroke center hospitals
- Regional triage protocols were developed
- Still faced important hurdles.................
Overcoming Hurdles

• We asked hospitals if they minded being by-passed
  – about 30% had no interest in treating stroke and were OK with by-pass

• EMS has significant national diversity
  – Like herding cats…..
  – Empowered EMS to develop local protocols
  – Move system forward

• Concerns about over-crowding specific hospitals and long transport times
  – Marketplace adapted
  – More hospitals became stroke centers
  – Trend continues………..
Design a System with Flexibility

• Track outcomes and change protocols as indicated by the data
• Evolve as the standards of care change
  – Stroke centers changing due to proof of EVT
• Look for opportunities to collaborate in terms of care, research, etc.
  – GWTG-Stroke—national registry of in-patient care metrics and outcomes
  – Mission Lifeline-Stroke—focusing on EMS/ED care metrics
Important Differences

STROKE/BAC

- EMS recognition incorrect in 50% of cases
- Only 1% of EMS calls
- Many mimics
- Poor lay knowledge
- Public education for recognition, not Rx

CARDIAC ARREST

- EMS recognition pretty good
- Common EMS call
- Few mimics
- Reasonable lay knowledge
- Public education for TREATMENT
## Different Levels of Centers

<table>
<thead>
<tr>
<th>Disease</th>
<th>Level of Center</th>
<th>Services</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>CSC</td>
<td>Full diagnostic and Rx services</td>
<td>24/7 availability; NICU, EVT; research and outreach</td>
</tr>
<tr>
<td></td>
<td>PSC</td>
<td>Routine diagnostic and Rx services</td>
<td>24/7 availability</td>
</tr>
<tr>
<td></td>
<td>ASRH</td>
<td>Limited services</td>
<td>Stabilize patient; IV TPA, Telesstroke, transfer most patients to PSC, CSC</td>
</tr>
<tr>
<td>Trauma</td>
<td>Level 1</td>
<td>Full services provided by specialists in many areas</td>
<td>24/7 in-house staffing</td>
</tr>
<tr>
<td></td>
<td>Level II</td>
<td>Most essential services available</td>
<td>Research not required</td>
</tr>
<tr>
<td></td>
<td>Level III</td>
<td>Emergency resuscitation</td>
<td>Transfer some patients</td>
</tr>
<tr>
<td>CACs</td>
<td>Comprehensive</td>
<td>Restart heart; advanced cardiac care, hypothermia</td>
<td>Research program; 24/7 staffing</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>Restart heart; some cardiac care</td>
<td>Likely transfer some patients</td>
</tr>
<tr>
<td></td>
<td>Initial Care</td>
<td>Restart heart</td>
<td>Transfer most patients</td>
</tr>
</tbody>
</table>
PROPOSAL

1. Set up a CAC (Cardiac Arrest Coalition):
   - Reach consensus on key care elements
   - Set priorities
   - Speak with one voice
   - Help organize various groups
   - Bring focus to various care initiatives
Proposal

• 2. Form a national network of Cardiac Arrest Centers
  – Backbone of care
  – Establish a formal objective certification process
    • Avoid self-certification or self-attestation
  – Focal point for education and research
  – Track outcomes
  – Lobby for funds and support
“Maria” Follow-Up

- EMS recognized a severe stroke
- Taken to our CSC
- Not treated with IV TPA
- Received EVT for L distal internal carotid occlusion
- Excellent reperfusion
- Discharged in 4 days with minimal deficit
- Delivered a normal baby girl few months later
Conclusions

• Cardiac Arrest centers make perfect sense
• Concept worked very well for Trauma and Stroke
• Many parallels in the diseases and care paradigms
• When the going gets tough….always ask “What is best for the patient?”
• The answer will guide you to the best path forward