Making Telestroke Work for our Patients

The World is “Flat”: A Brief Future of Telestroke

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Disclosures

• Co-Founder REACH Health Inc, Board of Directors
Many/Most US Hospitals NOT treating stroke patients with IV tPA

• MEDPAR database revealed that 64% of US hospitals did not treat a single Medicare patient with tPA over a 2 year period

Bed size, region, and population density associated with low tPA usage

The Geographic Penalty

- The quality of stroke care is dependent upon the hospital you go to.
- If you live in a rural area or "underserved acute stroke care" area you will NEVER receive tPA.
- Of the 5779 US hospitals, 2003 are "rural".
- There is a GEOGRAPHIC penalty for stroke.

REACH Hub & Spoke Telestroke Model

### Feasibility and Reliability of NIHSS via Telestroke

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>Point-to-point ISDN lines</td>
<td>Web-based, Mobile consultant</td>
<td>Point-to-point* Web-based, Mobile consultant</td>
<td></td>
</tr>
<tr>
<td><strong>Number of patients</strong></td>
<td>20</td>
<td>20</td>
<td>41 (ED)</td>
<td>25</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Kappa <em>r=.97</em></td>
<td>Pearson <em>r=.95</em></td>
<td>Kappa <em>r=.85 to .99</em></td>
<td>Kappa <em>r=.94</em></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>9.70 min vs 6.55 min</td>
<td>9.11 min vs 6.24 min</td>
<td>11.4 min vs 10.8 min</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Comments</strong></td>
<td>Remote vs on site NIH all ≤3</td>
<td>Remote vs on site NIH all ≤3</td>
<td>Facial paresis least reliable</td>
<td>Modified NIHSS also reliable</td>
</tr>
</tbody>
</table>

### Early REACH Prototype (REACH 1.0)

ASA Review of Evidence and Guidelines (Stroke, 2009)

- The NIHSS-telestroke examination, when administered by a stroke specialist using HQ-VTC, is recommended when an NIHSS-bedside assessment by a stroke specialist is not immediately available for patients in the acute stroke setting, and this assessment is comparable to an NIHSS-bedside assessment (Class I, Level of Evidence A).

Prospective, Randomized Trial of Telemedicine vs Telephone

Acute Stroke Patients (4 Community Hospital Emergency Rooms)

Telemedicine
28% (31/111) tPA
Correct Treatment Decision: 98%*

Telephone
23% (25/111) tPA
Correct Treatment Decision: 82%

No difference in 90 day functional outcome


ASA Review of Evidence and Guidelines (Stroke, 2009)

- It is recommended that a stroke specialist using HQ-VTC provide a medical opinion in favor of or against the use of intravenous tPA in patients with suspected acute ischemic stroke when on-site stroke expertise is not immediately available (Class I, Level of Evidence B)

Phenomenal Growth of Telestroke in U.S

- Increase in telestroke programs (more than 50 “hub and spoke” in U.S)
- Increase in mean number of spokes per hub from 2007 to 2009 (3.78 to 7.90, p<.05)\(^1\)
- Most academic and integrated service delivery networks have a telestroke program or considering a program; often driven by “competition” and the health care “marketplace”

## A Tale of Two Spokes

<table>
<thead>
<tr>
<th>Type A-Rural</th>
<th>Type B-Suburban/Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 100 beds</td>
<td>&gt; 150 beds</td>
</tr>
<tr>
<td>ED volume &lt;20,000/yr</td>
<td>ED volume &gt;30,000/yr</td>
</tr>
<tr>
<td>No ICU/limited ICU</td>
<td>ICU</td>
</tr>
<tr>
<td>No neurologist on staff</td>
<td>Neurologist on staff</td>
</tr>
<tr>
<td>“Drip and ship” tPA</td>
<td>RN Stroke Coordinator</td>
</tr>
<tr>
<td>Most strokes transferred</td>
<td>“Drip and keep” tPA</td>
</tr>
<tr>
<td></td>
<td>Most strokes kept</td>
</tr>
<tr>
<td></td>
<td>Transfer ICH and some large ischemic strokes</td>
</tr>
<tr>
<td></td>
<td>(basilar, NIH &gt;15)</td>
</tr>
</tbody>
</table>

### The Underserved Rural Sites
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GRU REACH Mega Multi-Hub and Spoke Telestroke Network

A: Rural
B: 200 bed

Comparison of Onset to Treatment times (OTT) between systems
(Switzer et al J Emergency Medicine, 2009)

<table>
<thead>
<tr>
<th>System</th>
<th>OTT</th>
<th>&lt;90 min (%)</th>
<th>&lt; 2 hr (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REACH Telestroke (N=50)</td>
<td>128</td>
<td>24</td>
<td>50</td>
</tr>
<tr>
<td>MCG ED (n=26)</td>
<td>146</td>
<td>19</td>
<td>35</td>
</tr>
<tr>
<td>Published stroke systems</td>
<td>148</td>
<td>&lt;5-10</td>
<td>28</td>
</tr>
</tbody>
</table>
Telestroke call on Labor Day, 2012

E mail received late afternoon on 9-3-12

I was the attending at “hospital X” earlier today.

15 minutes after we started the TPA on the patient with the left hemiparesis, her symptoms complete resolved.

Nurses were astonished and amazed. Family was deeply appreciative.

John Rogers MD, FACS, FACEP
Associate ED Medical Director

TEMPiS Telestroke Network in Bavaria

- Open intervention trial of telestroke-directed care in 3122 patients
- 5 community hospitals with telestroke vs 5 control
- Patients in telestroke hospitals had better outcomes; (44% vs 54% poor outcomes at 3 mos)

Is “Hub and Spoke” Telestroke Cost-Effective?

  - Decision analytic model for 90 day and lifetime horizons with Hub and 8 spokes
  - ICER of $108,363/QALY for 90 day and $2449 for lifetime horizon (societal perspective) (< threshold of $50,000/QALY)

  - ICER about $50,000/QALY at one year
  - Telestroke “dominant” in quality and cost after 2 years and improved over longer time scale

Is Telestroke Cost Effective from the Hospital Perspective (Hub, Spoke, Hub + Spoke)? **YES**

- Decision analytic model using “real data” from Georgia Health Sciences (REACH network) and Mayo Clinic Scottsdale, AZ
- Assumes 1 Hub and 7 Spokes and 5 year horizon
- Each year, network was associated with $358,435 in cost savings; cost sharing can be arranged so that each hospital could achieve an equal amount of cost savings ($44,804/y)
- 6.1 more home discharges per year

“Telestroke: Beyond tPA”

- “e-Stroke Unit”
- Select patients for IA interventions: “Rescue tPA,” basilar artery occlusions
- Identify high risk patients for malignant MCA edema that may require hemicraniectomy
- ICH: SAH, intraventricular needing EVD
- Identify patients for acute stroke clinical trials

The Next Frontier: Acute stroke clinical trials via telestroke

- Permits the inclusion of patients until now excluded from clinical trials
- Will improve the “generalizability” of clinical trial results
- Will increase numbers of patients in clinical trials
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[Diagram of telestroke process]

[Diagram comparing two scenarios]
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[Diagram of telestroke workflow for patients]
Hub and Spoke Clinical Trial Enrollment

- 5/9 of FAST ICH trial identified at REACH site
- 12/17 in NINDS minocycline trial identified at REACH site
- 11/12 received IV tPA

Clinical trial hurdles

- Informed consent issues
  - Powerpoint presentations, video conferencing, recording
- Training of “spoke” staff in clinical research
  - Tele-training by Hub Personnel
- Pharmacy issues (Randomization)
  - Tele-guided by Hub Pharmacy/Pharmacist
Conclusions

• Telestroke can “flatten” stroke care and bring a stroke specialist to ANY rural, community hospital IMMEDIATELY regardless of geography
• Human factors – “local spoke champions” and education critical to success
• Next frontier is using telestroke for acute stroke and emergency neurology clinical trials
• Academic and Regional Medical Centers should become Hubs (Comprehensive Stroke Centers) and support community hospitals as Spokes

Telestroke is a Team Sport

MCG REACH TEAM