Telemedicine

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Disclosures

• Consultant
  – Stryker

• Speaker’s bureau
  – Stryker
  – Penumbra Inc.
  – Genentech Inc.
Objectives

• Clinical problem
• Description of telestroke networks and models
• Clinical outcomes and effectiveness
• Review of Ochsner’s telestroke network
Burden of stroke

• US has ~ 4 neurologists per 100,000 persons
  – Caring for more than 795,000 strokes per year
• Many parts of US are without access to acute services entirely
• Neurologists across the country are opting out of call coverage for stroke and other neurologic emergencies
• Direct and indirect costs of stroke are estimated to be $62.7 billion annually in the US
Burden of stroke

- Rapid recognition and accurate diagnosis are critical
- Many conditions can mimic stroke
- Misdiagnosis rate by primary care and emergency physicians may be as high as 30%
- Delays in diagnosis and misdiagnosis limit the use of proven therapies
- Evidence concerning litigation involving stroke therapy with IV rtPA indicates liability is predominantly associated with failure to provide treatment rather than adverse events
Options for Patients Experiencing an Ischemic Stroke

IV tPA
Gold-standard in ischemic stroke care. Drug is designed to break apart the clot.

Medical Management
Monitor vitals and provide secondary stroke prevention.

Endovascular Clot Removal
Mechanical disruption or removal of the clot using standard endovascular approaches

Bridging Therapy
Meta-analysis Shows a Strong Correlation Between Revascularization and Good Patient Outcomes

* Differences in sICH were not statistically significant between the revascularized and non-revascularized groups.

IV tPA, the “Gold Standard”

- Systemic “Clot Buster”

- FDA Approved for the treatment of AIS in 1996

- Only 8% of ischemic stroke patients are eligible for IV tPA
  - Narrow time window
  - Risk of cerebral and systemic hemorrhage

- Achieves early reperfusion in only 13-50% of large vessel occlusions


Treatment window

• Treatment within the first 3 hours only
  – IV t-PA

• Treatment within the first 4.5 hours
  – IV t-PA

Figure 3: Model estimating odds ratio for favourable outcome at 3 months in rt-PA-treated patients compared with controls by OTT

Adjusted for age, baseline glucose concentration, baseline NIHSS measurement, baseline diastolic blood pressure, previous hypertension, and interaction between age and baseline NIHSS measurement.
Number of patients who benefit and are harmed per 100 patients treated with t-PA in each time window

<table>
<thead>
<tr>
<th>Treatment time-window (minutes)</th>
<th>Benefit</th>
<th>Harm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-90</td>
<td>27.8</td>
<td>1.5</td>
</tr>
<tr>
<td>91-180</td>
<td>23.1</td>
<td>2.6</td>
</tr>
<tr>
<td>181-270</td>
<td>16.9</td>
<td>3.4</td>
</tr>
<tr>
<td>271-360</td>
<td>5.2</td>
<td>7.3</td>
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</tbody>
</table>
Challenges in acute stroke care

- Intravenous thrombolysis reduces long-term disability and is cost-effective in acute ischemic stroke (AIS)
- Intravenous thrombolysis must be delivered within a narrow time window in order for the treatment to be effective
- Lack of stroke specialists and lack of access to endovascular revascularization therapies, especially in rural areas, account for low utilization of intravenous thrombolysis
  - Rate of intravenous thrombolysis is < 5% of AIS cases
POSSIBLE SOLUTION?
Telestroke
Telemedicine

• Defined as the use of telecommunications technologies to provide medical information and services

• First reported to be used for stroke in early 1990’s
  – Term telestroke first used in 1999
Telestroke

- Interactive videoconferencing by bidirectional audiovisual systems
  - Characterized by dedicated, high-quality, interactive equipment
- Coupled with the use of teleradiology for remote review of brain images
- Allows for patient and/or family and both the bedside and distant healthcare provider to see and hear each other in full color
Quality requirements

• > 20 frames per second of bidirectional synchronized audio and video at a resolution capable of being displayed on monitors of ≥ 13”

• Teleradiology is the ability to obtain radiographic images at 1 location and transmit them remotely to another location for diagnostic and consultative purposes
Telestroke advantages

• Helps solve shortage of neurologists and radiologists
• Allows hospitals to become “acute stroke ready”
• Enhances stroke diagnosis
• Increases IV thrombolysis administration rates
• Overcomes geographic barriers to acute stroke care
• Improves long-term outcomes
• A study published in 2011 found that hub-and-spoke telestroke networks were cost-effective in the long term from a societal perspective

Telestroke models

• Hub-and-spoke model
  – Hub
    ○ Usually a Comprehensive Stroke Center
      = Primary Stroke Center with advanced neurological capabilities
    ○ 24 x 7 support with in-house neurology providers
  – Spoke\(^1\)
    ○ Typically smaller hospitals with less extensive neurology coverage
    ○ Underserved hospitals in rural or sub-urban areas

• Third party provider
  – Spoke hospital contracts with a third party provider for neurologist coverage
    ○ Third-party provider employs neurologists to be on call to provide telestroke services\(^2\)
    ○ Spoke hospitals transfer more complicated patients to a tertiary hospital\(^2\)

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Patient flow in hub & spoke network

• **Hub**
  – No changes in patient flow

• **Spoke**
  – Fewer patients transferred out
  – More patients receiving IV thrombolysis and/or endovascular therapy

• **Research study conducted in 2012 assessed costeffectiveness of telestroke networks from individual hospitals’ perspectives**
  – **Study population**
    - Telestroke network with 1 hub and 7 spoke hospitals
    - Total of 1,112 unique AIS patients presenting to the emergency departments in the network hospitals per year
  – **Clinical outcomes**
    - About 114 fewer AIS patients would be admitted to the hub hospital each year, whereas approximately 16 more patients would be admitted to each spoke hospital compared with a no network setting
    - 45 more patients would be treated with IV thrombolysis & 20 more with endovascular stroke therapy in a telestroke network per year

Barriers to telestroke

- Infrastructure funding
- Regulatory changes to promote development of acute stroke-capable or PSC’s
- Reimbursement for services
- Promoting physician adoption and participation
- Physician licensure and credentialing
- Technology assessment and deployment
- Medical liability
- Compliance with privacy and security laws
Best practices

- A program leader to champion the effort
- Support from emergency departments (ED) at spoke hospitals
- On-site visits between hub leaders and spoke sites
- Standardized protocols at all sites throughout the network (hub and spoke)
- Availability of Activase
- Personnel trained in Activase administration
- Spoke hospital training
- Transfer agreements in place
- Ongoing educational planning for hub and spoke personnel

ASSERT: Acute Stroke System for Emergent Regional Telestroke

Ochsner Tele-stroke Network
31 sites currently
Projected 45 sites by late 2015
1267 total telemedicine consults in 2014
IV tPA initiations in 190 patients in 2014
  255 total doses initiated by our team
Site expansion:
  Mississippi
  Future proposed sites: Saudi Arabia & Caribbean
Transfer rate ~30%
Transfers to OMC

- Goal: Patients stay local when possible
- Goal: Make appropriate level of care available for all stroke related patients
- Who is transferred to OMC-NOLA?
  - Critical care patients
  - High complexity
  - Endovascular candidates
- How are patients transferred?
  - Distance and weather dependent
  - Ochsner Flight Care (helicopter/fixed wing)
  - Critical Care ground transport
- Large Strokes
- Most hemorrhages
- Endovascular Candidates
- High Complexity

- Non-Complex IV t-PA
- Non interventional candidates

Any Patient regardless of complexity

- Non-critical patients
- Mild strokes
- TIA

Complex non-critical Stroke, based on NIHSS

Critical Access Hospital
Ischemic Stroke rtPA Administration Rates (Pre- and Post-Telestroke)

Hub and spoke hospital ischemic stroke rtPA administration rates: 6 months pre-telestroke compared to a recent 6 month period post-telestroke.
Telestroke Update

- Total # TPA administrations (as of 12.31.2015) - 812
  - 68 doses in 2011
  - 125 doses in 2012 (842 consults) → 15%
  - 153 doses in 2013 (956 consults) → 16%
  - 190 doses in 2014 (1267 consults) → 15%
  - 216 doses in 2015 (1817 consults) → 12%
Summary

• Telestroke can satisfy requirements for around-the-clock acute stroke coverage and allow for highly efficient dissemination of expertise to neighboring and distant communities for acute stroke treatment and education.
Benefits of telestroke

- Optimization of the use of IV rtPA
- Decrease in time to initiate IV rtPA
- Providing treatment with similar safety as Primary Stroke Centers
- Immediate access to specialty consultation
- Reliable neurologic exams and NIHSS scores
- High use rates of IV rtPA without increase in complications or hemorrhages