Effective Systems of Stroke Care

Presented by:
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System Stroke Program Manager

at
AHA 19th Annual Bistate Stroke Conf
The Ritz Charles
November 3, 2017
Disclosures

• Nothing to Disclose
Objectives

• Identify new paradigms in stroke care to guarantee successful system program management and effective use of resources

• Define ways to enhance collaboration with referring centers to help streamline processes in stroke within a region or city.
9 hospitals

1 hospice house

1 children’s psychiatric facility

Saint Luke’s Physician Specialists

Saint Luke’s Medical Group
Primary Service Area (PSA) – 50 mile radius
- 2016 PSA stroke discharges: greater than 5,000
- SLH market share: 14.1%

Secondary Service Area (SSA) – 150 mile radius
- 2016 SSA stroke discharges: greater than 10,000
- SLHS market share: 21.9%
SYSTEM OF CARE INITIATIVE
In 2015, the standard of care for acute stroke due to large vessel occlusion became endovascular therapy.

In the United States hospitals of varying stroke treatment capabilities competed for patients resulting in uneven care of this vulnerable population.

Within Kansas City, we have developed an efficient model for stroke systems of care that optimizes resources to improve routing of stroke patients to the appropriate stroke hospital and decreases times delays in the much needed treatment that stroke patients need to receive.
We sought to

- Communicate more effective practices for better door to door times
- Improve EMS transport times
- Better delineate stroke treatment
- Enhance collaboration of referring hospitals that result in improved clinical outcomes
ASA Guidelines

**AHA/ASA Guideline**

2015 AHA/ASA Focused Update of the 2015 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

**A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association**

*The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons*

William J. Powers, MD, FAHA, Chair; Colin P. Derdeyn, MD, FAHA, Co-Chair; Joseph G. Brott, MD, FAHA, Co-Chair; John J. Sheehan, MD, MPP, FAHA, Co-Chair; Robert L. van Gijn, MD, FAHA, Co-Chair; Soumitra Chowdhury, MD, PhD, FAHA; Cara Meng, MD, MSc, FAHA; Andrew J. Sayed, MD, PhD, FAHA; Deepak Fort, MD, FAHA; Edward C. Jauch, MD, MS, FAHA; Jeffrey L. Saver, MD, FAHA, Vice Chair; Harold P. Adams, Jr, MD, FAHA; Askiel Bruno, MD, MS; J.J. (Buddy) Connors, MD; Bart M. Damerausch, MD, MSc; Pooja Khatri, MD, MSc, FAHA;

**ASA Policy Recommendations**

**Recommendations for the Establishment of Stroke Systems of Care**

**Recommendations From the American Stroke Association’s Task Force on the Development of Stroke Systems**

**Task Force Members**

Lee H. Schwamm, MD; Arthur Pancioli, MD; Joe E. Acker III, EMT-P, MPH, MS; Larry B. Goldstein, MD; Richard D. Zorowitz, MD; Timothy J. Shephard, PhD(c), CNRN, CNS; Peter Moyer, MD, MPH; Mark Gorman, MD; S. Claiborne Johnston, MPH, MD, PhD; Pamela W. Duncan, PhD; Phil Gorelick, MD; Jeffery Frank, MD; Steven K. Stranne, MD, JD; Renee Smith, MPA; William Federspiel, BA; Katie B. Horton, RN, JD; Ellen Magnis, MBA; Robert J. Adams, MD
**SLH Stroke Activation Volume**

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<th>Yellow</th>
<th>Red</th>
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**Years:**
- **2013:** Oct-13 to May-13
- **2014:** Oct-13 to May-14
- **2015:** Oct-13 to May-15
- **2016:** Oct-13 to May-16
Code Stroke: The Tiered Triage Approach

**RED Criteria:**
- Last Known Well
- 0-4.5 hours (Possible tPA, or IR)

**POC:** INR & Cr
- Obtain Non-Contrast CT
- Mix & Give tPA, if indicated

**YELLOW Criteria:**
- Wake-up Stroke
- Onset Time Up to 12 hours or unknown
- Outside tPA window
- TPA Contradicted
- Trauma
- TIA/Fluctuating Sx
- ICH/SAH (Possible IR)

**POC:** INR & Cr
- Obtain Non-Contrast CT

**GREEN Criteria:**
- Last known Well Confirmed at Greater than 12 Hours
- Confused
- Globally weak Impaired
- No focal Sx

**POC:** INR & Cr
- CT
- Large Vessel Sx? FANG-D

Consider CTA/CTP (and/or discuss with Neurology)
Consider IR

F - Field cut
A - Aphasia
N - Neglect
G - Gaze Preference
D - Dense Hemi-paresis
Goal: Target Stroke Initiative
➢ 75% of tPA in 45 minutes or less!!

Goal: Initiate Procoagulant within 15 minutes of CT result

Goal: Transfer Initiative
➢ 75% of Stroke Transfers Door to Door of 60 minutes or less
Methods

• Utilize routing protocols to give guidance for EMS and non-comprehensive stroke centers to optimize resources that facilitate transport of stroke patients to the appropriate hospital

• Systemize pre-hospital requirements to aid in 60 min door in and door out times

• Request prompt follow-up reports for EMS on stroke transfers
Methods

- Develop algorithms that include preferential shipping of patients to PSC or CSC, or ASRH to PSCs/CSCs

- Recognize Pre-hospital notification as important

- Require an efficient Code Neuro/Stroke Team

- Set PI Goals and make sure the Team knows them!
Methods

• Load radiology images into a cloud environment for remote viewing of images obtained at Acute stroke ready or primary stroke centers

• Pay careful attention to time metrics in the PSC to help aid rapid transport to the CSC

• Give consultative comments, not criticisms
Saint Luke’s System Plan for Transfers

Code Stroke Activated & Arrival to ED

Straight to CT & Labs Obtained

Neurologic Assessment
- Cortical Findings?
- Consider CTA & CTP

CT Read & Images into SMR Cloud

Consider Initiation of EMS

Call to eDOC One Transfer Team

Door to Door Goal of 60 minutes
Results

• Mean door to recanalization rates decreased from 224 minutes in 2013 to 86 minutes in 2016. National data was benchmarked at greater than 120 minutes.

• Stroke treatment rates for tPA increased from 19.8% in 2013 to 22.7% in 2016, (national rates are averaging around 10%) and endovascular treatment rates of 14.6% to 18.1% in the same time period (national rates currently at 2.7%).

• Conversely, complication rates from stroke treatment declined within the same period from 7.4% to 1.4%. (National complication rates are 7.0% for same period.) Risk adjusted mortality decreased and symptom onset to reperfusion of vessel times decreased.
<table>
<thead>
<tr>
<th>Stroke Treatment</th>
<th>SLH 2014</th>
<th>SLH 2015</th>
<th>SLH 2016</th>
<th>National</th>
<th>Regional</th>
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<tr>
<td>tPA</td>
<td>19.8%</td>
<td>22.0%</td>
<td>22.7%</td>
<td>13.2%</td>
<td>17.6%</td>
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<tr>
<td>Endovascular Treatment</td>
<td>14.6%</td>
<td>14.6%</td>
<td>18.1%</td>
<td>2.7%</td>
<td>4.6%</td>
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<tr>
<td>Combined</td>
<td>34.4%</td>
<td>36.6%</td>
<td>40.8%</td>
<td>15.9%</td>
<td>22.4%</td>
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</table>

SLH treats stroke patients 2 ½ times more than the National Average
Due to more efficient system processes and routing protocols, we are able to treat faster and with markedly improved outcomes.

<table>
<thead>
<tr>
<th>Nonsurgical Complication Rates (%)</th>
<th>SLH 2015</th>
<th>SLH 2016</th>
<th>National</th>
<th>Regional</th>
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<tr>
<td>Bleed Rate after tPA</td>
<td>0.0%</td>
<td>0.0%</td>
<td>3.0%</td>
<td>2.8%</td>
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<tr>
<td>Bleed Rate after Endovascular</td>
<td>5.6%</td>
<td>1.8%</td>
<td>12.8%</td>
<td>6.5%</td>
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<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.8%</td>
<td>1.4%</td>
<td>7.0%</td>
<td>7.3%</td>
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</table>
A Case Study: Systemizing Stroke Care
Case Study

- 65 year old male patient was eating dinner at 1945 when he suddenly stopped talking and developed right sided flaccidity. His wife tried to get him into the car but he was unable to walk and slid to the ground.

- EMS was called and notified Emergency Department en route of stroke activation.

- Upon arrival to the ED patient was taken directly to CT. His NIH was 20 and there were no contraindications for tPA.

- Patient receive tPA at PSC facility
Case Study

• Patient Transferred: 2105

• Door to Door: 51 minutes

• Upon arrival to the CSC the NIH increased to 25 as stroke continued to evolve. CTA/P showed Left MCA infarct with considerable area of penumbra and fairly large core.

• The IR team was pre-activated and successful thrombectomy was achieved.
<table>
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<tr>
<th>Action</th>
<th>Actual time</th>
<th>Minutes elapsed</th>
<th>Goal time in minutes</th>
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<tr>
<td>ED arrival to Code Stroke activation</td>
<td>2009</td>
<td>PTA</td>
<td>15</td>
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<tr>
<td>Stroke team arrival</td>
<td>2014</td>
<td>0</td>
<td>15</td>
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<tr>
<td>ED arrival to CT head initiated</td>
<td>2016</td>
<td>2</td>
<td>25</td>
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<tr>
<td>ED arrival to initial doctor evaluation</td>
<td>2017</td>
<td>3</td>
<td>10</td>
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<td>ED arrival to CT results</td>
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<td>Neurologist consulted</td>
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<td>CT results to tPA bolus</td>
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<td>ED arrival to tPA bolus</td>
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Case Study: L MCA

Pre-Thrombectomy

Post-Thrombectomy

IR Thrombectomy
Post intervention he had some improvement in his symptoms, at 24 hours and continued to have right sided arm > leg weakness, droop, and minimal expressive aphasia.

His wife states he was able to eat using his right hand. Cardiac testing is ongoing as probable source of infarct.

24 hour NIH = 16.

Discharge NIH (to Rehab) = 8
Results

- Risk adjusted mortality can decrease
- Thrombolytic complications in intravenous and endovascular patients can decrease
- Treatment rates can increase
- Symptom onset to reperfusion of vessel times can decrease
Conclusion

- Implementation of field to hospital and hospital to hospital routing protocols is associated with improved clinical outcomes.

- Collaborating with referring ASRHs and PSCs on best practices results in a consistent stroke work-up process that is more streamlined aids the CSC.

- Positive process changes in referring centers sets a higher bar for time metrics, and pushes the CSC to higher standards.
Questions?

Thank you!
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