Building a Stroke Center: PSC & CSC

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Disclosures

- Genentech:
  – consultant, speaker, Advisory Board

- Corazon, Inc.
  – consultant, speaker

- The Joint Commission
  – speaker, DSC reviewer: PSC & CSC
Objectives:

1. Determine the market and facility specific role of a PSC/CSC
2. Integrate TJC standards into an understanding of the more difficult components of a PSC/CSC
3. Provide foundational information to assist in the business case and success of a PSC/CSC

Questions For You???

- Current PSC?
- Developing PSC?
- Independent Facility?
- Part of a 2-3 hospital system?
- Part of larger hospital network?
Primary Stroke Centers: 11 elements *
(foundation for TJC certification program)

- EMS Collaboration - actual or attempted
- ED Systems - performance measures
- Stroke Team - acute response & interdisciplinary design
- Stroke Unit - design concept
- Written Care Protocols - design and utilization
- Neurosurgical Services - <2 hours, 24/7
- Neuroimaging - <25/45 minutes, 24/7
- Laboratory Service - <45 minutes, 24/7
- Educational Programs, CME/EU - 8 hours
- Hospital and administrative support
- Outcomes/QI process around specific indicators

* Recommendations for the Establishment of Primary Stroke Centers: JAMA 2000 Vol 283 #23

PSC Update: 2011 *

- Acute stroke team
- Written care protocols
- EMS
- Emergency department
- Stroke Unit
- Neurosurgical services
- Imaging services: brain, cerebral vasculature, cardiac
- Laboratory services
- Rehabilitation services
- Institutional commitment and support
- PSC director, reimbursement for call
- Stroke registry with outcomes and QI components
- Educational programs: public and professional
- Support certification process
- Participation in stroke system of care

* Revised and Updated Recommendations for the Establishment of Primary Stroke Centers: A Summary Statement From the Brain Attack Coalition; Stroke 2011, 42:2651-2665
Benefits of Developing a PSC

- Increased market share, market presence
- Decreased LOS, CPC & complications (CMS)
- Improved throughput & decreased ED diversion
- Decreased variability in care, improved long-term patient outcomes
- The foundation of a CSC or neuroscience center

Comprehensive Stroke Centers

- **Volume of cases:**
  - The CSC will care for at least 20 subarachnoid hemorrhage patients per year.
  - The CSC will perform at least 10 craniotomy surgeries for aneurysm per year.
  - The CSC will perform at least 15 endovascular coiling surgeries (either acute or elective) for aneurysm per year.
  - The CSC will administer IV tPA to at least 25 eligible patients per year.

  **Note 1:** Providing IV tPA to an average of 25 eligible patients each year over a two year period is acceptable.

  **Note 2:** IV tPA administered in the following situations can be counted in the requirement of 25 administrations per year:
  - IV tPA ordered and monitored by the CSC via telemedicine with administration occurring at another hospital.
  - IV tPA administered by another hospital which then transferred the patient to the CSC.

  *CSC criteria from website of The Joint Commission*
It is OK to have expectations, just don’t expect them to always work out your way…

Comprehensive Stroke Centers

- What you will need:
  - Full scope neurosurgery (micro-vascular)
  - Neuro-interventional program
  - Neuro-radiology; advance imaging protocols
  - Neuro ICU, Neuro intensivist/Intensivist
  - Neuro APN; NP/CNS
  - Neuro clinical trials/research

ALL verified with call schedules and credentialing process
Neuroscience talent is hard to find and harder to keep
  – Recruit
  – Grow your own (depends on current talent)

Plan on multi-year recruitment for:
  – Neuro CNS (NP easier to find)
  – Endovascular neurosurgeon or neurologist
  – Micro-vascular neurosurgeon
    • National trend for premium/separate on-call pay

Physician Model
  – Alignment of current physician groups
  – Employment of general and/or sub-specialty physicians

Based on current level of service, alignment, ability to move market share

Ability to control variation in preparation for CMS bundled payments (neurology example)
Reduction in variability…

<table>
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<tr>
<th>Campus</th>
<th>FY10 AIS Volume Annualize</th>
<th>FY 10 rtPA cases</th>
<th>FY 10 rtPA rate</th>
<th>FY11 AIS Volume Annualize</th>
<th>FY 11 rtPA cases</th>
<th>FY 11 rtPA rate</th>
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<td>121</td>
<td>7</td>
<td>5.80%</td>
<td>132</td>
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<td>125</td>
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<td>0</td>
<td>0%</td>
<td>83</td>
<td>2</td>
<td>2%</td>
<td>51</td>
<td>0</td>
<td>0.00%</td>
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<tr>
<td></td>
<td><strong>1443</strong></td>
<td><strong>34</strong></td>
<td><strong>2%</strong></td>
<td><strong>1492</strong></td>
<td><strong>46</strong></td>
<td><strong>3%</strong></td>
<td><strong>1227</strong></td>
<td><strong>84</strong></td>
<td><strong>6.84%</strong></td>
</tr>
</tbody>
</table>

DATA: BSV NI FY 12; through June 2012

Comprehensive Stroke Centers

- The hospital will be able to provide:
  - CT/CTP/CTA
  - Catheter angiography
  - Carotid duplex ultrasound
  - MRI, MRC, DWI
  - TCD
  - TEE/TTE

24/7/365
Comprehensive Stroke Centers *

- Surgical & Interventional techniques: 24/7/365
  - Acute ischemic response
  - Acute hemorrhagic response
  - Acute ICP response
  - Acute vasospasm treatment
  - CEA

Dysplastic AcoA with multiple broad neck domes

Comprehensive Stroke Centers *

- Infrastructure
  - Neurovascular/neurosurgical acute care
  - Neuro critical care
  - Neuro OR & interventional suite/staff
  - Extensive data resources
  - Programmatic infrastructure/organization
  - Peer review processes
  - Transfer process and analysis
  - PI processes/Quality assurance/registry submissions

*Recommendations for Comprehensive Stroke Centers: Stroke. 2005;36:1597-1618
Comprehensive Stroke Centers

Eligibility for CSC*

- **Post hospital care coordination for patients.**
  - LT outcomes, 7 day follow-up
- **Dedicated neuro-intensive care unit (ICU) beds for complex stroke patients:**
  - The hospital will have dedicated neuro-intensive care unit (ICU) beds for complex stroke patients, that include staff and licensed independent practitioners with the expertise and experience to provide neuro-critical care 24 hours a day, 7 days a week.
- **Peer review process:** (case conference or M&M)
  - The hospital will have a peer review process to review and monitor the care provided to patients with ischemic stroke, SAH and administration of tPA.
- **Participation in stroke research:**
  - The CSC will participate in IRB-approved, patient-centered stroke research.
- **Performance measures:**
  - Initially, CSCs will be required to collect all of the standardized performance measures for Primary Stroke Centers. Additional CSC-specific performance measures are in development.

*CSC criteria from website of The Joint Commission

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Education/research/outreach programs

- Community education
- PSC/feed network development and educations
- EMS education and development
- Professional educations & development
- Patient education and 1-week follow-up process
- Clinical research program in medicine/nursing

*Recommendations for Comprehensive Stroke Centers: Stroke. 2005;36:1597-1618
Comprehensive Stroke Centers

- Metrics
  - 26 published
  - Not required at initial certification (presently)
  - Significant opportunity to further refine and test
  - Would encourage to select 3-5 and implement/test

- Standards
  - Workshops at TJC in June
  - Repeat Webinar for PSC in Sept & Oct

Questions to ask?
- Where does our facility currently fit?
- What is the developing model of stroke systems in our region/state?
  - EMS policy & routing
  - Gaps in care/market opportunities
- Where do we want to be within the evolving model?
- Is this vision clinically and fiscally sound?

Answer these questions or waste your time and money…
Where does a PSC/CSC fit in a system model?

Representation of how various facilities caring for stroke patients could be organized based on a hospital network or a defined geographic area. Patients can arrive at the various facilities via direct admission or transfer between facilities. N indicates non-stroke center facility.

Alberts et al., Recommendations for Comprehensive Stroke Centers: A Consensus Statement From the Brain Attack Coalition, Stroke. 2005;36:1597

Primary & Comprehensive Stroke Centers

Interstate Level: Operational Stroke Systems

*Figure 1. Regional hospital stroke referral network surrounding Saint Luke's Hospital Stroke Center in Kansas City, MO.*
Acute Stroke Care Hospital Roles

Levels of Service

- Level 1 - Comprehensive Stroke Ctr.
- Level 2 - Survey-Reported Stroke Ctr.
- Level 3 - Basic Stroke Service
- Level 4 - Initial Entry Access

Stroke System of Care Regions

- Southwestern Va
- Northern Va
- Eastern Va
- Central Va

Market Gaps: Stroke

Stroke Hospital Stratification Definitions

**Level 1**
**Comprehensive Stroke Center (CSC):** As defined by the Brain Attack Coalition (BAC) criteria and survey. A CSC can provide care for all levels of acute, sub-acute and chronic stroke and stroke-related care (e.g., thrombolysis, hypertension, rehabilitation, investigational therapies, etc.). A CSC can also provide care for the most complex stroke patients including but not limited to those requiring expertise in neurosurgical, neuroimaging, neurointerventional, and neurocritical care. There is not a current certification program for CSCs but the BAC recommendations for CSCs can be found on their web site.

**Level 2**
**Primary Stroke Center (PSC):** As defined by The Joint Commission (formerly JCAHO) certification criteria (developed in collaboration with the American Stroke Association and based on the Brain Attack Coalition's Recommendations for the Establishment of Primary Stroke Centers). This type of institution has been certified by The Joint Commission as a Primary Stroke Center. For further information see The Joint Commission web site.

**Level 3**
**Basic Stroke Service (BSS):** This is typically a larger institution that may not have the stroke volume, market competition or strategic initiatives to become a certified PSC but has many of the components of a PSC as noted in national survey results (2, 3). By definition this type of institution can fulfill many of the functions of a PSC, although the strategic administrative, clinical, fiscal and/or market impetus is not present to create the internal support for implementing the remaining infrastructure components. This type of institution may or may not plan to seek PSC certification.

**Level 4**
**Initial Entry Access (IEA):** Although this type of institution may have a fully functional Emergency Department, they may not have the stroke volume to provide the impetus to invest in the full infrastructure of a PSC or seek certification. This is typically a smaller institution, those with a very limited stroke population and/or PSC capability only during weekday working hours. They may treat and transport or refer to transfer hyper-acute stroke. Implementation of telemedicine/tele-radiology, transfer agreements and pre-planned transfer routes/services will be most useful in integrating this type of institution within a regional stroke system.

PSC certified by The Joint Commission: [http://www.jointcommission.org/](http://www.jointcommission.org/)
PSC certification: [http://www.jointcommission.org/](http://www.jointcommission.org/)
BAC recommendations: [http://stroke.ahajournals.org/content/full/96/7/1597](http://stroke.ahajournals.org/content/full/96/7/1597)
Why a system is required...

- 75% of all acute care hospitals are <250 beds
- Most strokes are cared for in community hospitals
- Most PSCs are community hospitals
- Most strokes in community hospitals are mild to moderate (MS-DRG changes)
- Few community hospitals can offer IA/MERCI/Penumbra (volume/severity)

Neurovascular Network

- Identify gaps by:
  - Physician needs analysis
  - Gaps in PSC coverage
Benefits of Systems Approach

- Patients transported to & treated at a facility with the capabilities required by patient complexity and severity.
- Increased severity/volume to maintain proficiency for ED, INR, ICU, Surgery
- Defined referral and transfer patterns
- Predictable volume for critical-care, surgical & interventional services
- Decreased liability for designated systems
- Creates viable roles for all acute care facilities with respect to planned business models

Pearls for Systems Design

- Legislative activity has been used in all state models (~50% of states)
- Existing systems have proven the success of interstate models of stroke care delivery
- Defining institutional capacity, telemedicine networks, EMS performance and routing is beneficial baseline state-level data
- Data and graphical models are useful tools for prioritizing actions, demonstrating progress and acquiring support from legislature
- Telemedicine and air transport systems should be incorporated into early state-wide planning
Challenging Components...

- Business case
- Neurology ED coverage
- Training & education: Core Team
- ED performance: Lab turn-around
- Data capture & reporting: Stroke Log

Do you agree?

Neurology Market Share
CY2010 Actual Share of Services by Hospital

<table>
<thead>
<tr>
<th>Year</th>
<th>Discharges</th>
</tr>
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<tbody>
<tr>
<td>2004</td>
<td>8,328</td>
</tr>
<tr>
<td>2005</td>
<td>8,756</td>
</tr>
<tr>
<td>2006</td>
<td>8,054</td>
</tr>
<tr>
<td>2007</td>
<td>6,881</td>
</tr>
<tr>
<td>2008</td>
<td>9,493</td>
</tr>
<tr>
<td>2009</td>
<td>9,164</td>
</tr>
<tr>
<td>2010</td>
<td>9,790</td>
</tr>
<tr>
<td>2011</td>
<td>9,634</td>
</tr>
</tbody>
</table>

Project Market Shift
Total 9834
1% pt. shift 98 cases

Project Volume Shift
Total 9834
Share 33.9%
Volume 3334

31.63% 42.50% 38.62% 37.20% 36.70% 37.05% 34.72%
38.43% 29.40% 30.20% 32.20% 31.20% 31.43% 32.43%
23.80% 21.10% 24.00% 24.80% 25.60% 25.87% 25.03%
8.15% 7.30% 6.90% 5.80% 6.40% 7.47% 8.10%
### Fiscal Year 2007 Payments:

<table>
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<tr>
<th>DRG Description</th>
<th>Relative Weight</th>
<th>Final Payment</th>
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</thead>
<tbody>
<tr>
<td>14 Intracranial Hemorrhage or Cerebral Infarction</td>
<td>1.2118</td>
<td>$6,424</td>
</tr>
</tbody>
</table>

**Payment for mild stroke drops**

**Why NIHSS matters…**

### Fiscal Year 2008 Prepaid Payments:

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<th>DRG Description</th>
<th>Relative Weight</th>
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<th>Decl.</th>
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<th>Weighted Net Impact</th>
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<td>1.1381</td>
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<tr>
<td>66 Intracranial Hemorrhage or Cerebral Infarction</td>
<td>0.8358</td>
<td>$4,382</td>
<td>94022</td>
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</tr>
<tr>
<td>67 Intracranial Hemorrhage or Cerebral Infarction</td>
<td>1.3069</td>
<td>$6,329</td>
<td>1383</td>
<td>$5,057</td>
<td>1.0%</td>
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<tr>
<td>68 Intracranial Hemorrhage or Cerebral Infarction</td>
<td>0.8358</td>
<td>$4,382</td>
<td>94022</td>
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</table>

### ABC Medical Center

**Stroke Center Proforma Incremental Income Statement**

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tbody>
<tr>
<td>Inc. Cases</td>
<td>42</td>
<td>23</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Overall Cases</td>
<td>42</td>
<td>23</td>
<td>10</td>
<td>10</td>
<td>11</td>
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#### Growth 10% 5% 2% 2% 2%

<table>
<thead>
<tr>
<th>Case Type</th>
<th>Total</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIA</td>
<td>18%</td>
<td>60</td>
<td>66</td>
<td>72</td>
<td>75</td>
<td>78</td>
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<tr>
<td>Stroke</td>
<td>79%</td>
<td>350</td>
<td>385</td>
<td>422</td>
<td>438</td>
<td>455</td>
</tr>
<tr>
<td>TPA</td>
<td>3%</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
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#### Case Type Totals:

<table>
<thead>
<tr>
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<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<td>2,266</td>
<td>2,334</td>
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<td>2,476</td>
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<td>5,500</td>
<td>5,665</td>
<td>5,835</td>
<td>6,010</td>
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### Incremental Contribution Margin/Case:

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<th>Case Type</th>
<th>Year 1</th>
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<tr>
<td>TIA</td>
<td>$132,000</td>
<td>$145,200</td>
<td>$163,832</td>
<td>$175,203</td>
<td>$187,544</td>
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<td>$1,482,250</td>
<td>$1,672,450</td>
<td>$1,788,526</td>
<td>$1,914,511</td>
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<td>TPA</td>
<td>$33,000</td>
<td>$36,300</td>
<td>$40,958</td>
<td>$43,801</td>
<td>$46,886</td>
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### Total Incremental Contribution Margin:

- **Incremental Contribution Margin - Growth from Base Year**: $16,350
- **Cumulative Contribution Margin - from Base Year**: $1,770,373

#### Incremental Expenses:

<table>
<thead>
<tr>
<th>Expense Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<td>Other Expenses</td>
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<td>$43,000</td>
<td>$43,000</td>
<td>$43,000</td>
<td>$43,000</td>
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<td>Total Incremental Expenses</td>
<td>$1,528,850</td>
<td>$1,755,183</td>
<td>$1,872,717</td>
<td>$2,018,773</td>
<td>$2,157,350</td>
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#### Operating Margin:

- **Operating Margin**: $1,528,850
- **Cash Flow**: $1,528,850

#### Incremental Contribution Margin - Growth from Base Year:

- **Incremental Contribution Margin**: $16,350
- **Cumulative Contribution Margin - from Base Year**: $1,770,373

### Project Market Share Increase

**Project Volume & Margin Increase**

**Targets to Trigger “recovery plan”**

### Set “success” Targets
Pearls for the Business Case

- Use your own data (no matter how bad….)
- Generally project 3% growth in cost and volume
- New Program-project 7-10% growth first year after certification marketing begins
- Compare results to original business case
- Define the scope and targets of the program

Neurology ED coverage

- The potential scenario:
  - Shortage of neurologists
  - Shortage of “willing” neurologists
  - ED culture not acclimated to acute stroke work up without neurologist
  - Plenty of willing neurologist but response & care variability
  - Aligned or employed neurologists
Tele-neurology: PSC with employed Neuro

1. Less response variability
2. Often same/similar cost
3. Faster response times
4. Easier to recruit

Data capture & reporting: Stroke Log

- Define the “nature” of your program
- Capture all “stroke alert” cases
- Report the following:

<table>
<thead>
<tr>
<th>Volume</th>
<th>Reperfusion Cases</th>
<th>Reperfusion Rate</th>
<th>Not Treated</th>
<th>Why</th>
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</thead>
<tbody>
<tr>
<td>Total Ischemic Stroke Cases</td>
<td>N of all IV/IA MERCI, Penumbra</td>
<td>% of total IS population treated</td>
<td>% of total cases not treated</td>
<td>n/% of reasons for non-treatment</td>
</tr>
<tr>
<td>&lt; 3 hour</td>
<td>N of all IV/IA MERCI, Penumbra</td>
<td>% of total IS population treated</td>
<td>% of total cases not treated</td>
<td>n/% of reasons for non-treatment</td>
</tr>
<tr>
<td>&lt; 6 hour</td>
<td>N of all IV/IA MERCI, Penumbra</td>
<td>% of total IS population treated</td>
<td>% of total cases not treated</td>
<td>n/% of reasons for non-treatment</td>
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### Example

<table>
<thead>
<tr>
<th>Ischemic Stroke</th>
<th>N</th>
<th>Reperfusion Cases</th>
<th>Reperfusion Rate</th>
<th>Not Treated n%</th>
<th>Why</th>
<th>N/%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>41</td>
<td>31</td>
<td>7.5%</td>
<td>379/92.5%</td>
<td>Outside window</td>
<td>N/%</td>
</tr>
<tr>
<td>&lt; 3 hour cases</td>
<td>75</td>
<td>31</td>
<td>41%</td>
<td>44/59%</td>
<td>Resolving symptom*</td>
<td>N/%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hemorrhage risk</td>
<td>N/%</td>
</tr>
<tr>
<td>&lt; 6 hour cases</td>
<td>12</td>
<td>31</td>
<td>24.5%</td>
<td>91/75.5%</td>
<td>Patient refused</td>
<td>N/%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Onsite delay</td>
<td>N/%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>? Salvageable brain</td>
<td>N/%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Age</td>
<td>N/%</td>
</tr>
</tbody>
</table>

*Resolving Symptoms is reason why NIHSS is needed in ED & discharge

### Summary/Pearls

- Explore the data for your own campus/system
- Understand the intermediate and long range goals of your facility/system & align neuroscience
- Know market position/share, competition and gaps
- Complete a business case with measures & triggers
- CSC and NC require a feed network
- Stroke is an excellent neuroscience introduction
THANK YOU!