Integrating Visual Analytics to Enable Evidence-Based Care at the Providence Brain and Spine Institute

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Background and Context
Services Offered:
- Telestroke
- Stroke
- Epilepsy
- ALS
- MS
- Spine
- Movement Disorders

1 Epidemiologist
1 Biostatistician
4 Analysts
1 Assistant Analyst
1 BI Developer
2+ Data Abstractors (in-house)
Stroke in the U.S.

Age-adjusted stroke death rate significantly higher in the NW

One type of stroke (Ischemic) is treatable by a clot busting drug – IV Alteplase – which improves long term outcomes and survival

70% of all strokes are ischemic

3rd Leading cause of death in U.S.

Treatment rates varied from 0-23%

National average treatment rate 1.8%-2.1%
Geography of Patient Care in the Northwest

Perfect for Telestroke
- Two way audio-visual communication via robot to assess stroke patients in rural hospitals
- Hubs: The hospitals that provide services
- Partners: The hospitals that receive services

Diverse Network
- Need: Underserved communities.
- Hospital characteristics: Bed size, level of stroke care designation, & type of providers
- Physical Geography: Majority of the state is rural, large distances, weather, terrain.

All of it influences how we can care for our patients.

Distances range between 10 – 288 miles from stroke specialists

Time is a critical factor in treating stroke

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![Distance Bar Chart]

Miles

Distances range between 10 – 288 miles from stroke specialists

Time is a critical factor in treating stroke
Our Goals

- Increase treatment rate
- Decrease transfers
- Improve outcomes
- Triple Aim

- Develop cross-state stroke registry
- Analytics development
  - Partner Quality Metric Dashboards
Our Challenges and Implications for Analytic Development
One-Size Analytics Vs. Unique Experiences

Reports

“This cannot be right”

Consistent Patient Care

“The way we’ve always done it”

Deployment Vs. Reception/Adoption

Technology

“Don’t show my Data”

Redefining Comfortable

“I’m not a data person”
What We Knew: Changing a Landscape
Starting Landscape

- Excel
- MS Access
- National registry
- Disjointed Data Sources
- Data Integrity
- Apples and oranges
- Few shared definitions

Different Experiences/Different Resources
- Eager to help patients, nervous about change
- Learning curve

- No performance measures
- Data Capture
- No known stroke volume
- Few Abstracted Data

- Static Reporting
- Labor intensive
- Limited view
- Many user groups

- Treatment rates
- Patient Care
- Access
- Processes
- Transfer rates
### Table 1. Pre Telestroke and Quality Initiatives

<table>
<thead>
<tr>
<th>Site</th>
<th># of AIS</th>
<th>Door to CT (Minutes)</th>
<th># Treated</th>
<th>% Treated</th>
<th>Door to Needle (Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL Sites</td>
<td>217</td>
<td>40.0</td>
<td>13</td>
<td>6.0</td>
<td>87.0</td>
</tr>
<tr>
<td>Site 1</td>
<td>45</td>
<td>43.0</td>
<td>4</td>
<td>8.9</td>
<td>87.5</td>
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<tr>
<td>Site 2</td>
<td>42</td>
<td>39.0</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Site 3</td>
<td>26</td>
<td>24.5</td>
<td>1</td>
<td>3.8</td>
<td>82.0</td>
</tr>
<tr>
<td>Site 4</td>
<td>39</td>
<td>62.0</td>
<td>6</td>
<td>15.4</td>
<td>108.5</td>
</tr>
<tr>
<td>Site 5</td>
<td>5</td>
<td>42.0</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Site 6</td>
<td>21</td>
<td>30.0</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Site 7</td>
<td>14</td>
<td>25.0</td>
<td>1</td>
<td>7.1</td>
<td>74.0</td>
</tr>
<tr>
<td>Site 8</td>
<td>9</td>
<td>45.0</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
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<tr>
<td>Site 9</td>
<td>16</td>
<td>27.0</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- 65% of sites did not abstract stroke data prior to telestroke implementation
- 30% were still using paper medical records
Changing the landscape: Data Capture

• Provide a platform for data capture
  – PBSI covers the cost
  – Uniform set of fields and answer options
  – Train sites & ongoing support for abstraction
  – PBSI implements retrospective abstraction
  – Apply for grants
Changing a Landscape: Registry Development

Disjointed Data Sources

Data Integrity

For all Partner Sites: Patient and Data Process

PATIENT at Hood River: NON TRANSFER

ED, Inpatient, DC

- Patient is not transferred but is admitted to this facility.

PATIENT at Hood River: TRANSFER

ED ONLY

Inpatient & DC

- Patient bypasses ED and is admitted to the HUB.

HUB709

HUB8 are the same if HUB A is transferring to HUB B or vice versa. This is a rare occurrence.

HR60

PARTNER DEMOGRAPHIC FORM is completed: all information is filled out for this instance of stroke under the unique ID of HR60.

Stroke Story

Patient identification and some other status details

MATCH ID HR60

Partner is assigned a GWTO’s Number:

GWTO’s LIMITED FORM is completed: The entire form is filled out for this instance of stroke under the unique ID of HR60.

GWTO’s STANDARD FORM is completed: The entire form is filled out for this instance of stroke under the unique ID of HUB709.

ENCOUNTER FORM is completed: The online form is filled out for this instance of stroke under the unique ID of HUB709 & a HUB ENCOUNTER #.

MATCH ID HUB709

Patient is assigned a GWTO’s Number:

MATCH ID HR80

Patient identification and some other status details

Stroke Story

 THESE TWO RECORDS – HR60 & HUB709 must be matched to complete the patient experience across the two hospitals.
Changing the landscape: Data Integrity

Examples of Corrections

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Erroneous Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>gs__arrdatetime</td>
<td>1/1/1941 19:41</td>
</tr>
<tr>
<td>gs__arrdatetime</td>
<td>6/8/2071 13:05</td>
</tr>
<tr>
<td>gs__ctcompidatetime</td>
<td>7/21/1700 17:00</td>
</tr>
<tr>
<td>gs__ctcompidatetime</td>
<td>10/8/1951 20:07</td>
</tr>
<tr>
<td>gs__ctcompidatetime</td>
<td>4/18/2997 0:17</td>
</tr>
<tr>
<td>gs__ctcompidatetime</td>
<td>3/1/3007 13:36</td>
</tr>
<tr>
<td>gs__ctcompidatetime</td>
<td>10/3/4200 19:53</td>
</tr>
</tbody>
</table>
Starting Landscape: Reporting

Example of static reports from 3rd party application
Changing a Landscape: Self-service reporting

- How do we become nimble?
- How do we become faster?
- How do we tell a story with our data?
Reporting: Finding Simplicity (kinda)
Development: Build, Build, Build

• You know your users
• You know the data
• You know your sites
• You know “You”
• Start the conversation
  • Do the End Users Like it?
  • Do you Like it?
  • Is it Sustainable?
Example 1: Behind the Scenes

**Pros:**
- End users loved it!

**Cons:**
- Month to month maintenance of data was awful.
- Data sources were diverse and clunky.
- Analysts hated it!

**Details:**
- Located in Excel and PowerPoint.
- Primary End User: Administration
Example 1: Today

- Today the analyst saves time every quarter

  **Saves ~9 hours**

- End users have easily adapted and preferred the new look

- The ability to drill down!
Example II: The way we communicate

Pros:
- Effective in showing a “mini-story” by physician.

Cons:
- Lots of time for analyst prepare
- End Users easily confused
- Too much time on “How to read”

Details:
- Located in Excel
- Primary End User: Docs
Example II: Today

- Door to Needle times have improved dramatically!
- Docs believe the report card and engage in discussion about the data
Example III: Questioning whether it’s possible

LOS:
- Some hospitals transfer complex patients out
- Other hospitals accept complex patients
- LOS changes based on stroke severity
Example IV: Driving Change

- Performance improvement was a primary focus of our program
- It not only improved patient care but also engaged sites to abstract more data
Supply and Demand … and Pointillism
- 1617 Tableau views for partner dashboards
- 50 Tableau workbooks/ 129 different views for the Hubs/specific reports
- 1150 discrete fields in SQL DB
- Analysts hours of investment went UP
- Users were asked to move through too many different formats
- Data became complex again
- The big picture became harder to see
1. Certain features we want.
2. Certain creativity we need.
3. What is meaningful to a site?
4. What’s too much for a site?
5. Looking at the big picture: can we see it?
A beginning, a middle and an end...

- Title
- Filtering options
- Comparison group Selection

- Analyst’s canvas
- Dynamic graphs – additional options
Current Landscape

DEFINED DATA

DATA INTEGRITY

CROSS-STATE PATIENT-LINKED REGISTRY

Hub Reports
Partner Dashboards
Ad hoc Dashboards
Patient Outcomes: Looking at our Goals
### Table 2. Post Telestroke and Quality Initiatives With Change in Metrics

<table>
<thead>
<tr>
<th>Site</th>
<th># of AIS</th>
<th>Door to CT (Minutes)</th>
<th># Treated</th>
<th>% Treated</th>
<th>Door to Needle (Minutes)</th>
<th>Door to CT Change</th>
<th>Door to Needle Change</th>
<th>Change % AIS Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sites</td>
<td>403</td>
<td>31.0</td>
<td>90</td>
<td>22.3</td>
<td>76.0</td>
<td>-22.5%</td>
<td>-12.6%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Site 1</td>
<td>51</td>
<td>50.0</td>
<td>5</td>
<td>9.8</td>
<td>72.0</td>
<td>16.3%</td>
<td>-17.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Site 2</td>
<td>122</td>
<td>39.0</td>
<td>33</td>
<td>27.0</td>
<td>79.0</td>
<td>0.0%</td>
<td>N/A</td>
<td>27.0%</td>
</tr>
<tr>
<td>Site 3</td>
<td>43</td>
<td>18.0</td>
<td>9</td>
<td>20.9</td>
<td>71.0</td>
<td>-26.5%</td>
<td>-13.4%</td>
<td>17.1%</td>
</tr>
<tr>
<td>Site 4</td>
<td>24</td>
<td>29.0</td>
<td>2</td>
<td>8.3</td>
<td>74.5</td>
<td>-53.2%</td>
<td>-31.3%</td>
<td>-7.1%</td>
</tr>
<tr>
<td>Site 5</td>
<td>28</td>
<td>27.0</td>
<td>8</td>
<td>28.6</td>
<td>59.5</td>
<td>-35.7%</td>
<td>N/A</td>
<td>28.6%</td>
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<tr>
<td>Site 6</td>
<td>19</td>
<td>15.5</td>
<td>10</td>
<td>52.6</td>
<td>89.0</td>
<td>-48.3%</td>
<td>N/A</td>
<td>52.6%</td>
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<tr>
<td>Site 7</td>
<td>37</td>
<td>23.0</td>
<td>6</td>
<td>16.2</td>
<td>78.5</td>
<td>-8.0%</td>
<td>6%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Site 8</td>
<td>50</td>
<td>30.0</td>
<td>7</td>
<td>14.0</td>
<td>96.0</td>
<td>-33.3%</td>
<td>N/A</td>
<td>14.0%</td>
</tr>
<tr>
<td>Site 9</td>
<td>29</td>
<td>24.0</td>
<td>10</td>
<td>34.5</td>
<td>71.0</td>
<td>-11.1%</td>
<td>N/A</td>
<td>34.5%</td>
</tr>
</tbody>
</table>
Deployment
Deployment: Necessities

- Available
- Accessible
- Acceptable

Audience: Partner Sites and PBSI Team
Deployment: Accessibility Challenges

- Confidentiality vs benchmarking within network
- Technological Access
  - HIPAA Compliance
- Sustainability
Deployment: Previous solution to access

Telestroke Consults* and Beam-ins:
April 2011 – October 2011

Telestroke Performance Measures:
Jan 2011 – October 2011; Go Live=April 7, 2011
Deployment: Current Solution to access

- Providence Partners and PBSI team: Direct access to Providence Tableau server
- Non-Providence Partners: Access to Providence Tableau server through Citrix
Deployment: Sustainability
Reception and Adoption
Reception and Adoption: Theoretical model

X 34 Sites and PBSI Team
Reception and Adoption: Challenges

- Site Diversity
- Competing Priorities
- Technology (anticipated)
Reception and Adoption: Solutions

- National Standards
- Design
- Relationships/Training
Reception and Adoption: Results

• 75% of sites accessing dashboards with data updates
• Post-release increase in abstraction
• Dashboards utilized in
  • 4 Joint Commission Reviews
  • Identification and development of new performance improvement plans
• Development of new stroke team
In the past, we have had to wait for our yearly report out from the Brain and Spine Institute to see how we are doing. As a small facility, we do not have the resources to gather data and generate these reports so having the Institute gather and report out all the pertinent data is a great help to us in caring and improving management for our stroke patients.

Reception and Adoption: Response

PBSI Team: Late Adopter to High User
Reception and Adoption: Next Steps

• Assessment of on-going utilization
• Survey for phase two and adjustments
• Expansion to new regions
Thank You

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