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

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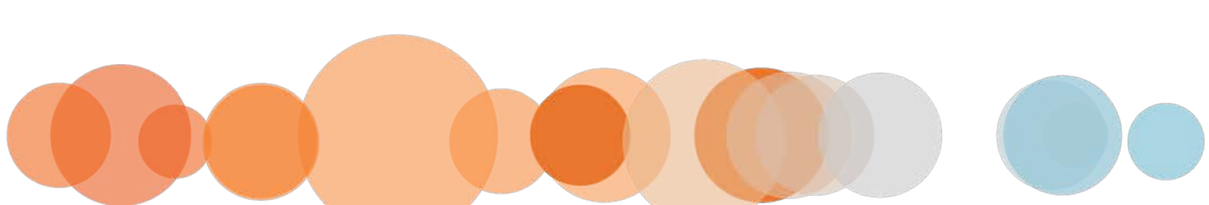
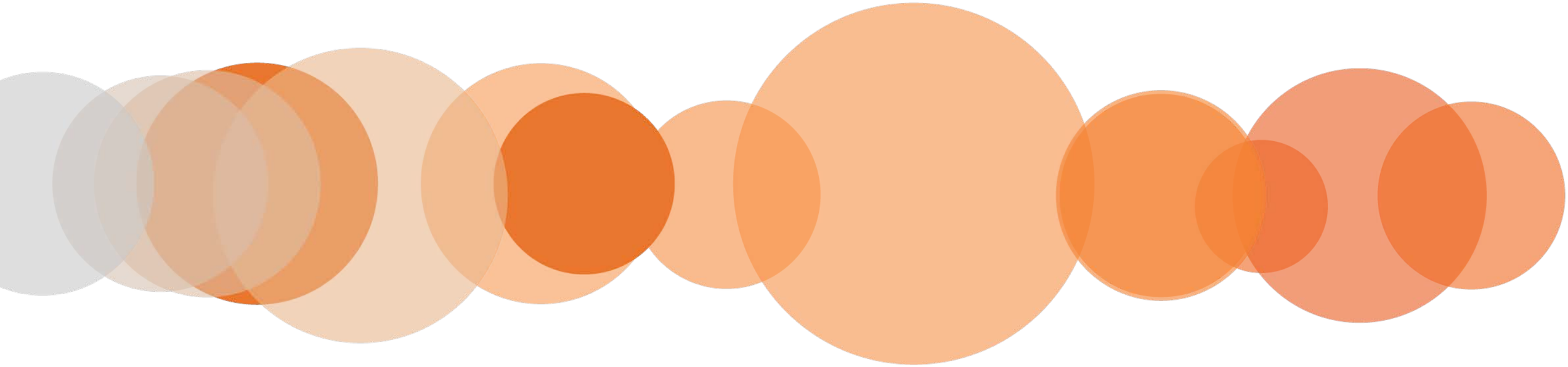


Background and Context



1 Epidemiologist
1 Biostatistician
4 Analysts
1 Assistant Analyst
1 BI Developer
2+ Data Abstractors (in-house)
DATA

Stroke in the U.S.

3rd Leading cause of death in U.S.

Age-adjusted stroke death rate significantly higher in the NW

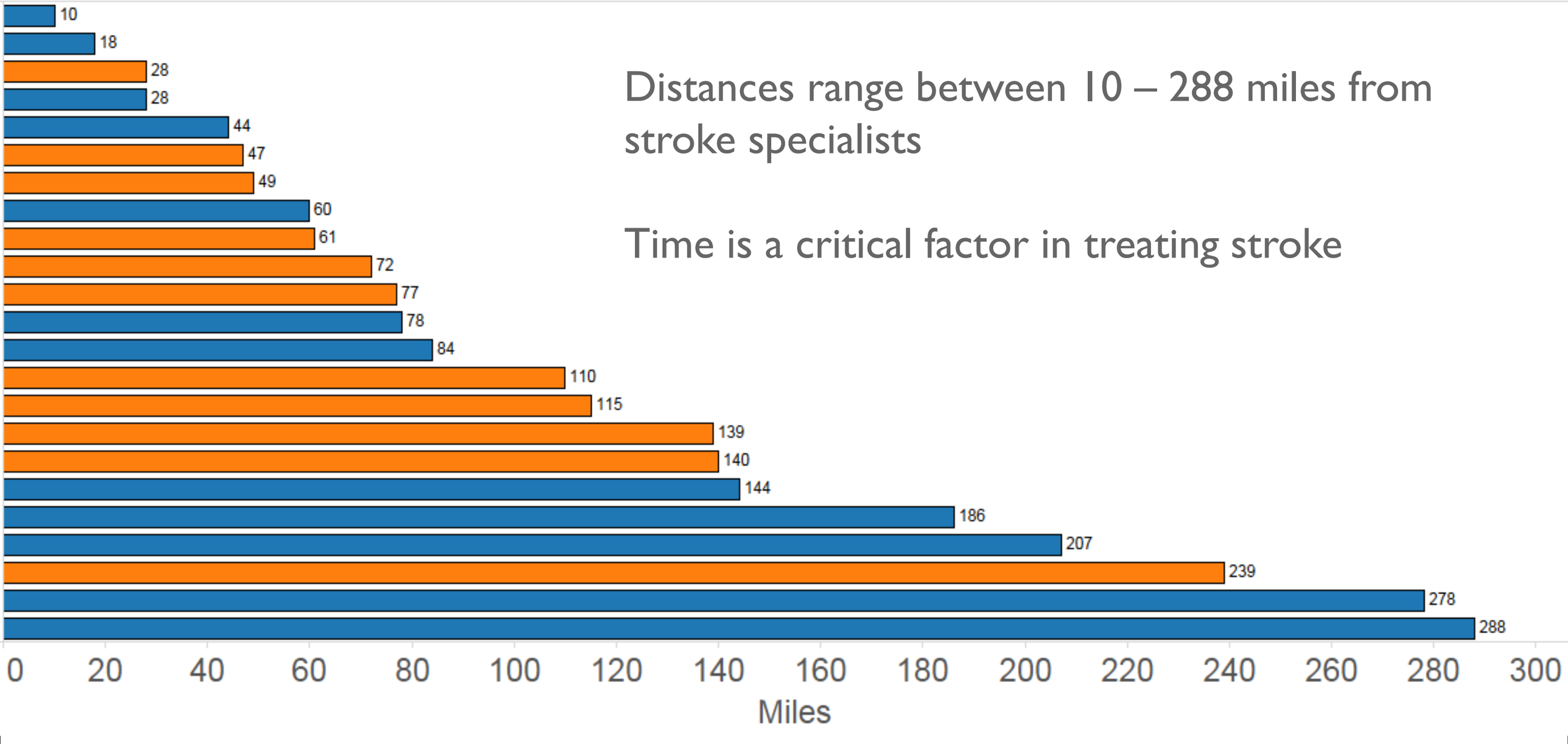
Treatment rates varied from 0-23%

National average treatment rate 1.8%-2.1%

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

Geography of Patient Care in the Northwest



Distances range between 10 – 288 miles from stroke specialists

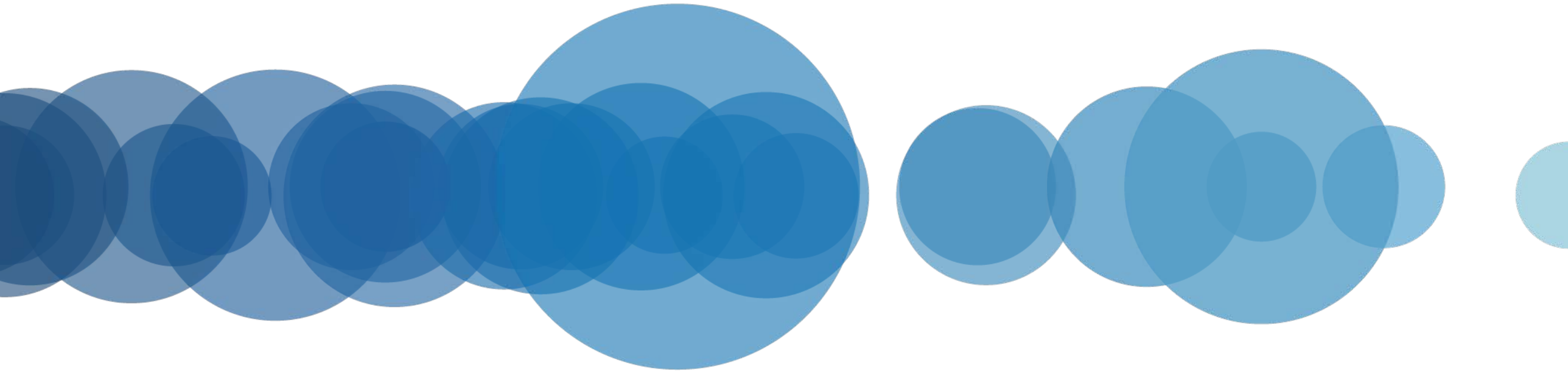
Time is a critical factor in treating stroke

Our Goals

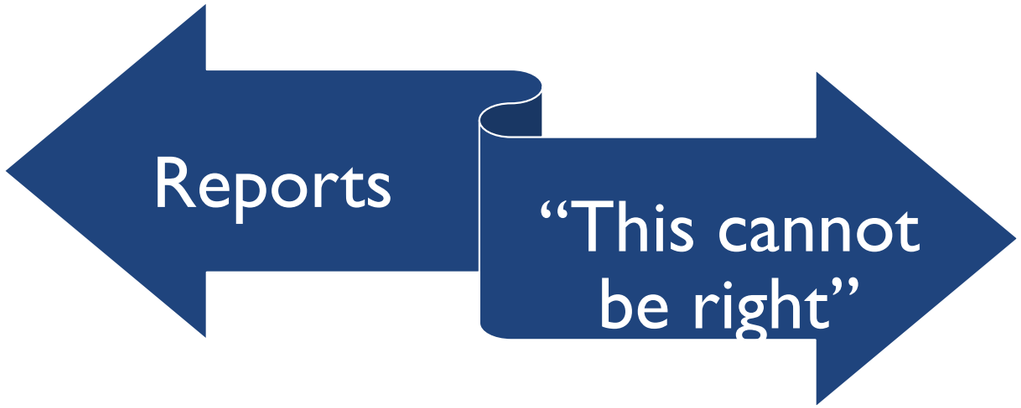
- Increase treatment rate
- Decrease transfers
- Improve outcomes
- Triple Aim

- Develop cross-state stroke registry
- Analytics development
  - Partner Quality Metric Dashboards

Our Challenges and Implications for Analytic Development



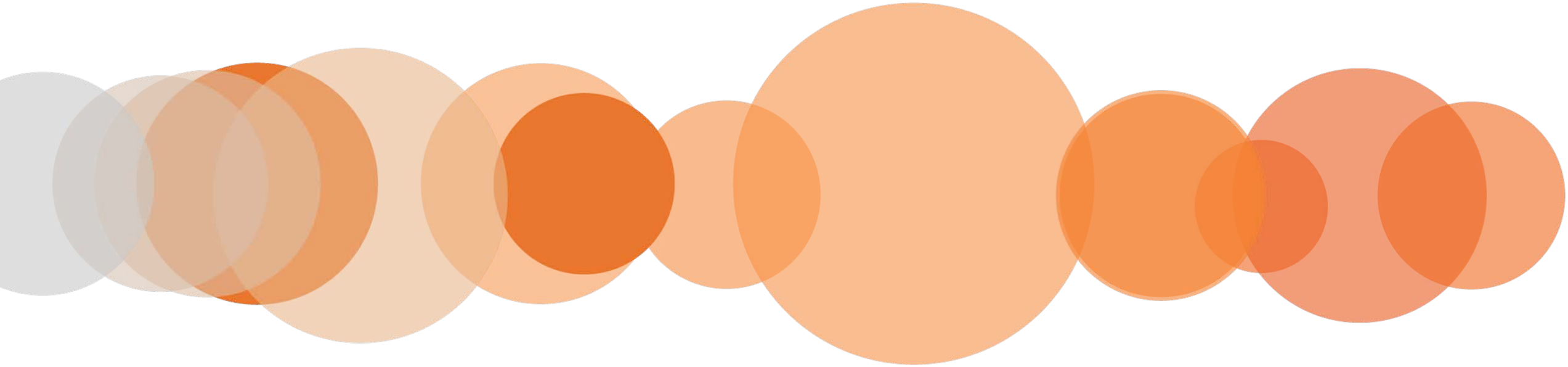
One-Size Analytics Vs. Unique Experiences



Deployment Vs. Reception/Adoption

+ableau

What We Knew: Changing a Landscape



Starting Landscape

No performance measures

Data Capture

No known stroke volume

Few Abstracted Data

Excel

Disjointed Data Sources

MS Access

National registry

Different Experiences/Different Resources

Static Reporting

Data Integrity

Eager to help patients, nervous about change

Learning curve

Labor intensive

Apples and oranges

Limited view

Few shared definitions

Treatment rates

Patient Care

Access

Many user groups

Processes

Transfer rates

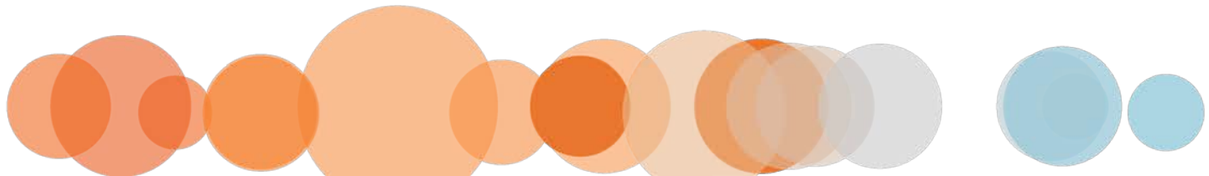
Starting landscape: Data Capture

Data Capture

Table 1. Pre Telestroke and Quality Initiatives

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

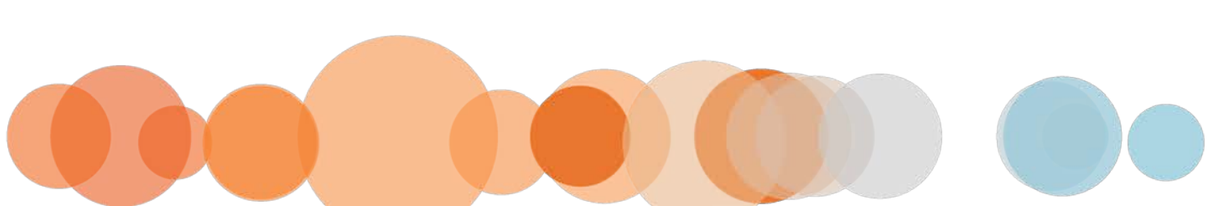
- 65% of sites did not abstract stroke data prior to telestroke implementation
- 30% were still using paper medical records



Changing the landscape: Data Capture

Data Capture

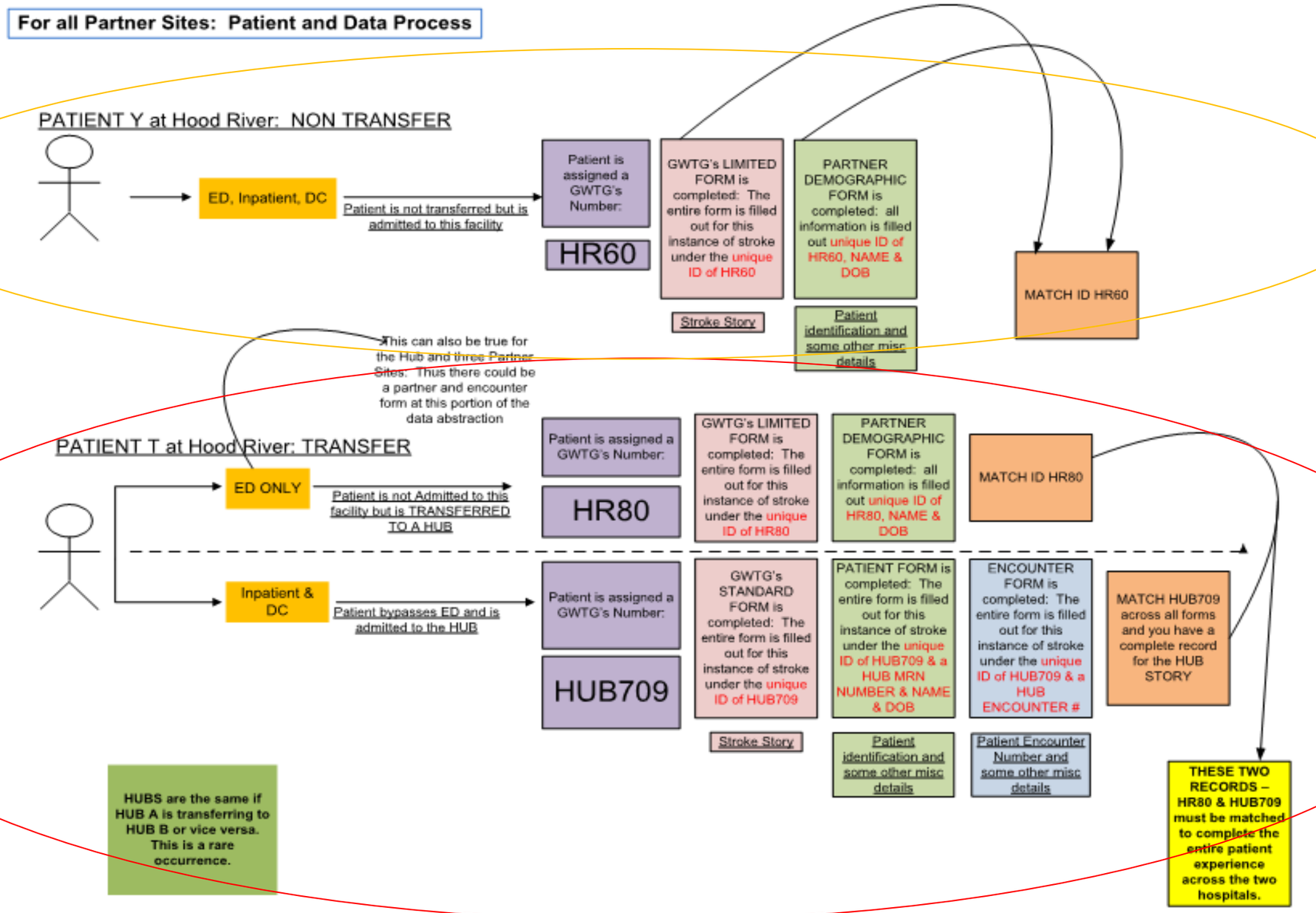
- Provide a platform for data capture
  - PBSI covers the cost
  - Uniform set of fields and answer options
  - Train sites & ongoing support for abstraction
  - PBSI implements retrospective abstraction
  - Apply for grants



Changing a Landscape: Registry Development

Disjointed Data Sources

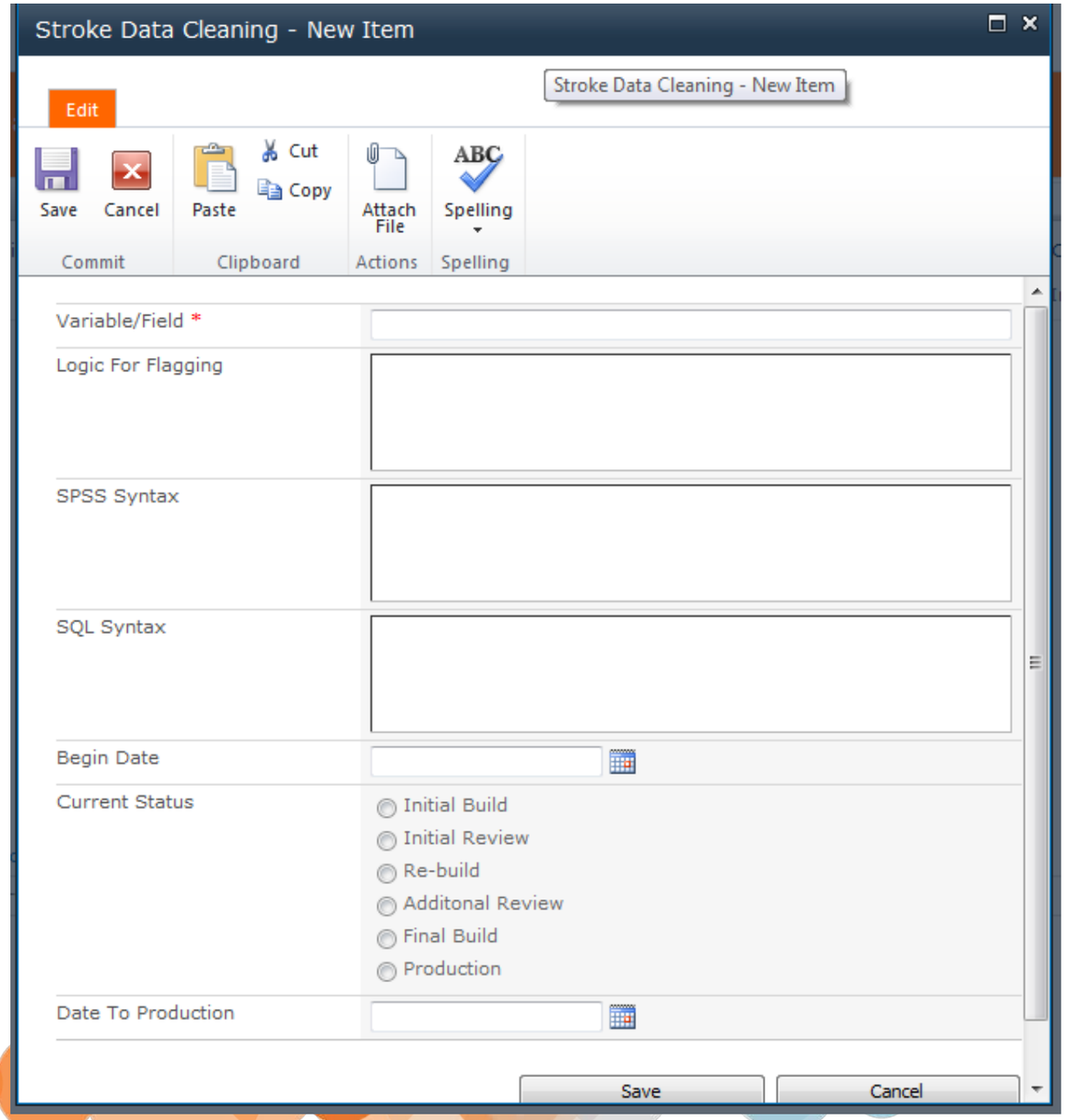
Data Integrity



Changing the landscape: Data Integrity

Disjointed Data Sources

Data Integrity



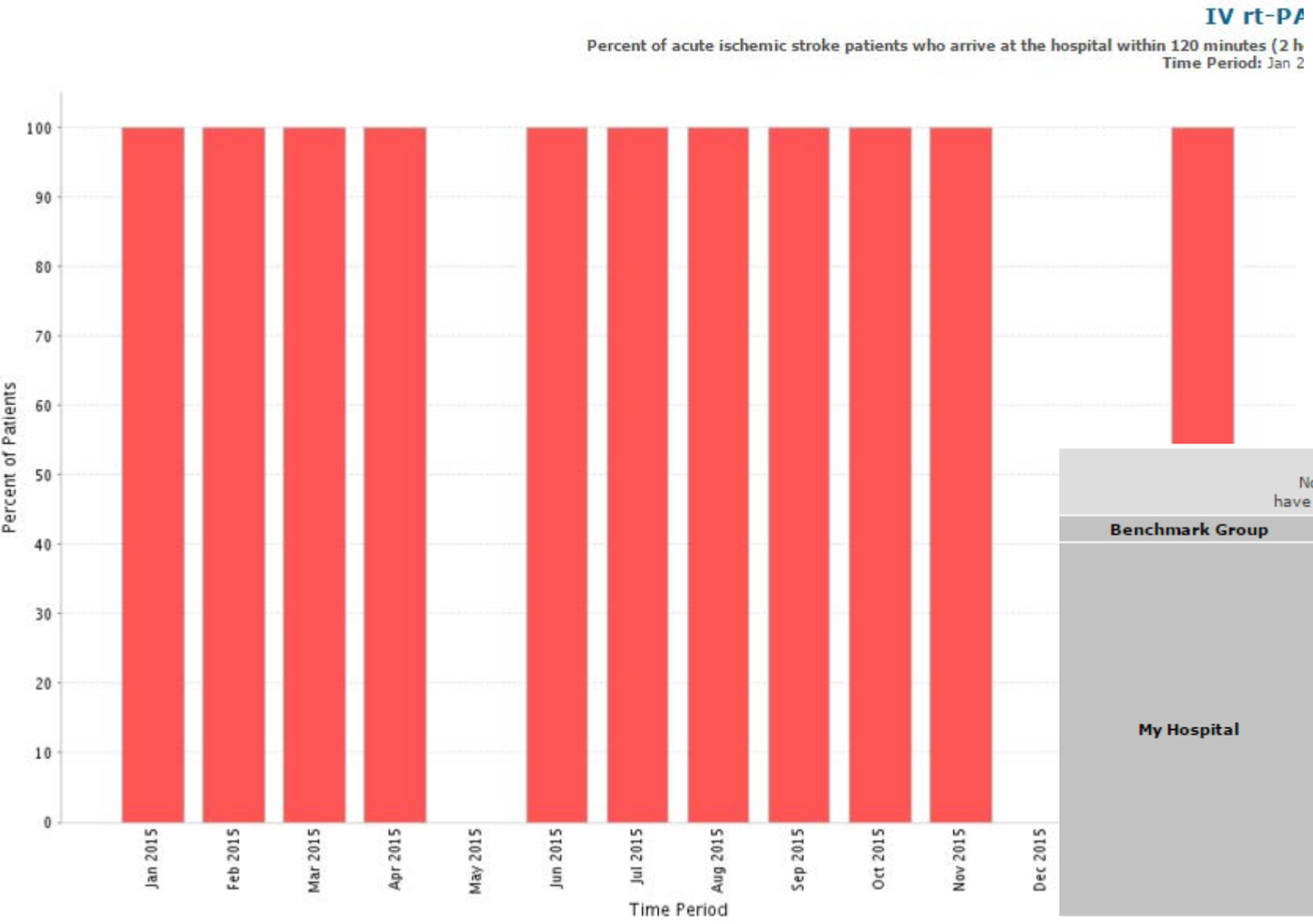
Examples of Corrections

Field Name	Erroneous Value
gs_arrdatetime	1/1/1941 19:41
gs_arrdatetime	6/8/2071 13:05
gs_ctcompdatetime	7/21/1700 17:00
gs_ctcompdatetime	10/8/1951 20:07
gs_ctcompdatetime	4/18/2997 0:17
gs_ctcompdatetime	3/1/3007 13:36
gs_ctcompdatetime	10/3/4200 19:53

tableau

Starting Landscape: Reporting

Static Reporting



Example of static reports from 3rd party application

IV rt-PA Arrive by 2 Hour, Treat by 3 Hour
Note: Time periods/Categories at the end of the graph and data table have been omitted because there were no patient records during that time.

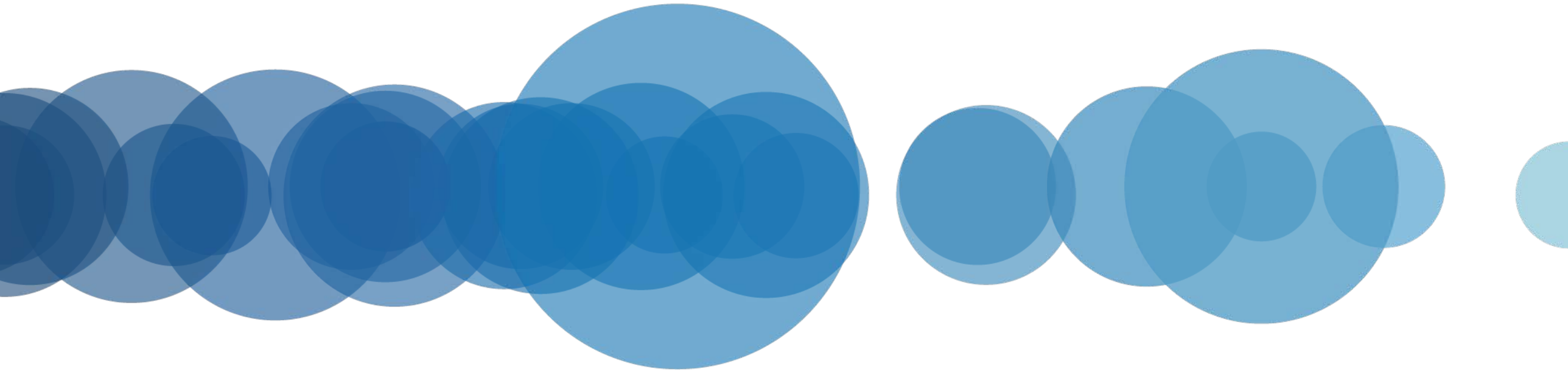
Benchmark Group	Time Period	Numerator	Denominator	% of Patients
My Hospital	Jan 2015	1	1	100.0%
	Feb 2015	1	1	100.0%
	Mar 2015	1	1	100.0%
	Apr 2015	1	1	100.0%
	May 2015	0	0	
	Jun 2015	3	3	100.0%
	Jul 2015	1	1	100.0%
	Aug 2015	1	1	100.0%
	Sep 2015	5	5	100.0%
	Oct 2015	3	3	100.0%
	Nov 2015	1	1	100.0%
	Dec 2015	0	0	
	Jan 2016	0	0	
	Feb 2016	3	3	100.0%

Changing a Landscape: Self-service reporting

Static Reporting

- How do we become nimble?
- How do we become faster?
- How do we tell a story with our data?

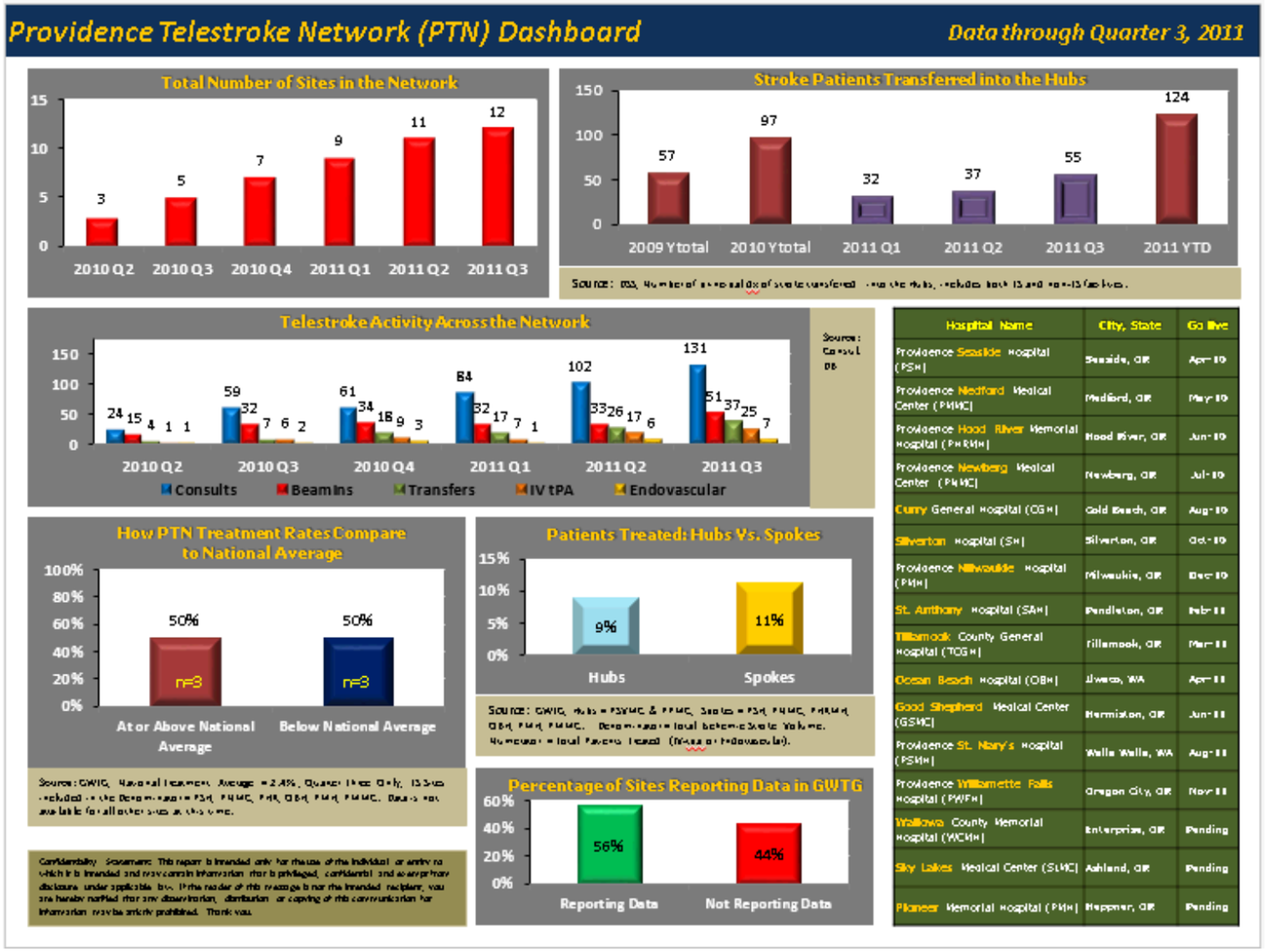
Reporting: Finding Simplicity (kinda)



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 !

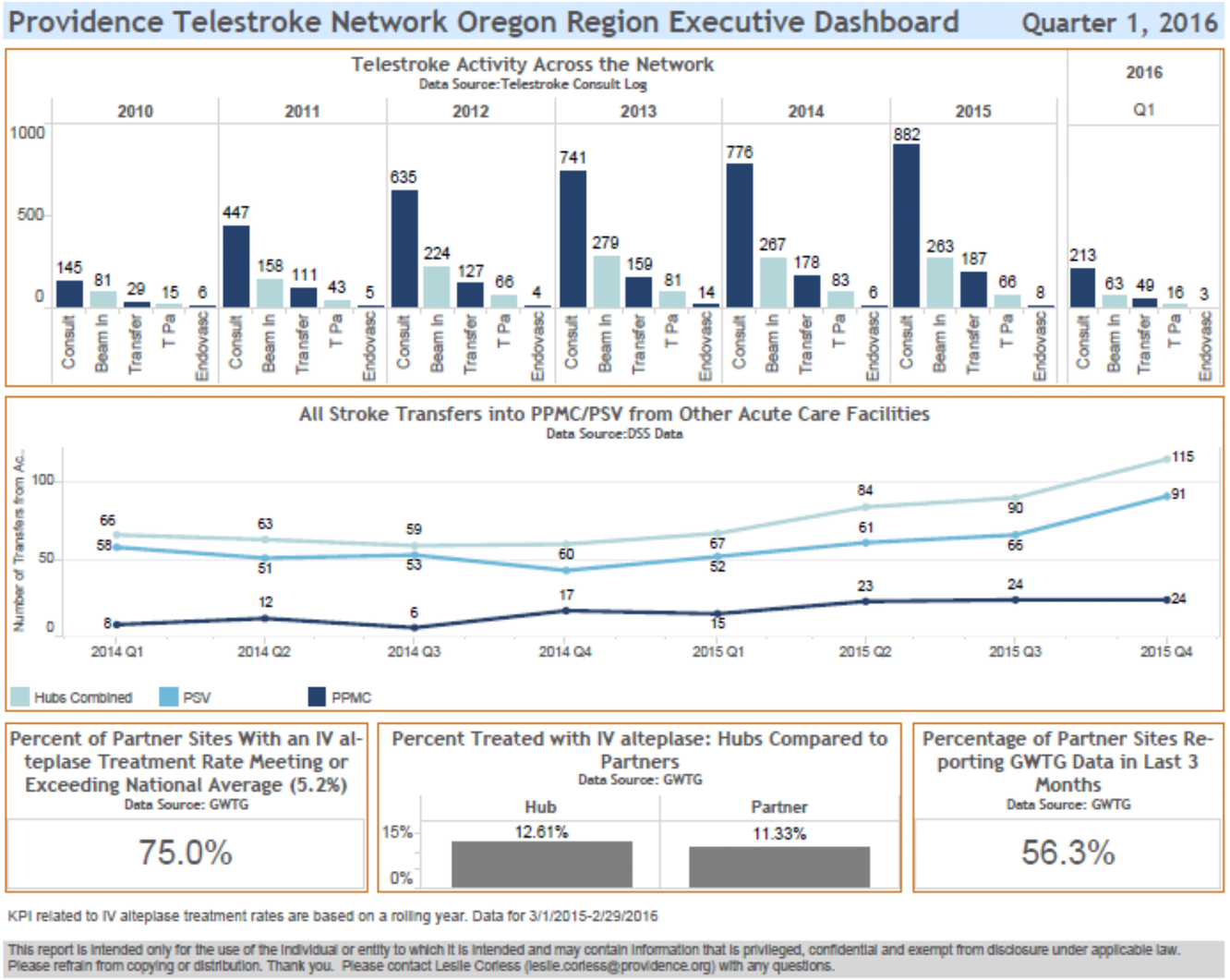
Cons:

- 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

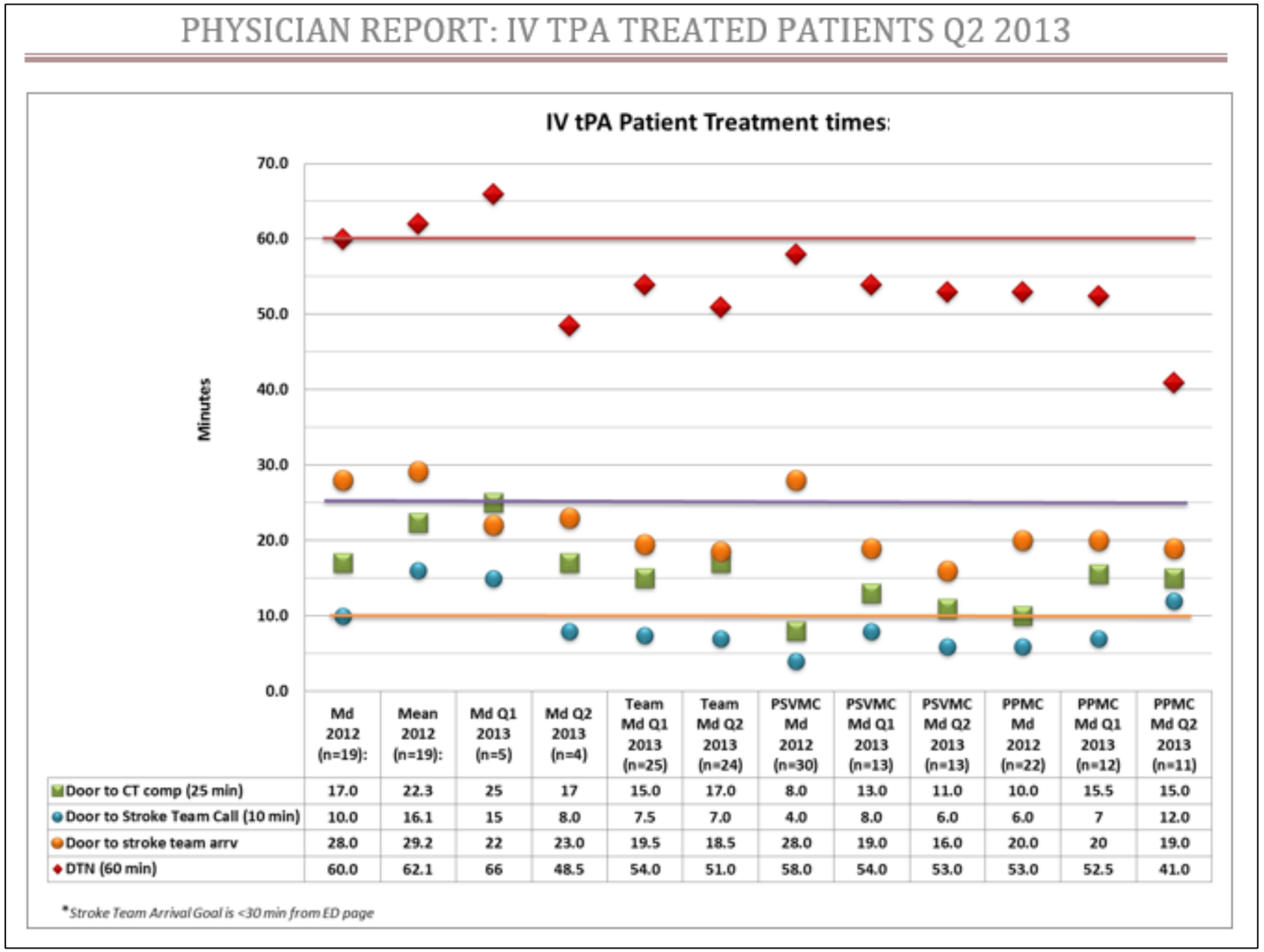


- Today the analyst saves time every quarter

  Saves ~9 hours

- End users have easily adapted and preferred the new look
- The ability to drill down!

Example II: The way we communicate



	Md 2012 (n=19):	Mean 2012 (n=19):	Md Q1 2013 (n=5)	Md Q2 2013 (n=4)	Team Md Q1 2013 (n=25)	Team Md Q2 2013 (n=24)	PSVMC Md 2012 (n=30)	PSVMC Md Q1 2013 (n=13)	PSVMC Md Q2 2013 (n=13)	PPMC Md 2012 (n=22)	PPMC Md Q1 2013 (n=12)	PPMC Md Q2 2013 (n=11)
Door to CT comp (25 min)	17.0	22.3	25	17	15.0	17.0	8.0	13.0	11.0	10.0	15.5	15.0
Door to Stroke Team Call (10 min)	10.0	16.1	15	8.0	7.5	7.0	4.0	8.0	6.0	6.0	7	12.0
Door to stroke team arrv	28.0	29.2	22	23.0	19.5	18.5	28.0	19.0	16.0	20.0	20	19.0
DTN (60 min)	60.0	62.1	66	48.5	54.0	51.0	58.0	54.0	53.0	53.0	52.5	41.0

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

Physician Report Cards: Acute Patients Receiving IVtPA

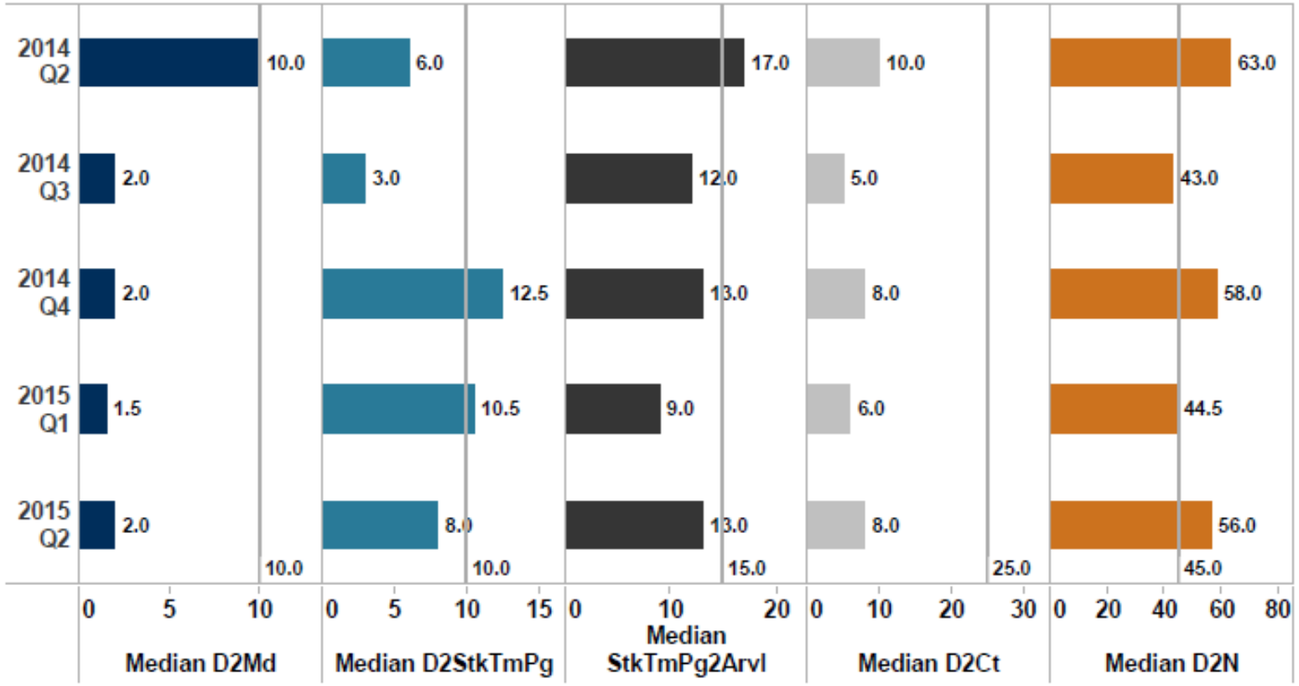
Annual Median Times: Team

	Door to MD	Door to Stk Tm Pg	Stk Tm Pg to Arrv	Door to CT	Median DNT
2014	3.0	7.00	9.0	9.0	48.00

Annual Median Times: Physician

	Door to MD	Door to Stk Tm Pg	Stk Tm Pg to Arrv	Door to CT	Median DNT
2014	7.5	7.00	13.0	6.0	59.00

Quarterly Median Treatment Times for Acute Stroke by Physician

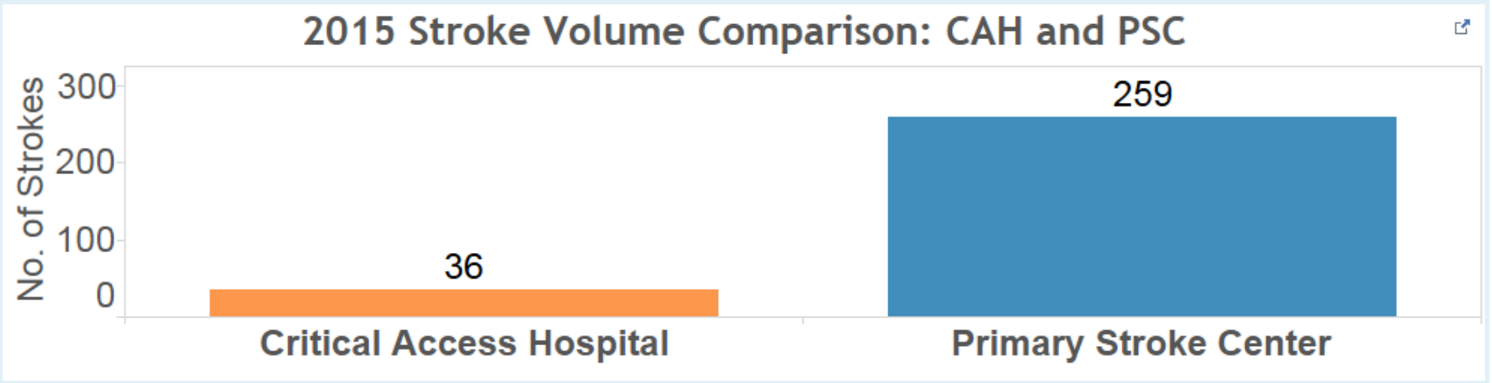


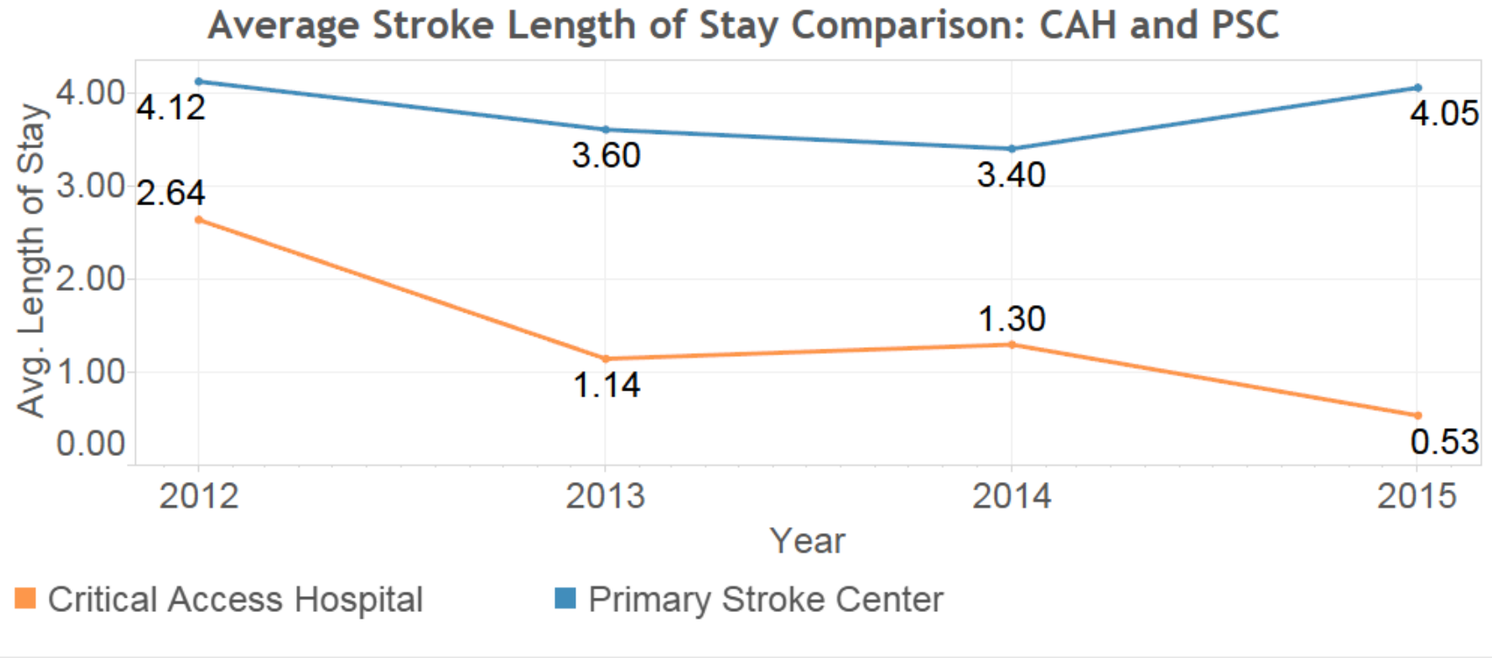
Consulting Doc
5
5
6
2
7

- Door to Needle times have improved dramatically!
- Docs believe the report card and engage in discussion about the data

tableau

Example III: Questioning whether it's possible

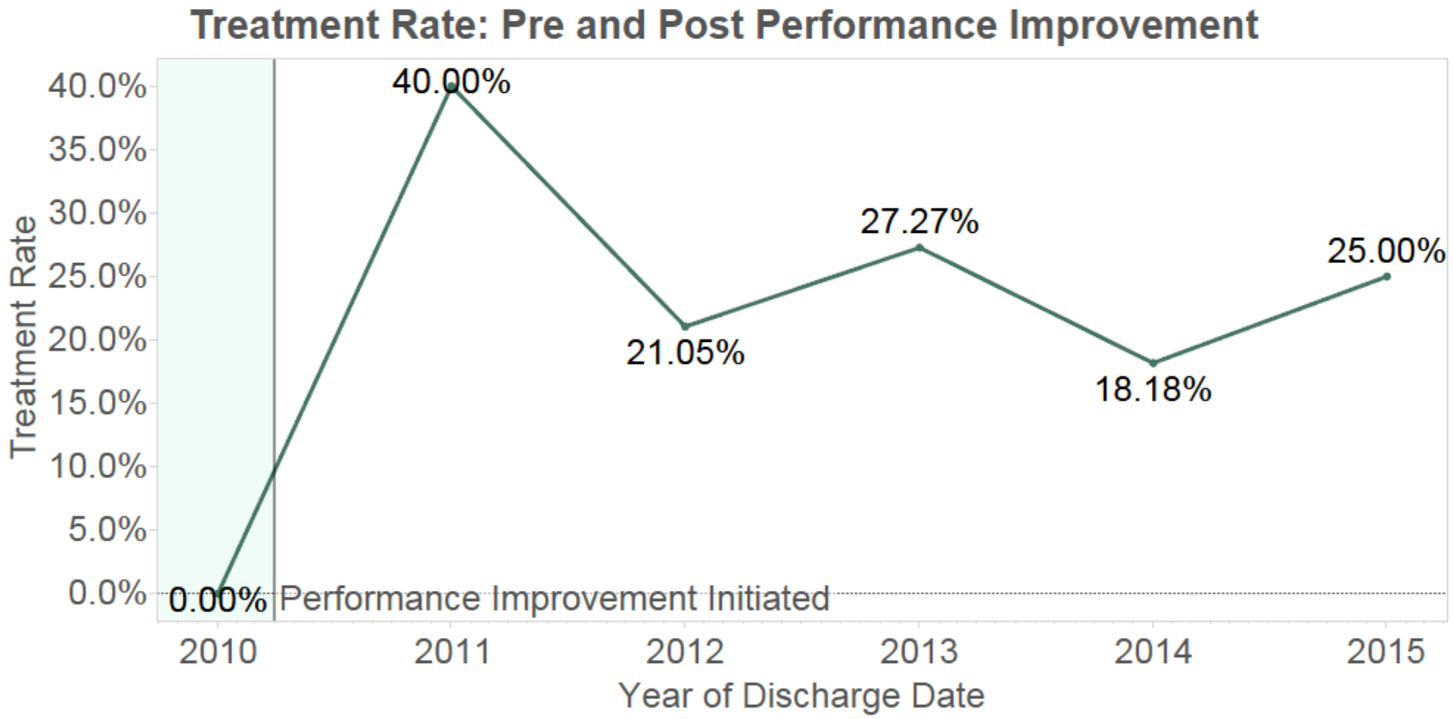




LOS:

- Some hospitals transfer complex patients out
- other hospitals accept complex patients
- LOS changes based on stroke severity

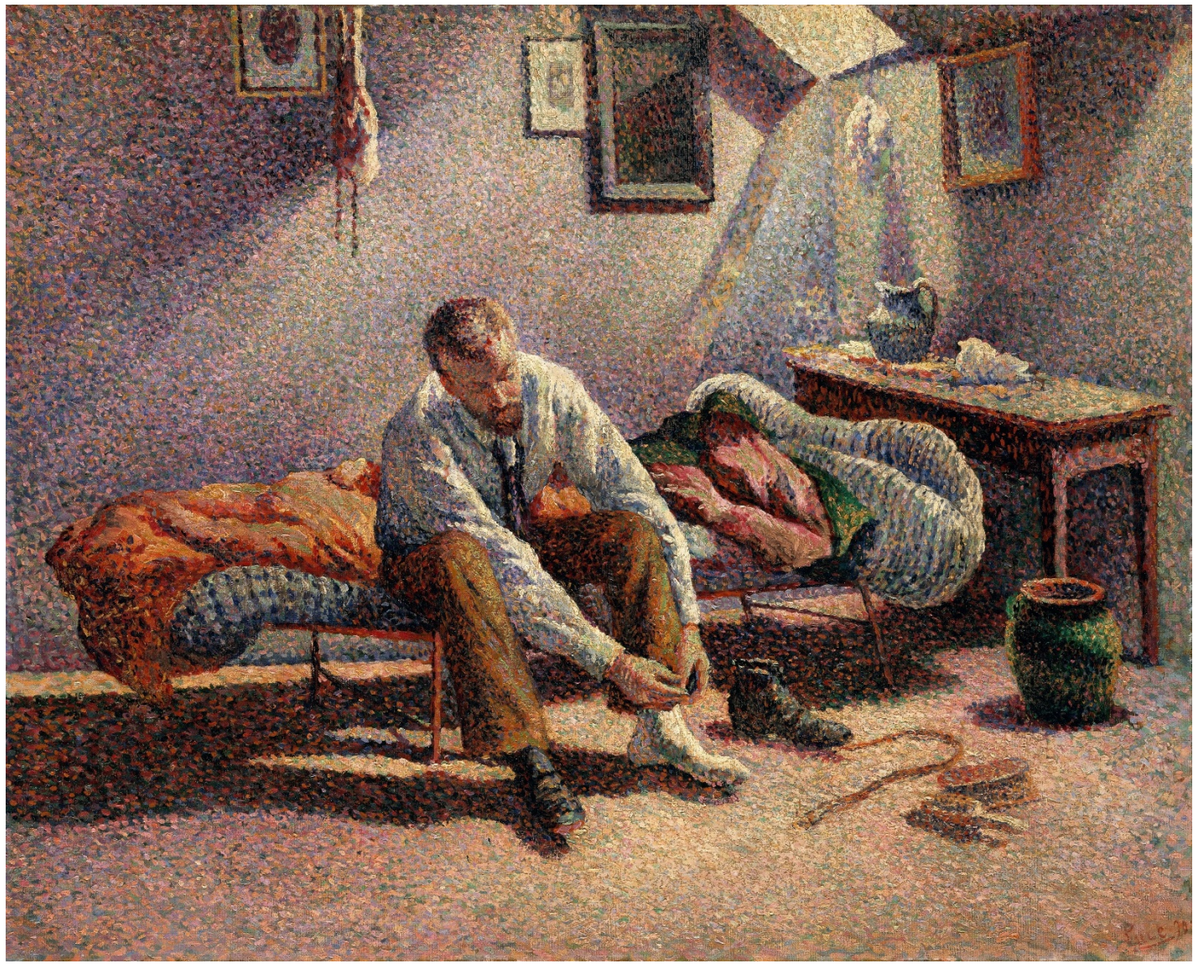
Example IV: Driving Change

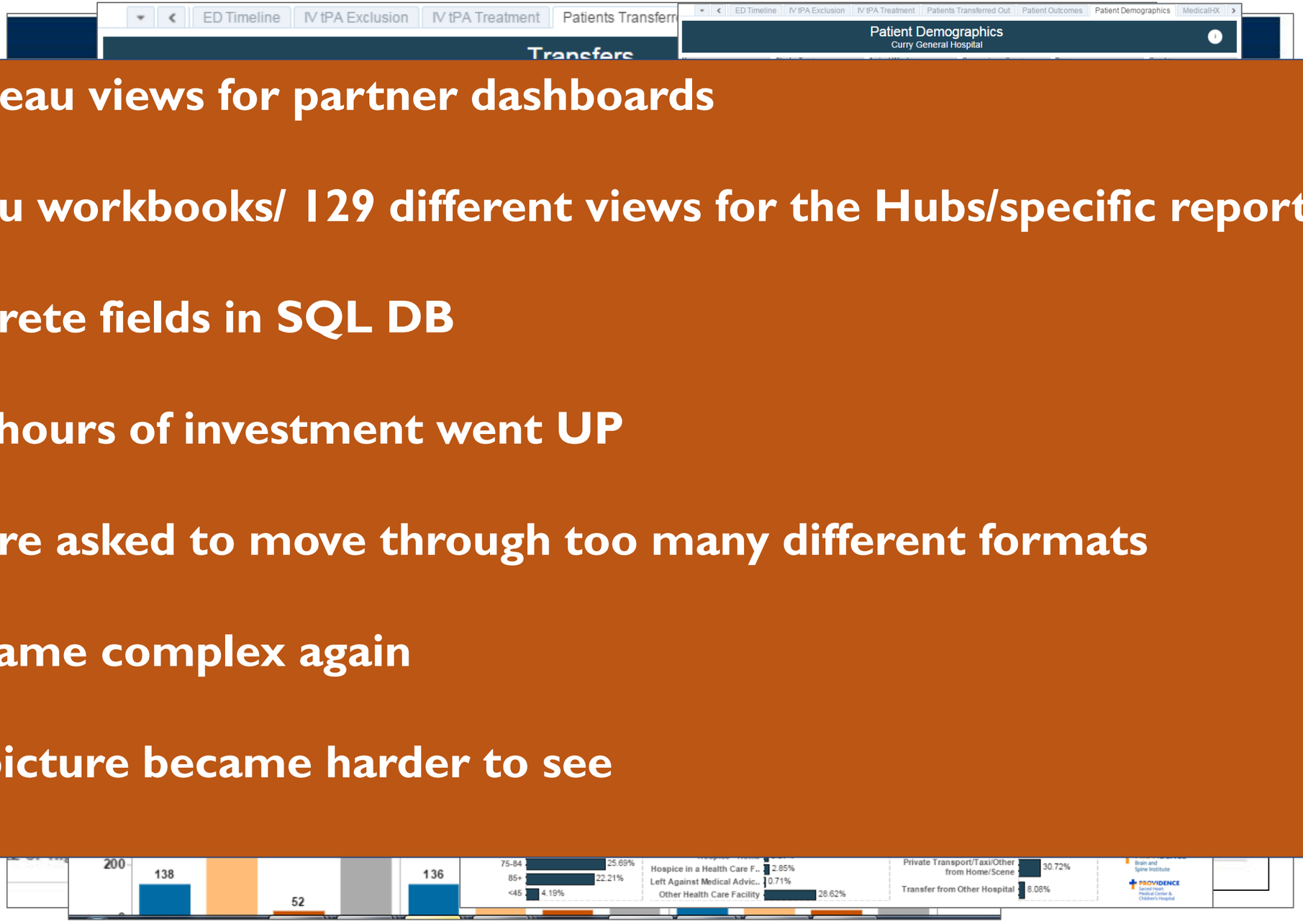


	2010	2011	2012	2013	2014	2015
No. Treated	0	6	4	3	6	5
No. Ischemic	8	15	19	11	33	20

- 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

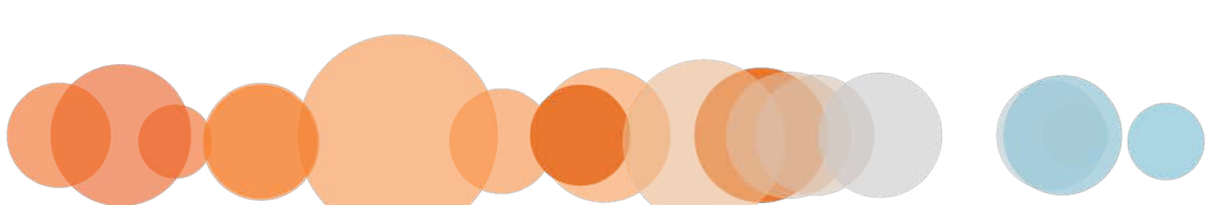




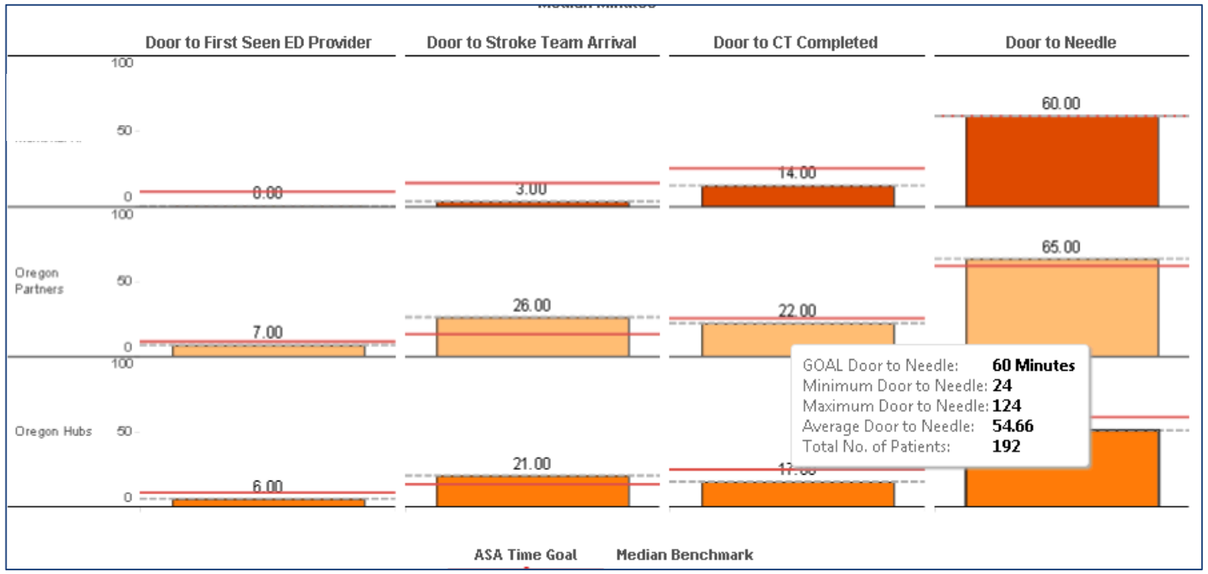
- 1617 Tableau views for partner dashboards
- 50 Tableau workbooks/ 129 different views for the Hubs/specific reports
- 1150 discrete fields in SQL DB
- Analysts hours of investment went UP
- Users were asked to move through too many different formats
- Data became complex again
- The big picture became harder to see

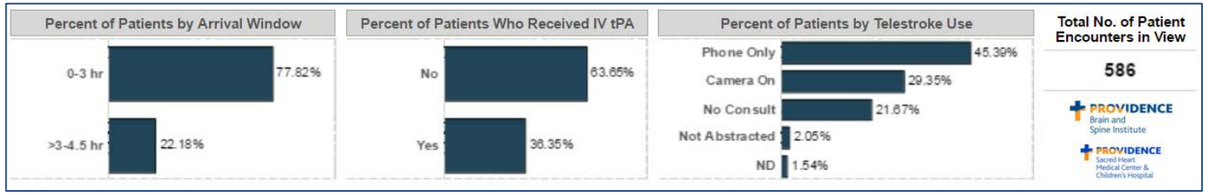
FOCUS! Alignment

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…



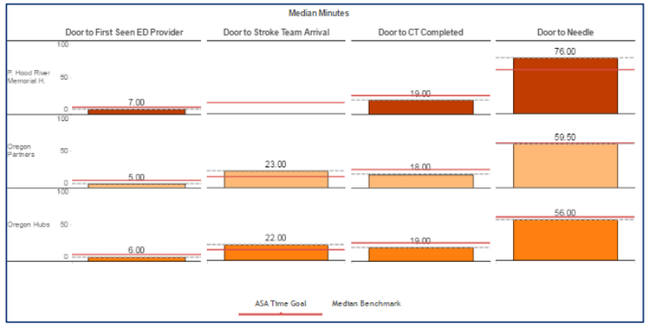


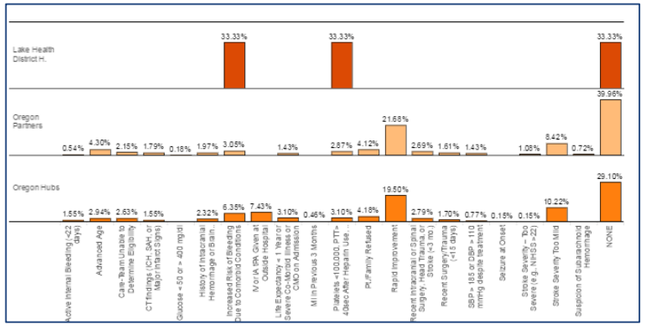
- Title
- Filtering options
- Comparison group Selection

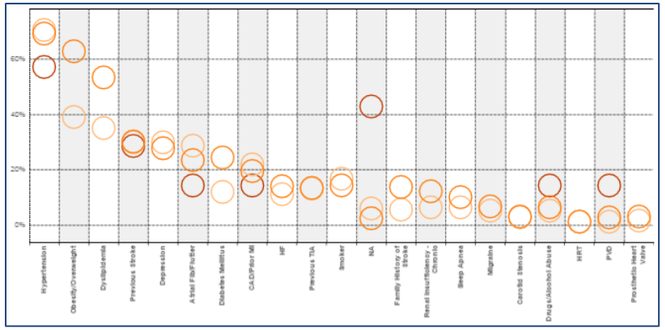
- Analyst's canvas

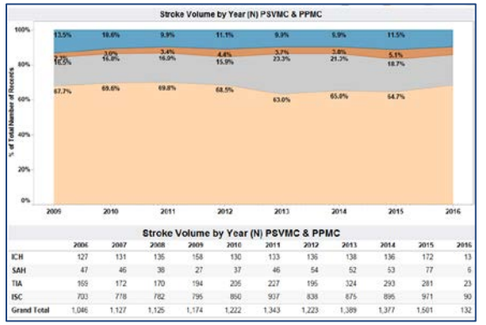
- Dynamic graphs – additional options

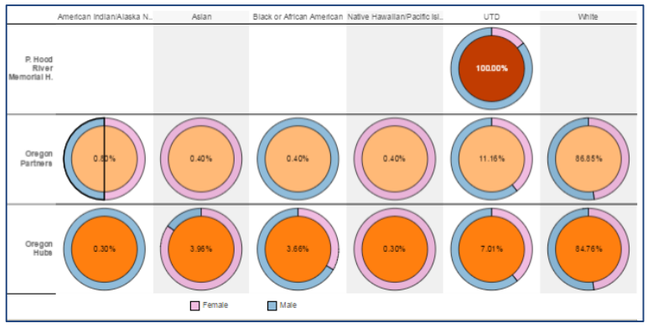
Alignment: Blank Canvas

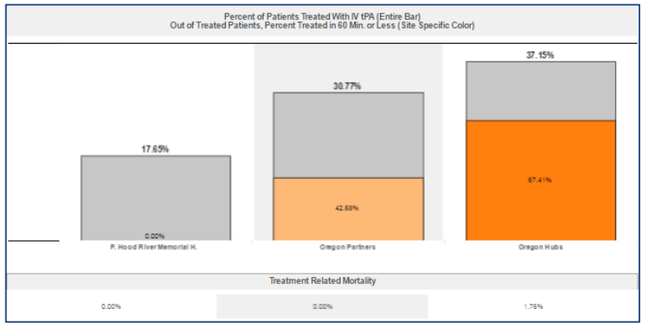


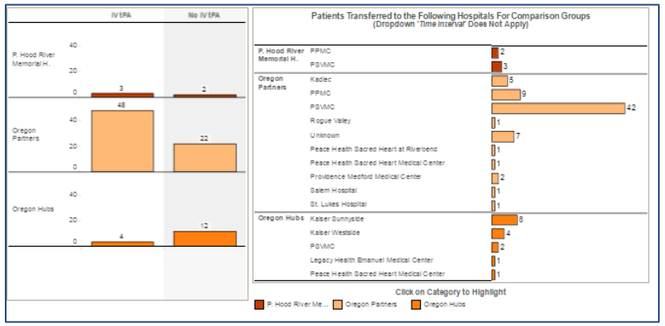


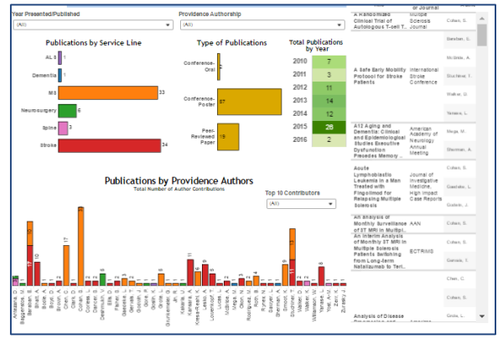


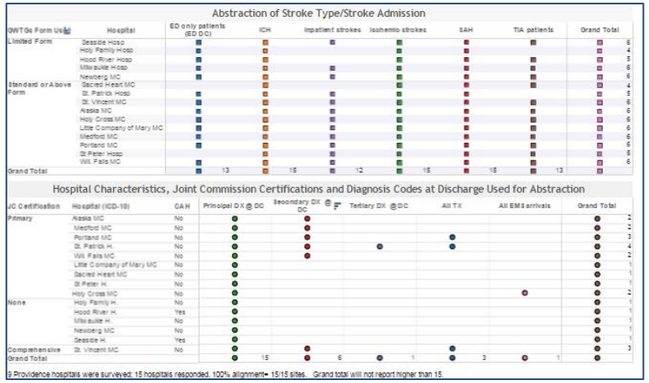


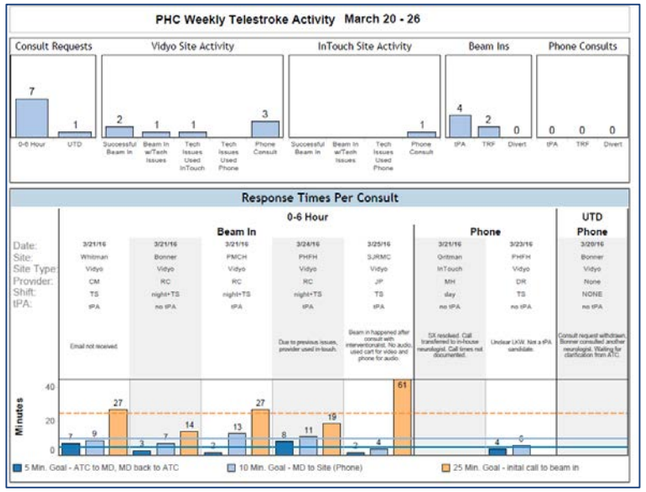


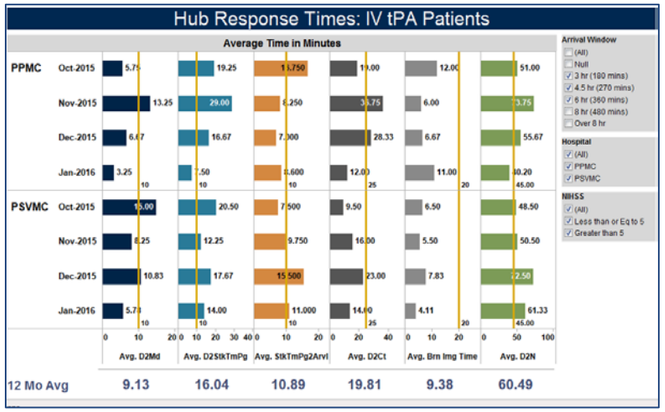




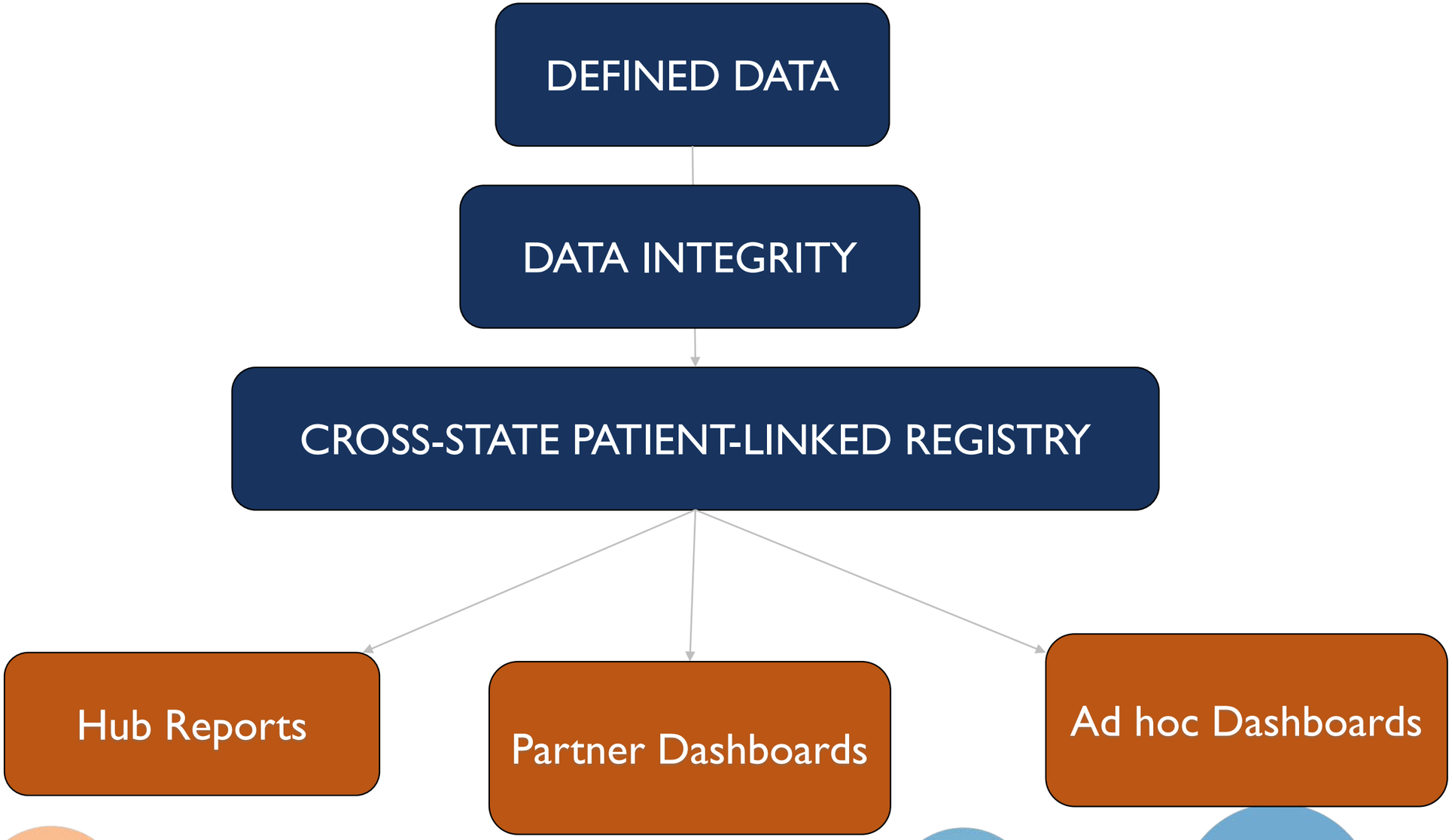








Current Landscape



Patient Outcomes: Looking at our Goals

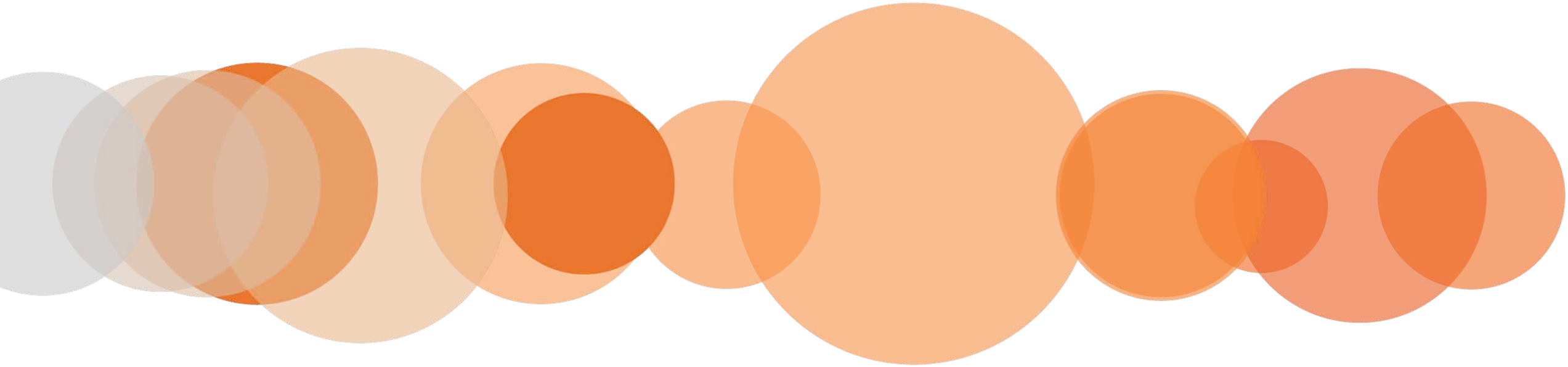
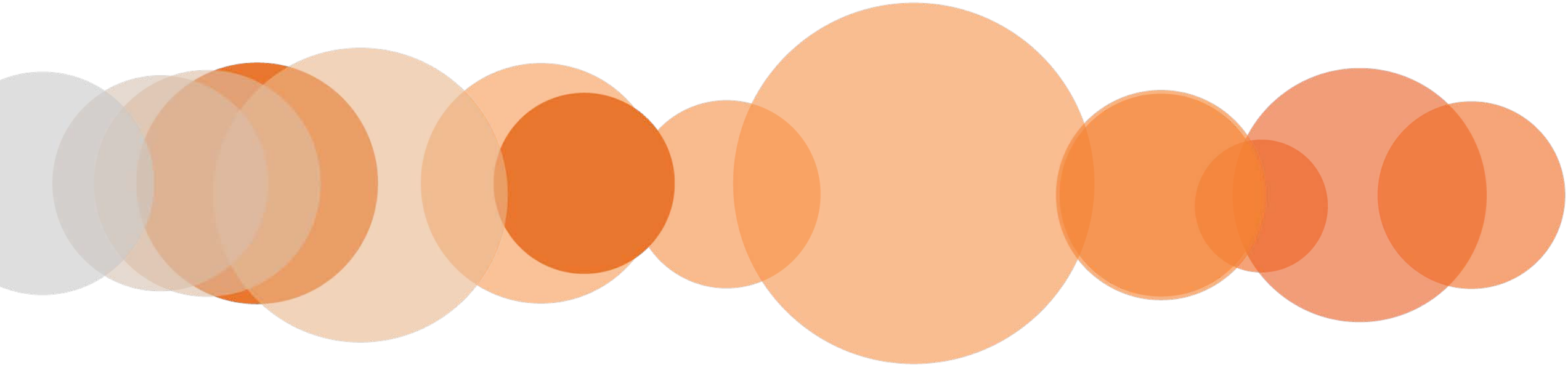


Table 2. Post Telestroke and Quality Initiatives With Change in Metrics

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

Deployment



Deployment: Necessities

Available

Accessible

Acceptable

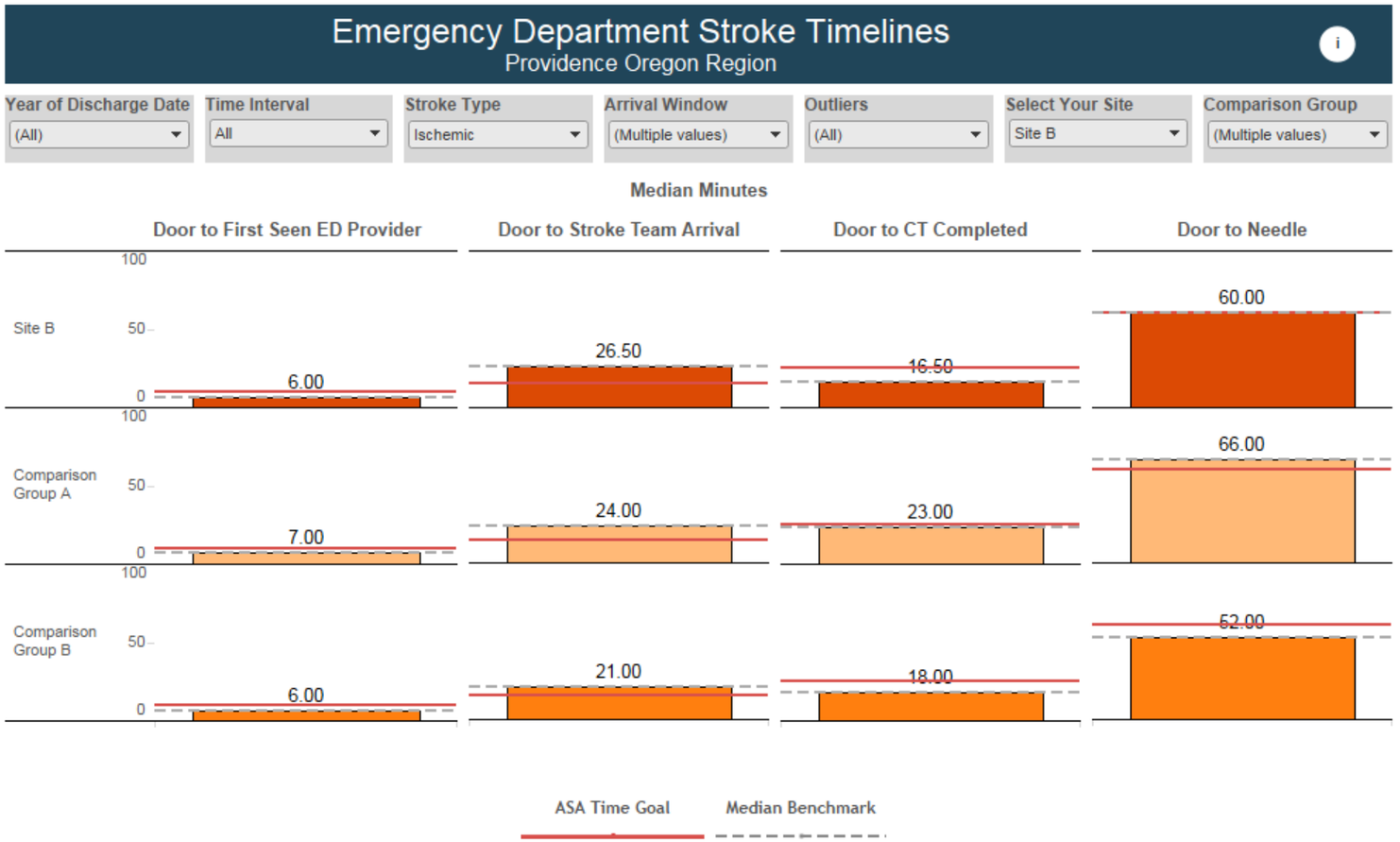
Audience: Partner Sites and PBSI Team

Deployment: Accessibility Challenges

Accessible

Acceptable

- Confidentiality vs benchmarking within network
- Technological Access
  - HIPAA Compliance
- Sustainability



Deployment: Previous solution to access

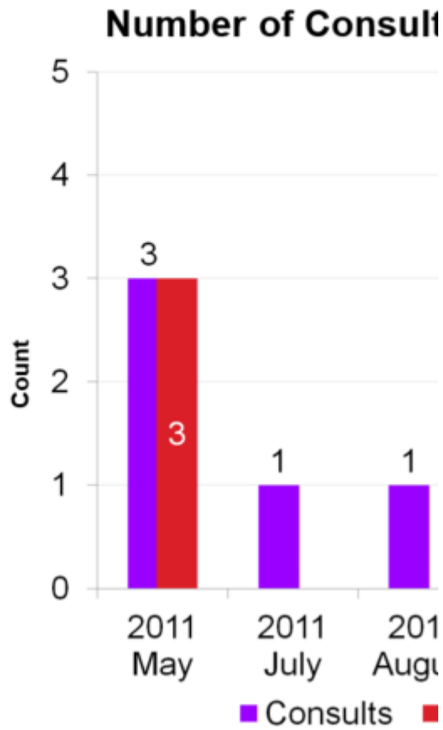
Accessible

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

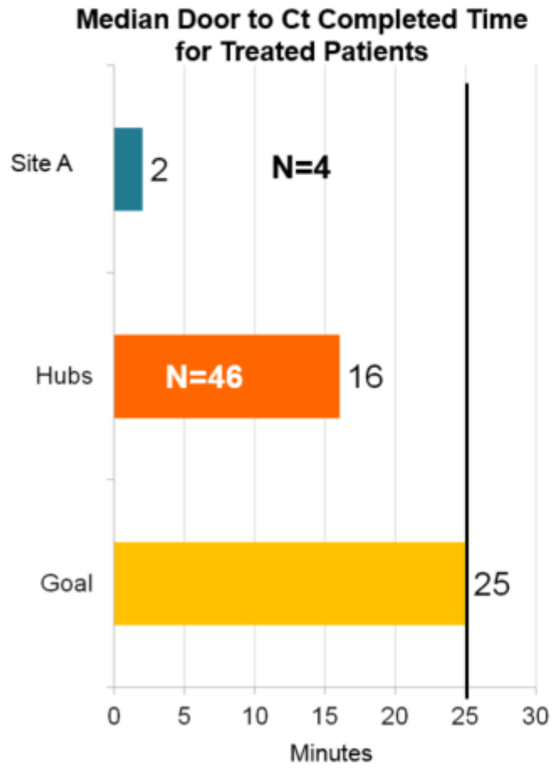
Telestroke Utilization: April 7, 2011 – October, 2011	
Total Consults	11
Total Beam-ins	4
Total Transfers	5

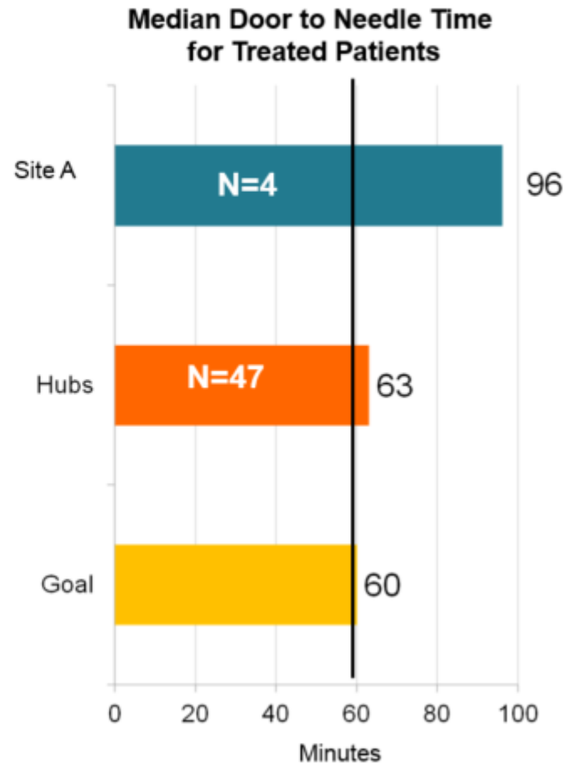
Type of Stroke Among Consults: April 7, 2011 – October, 2011	
Ischemic	5
Subarachnoid Hemorrhage	0
Intracerebral Hemorrhage	2
TIA	0
Not Stroke or Unknown at time of Consult	4

*Includes phone calls and beam-ins



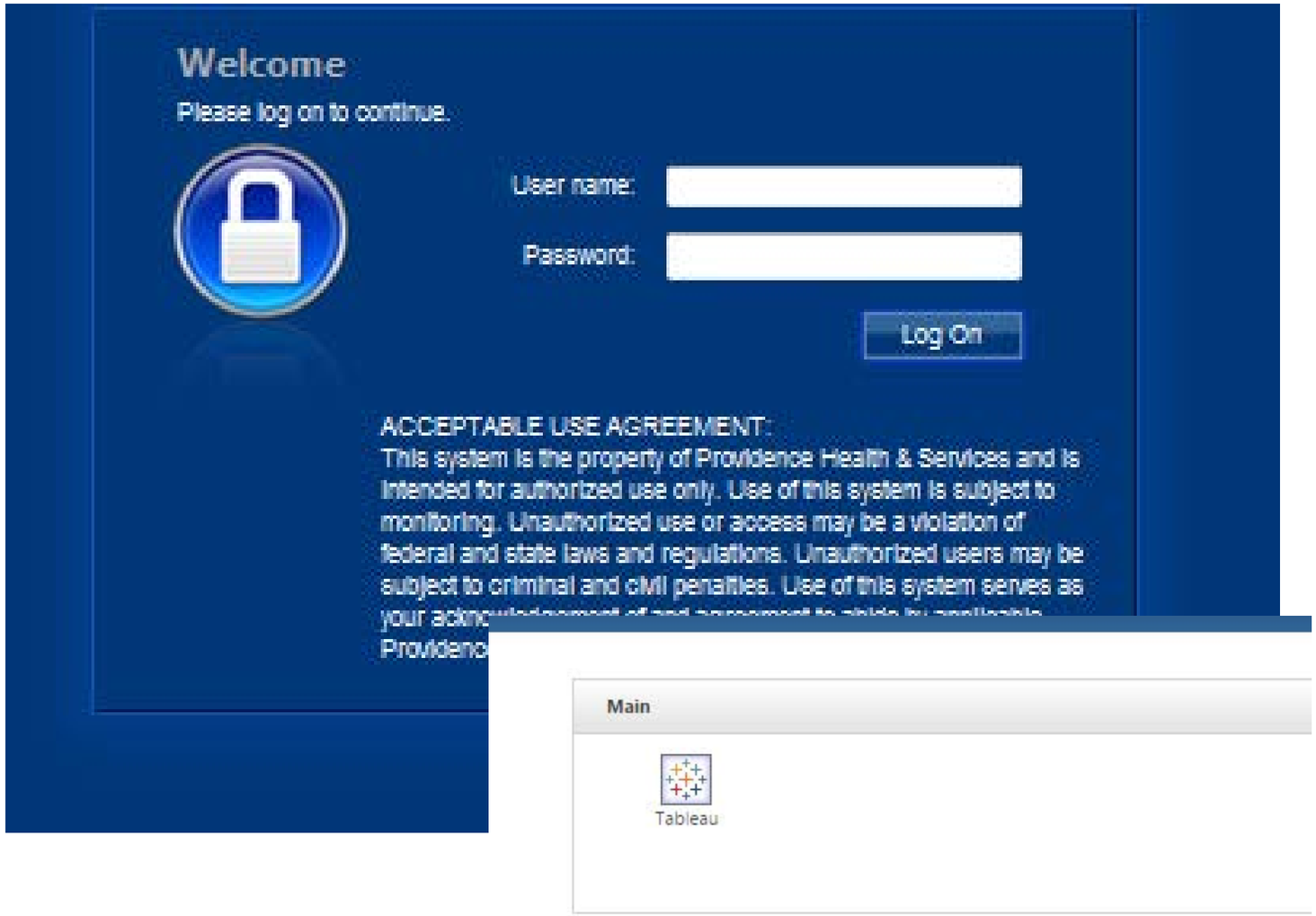
Telestroke Performance Measures:
Jan 2011 – October 2011; Go Live=April 7, 2011





Deployment: Current Solution to access

Accessible

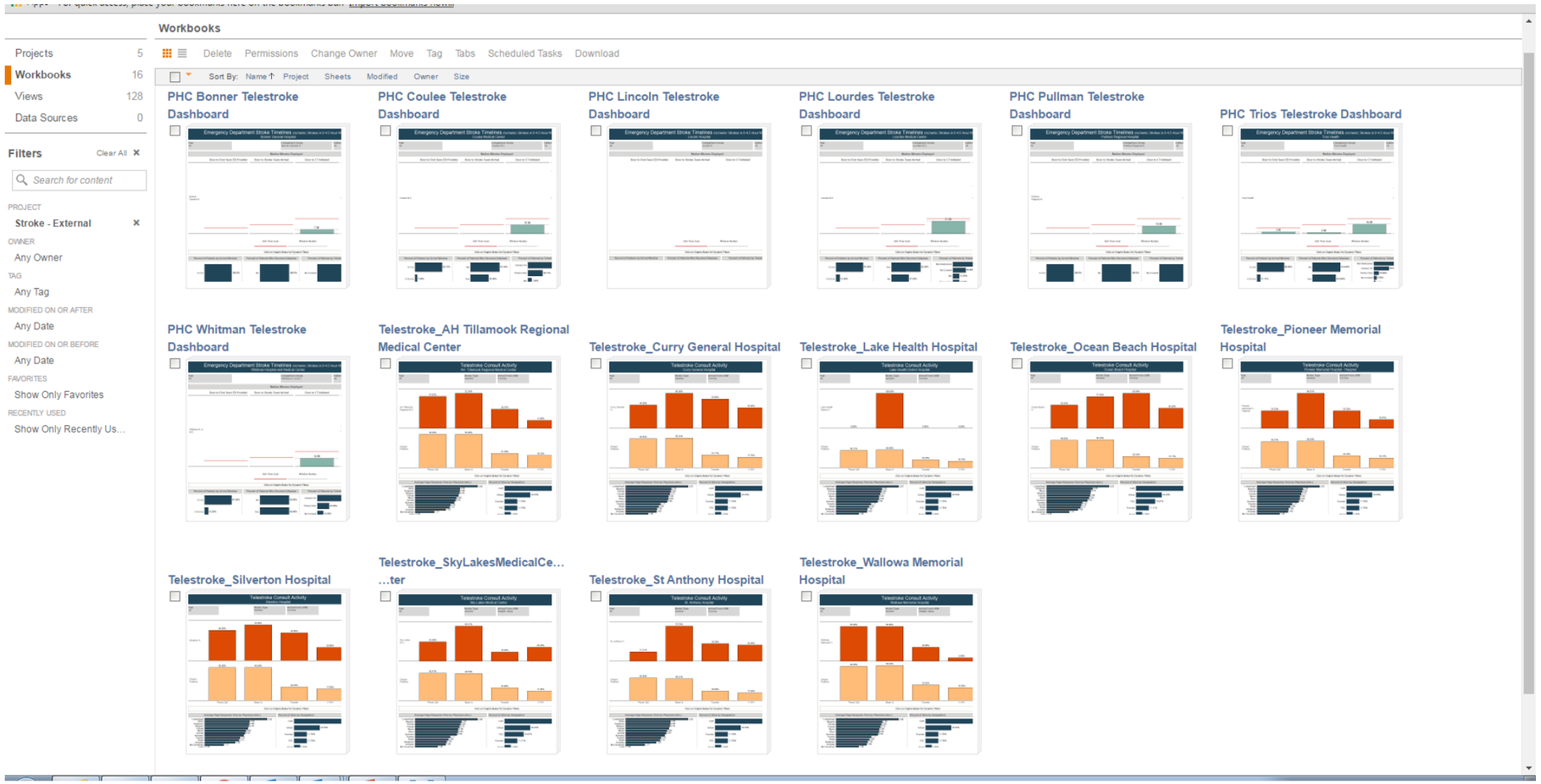


- Providence Partners and PBSI team: Direct access to Providence Tableau server
- Non-Providence Partners: Access to Providence Tableau server through Citrix

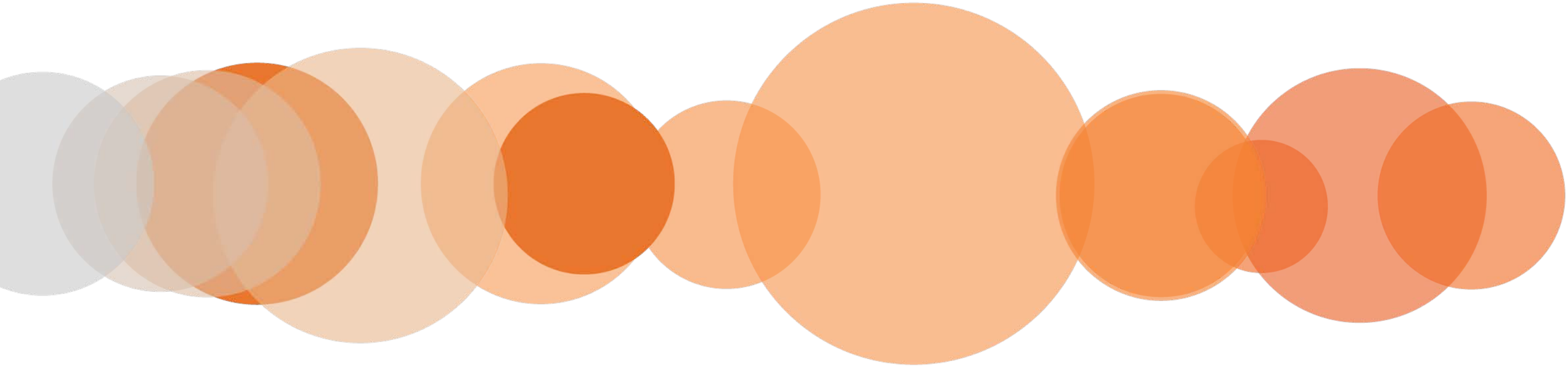
Deployment: Sustainability

Accessible

Acceptable

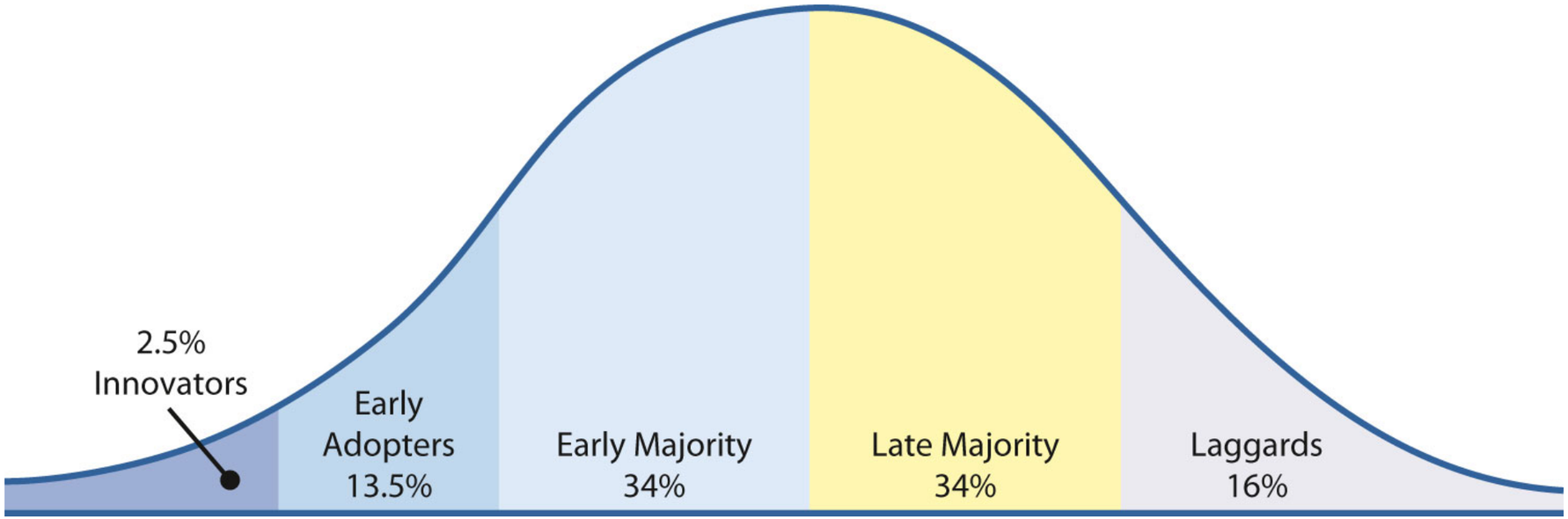


Reception and Adoption



Reception and Adoption: Theoretical model

Acceptable

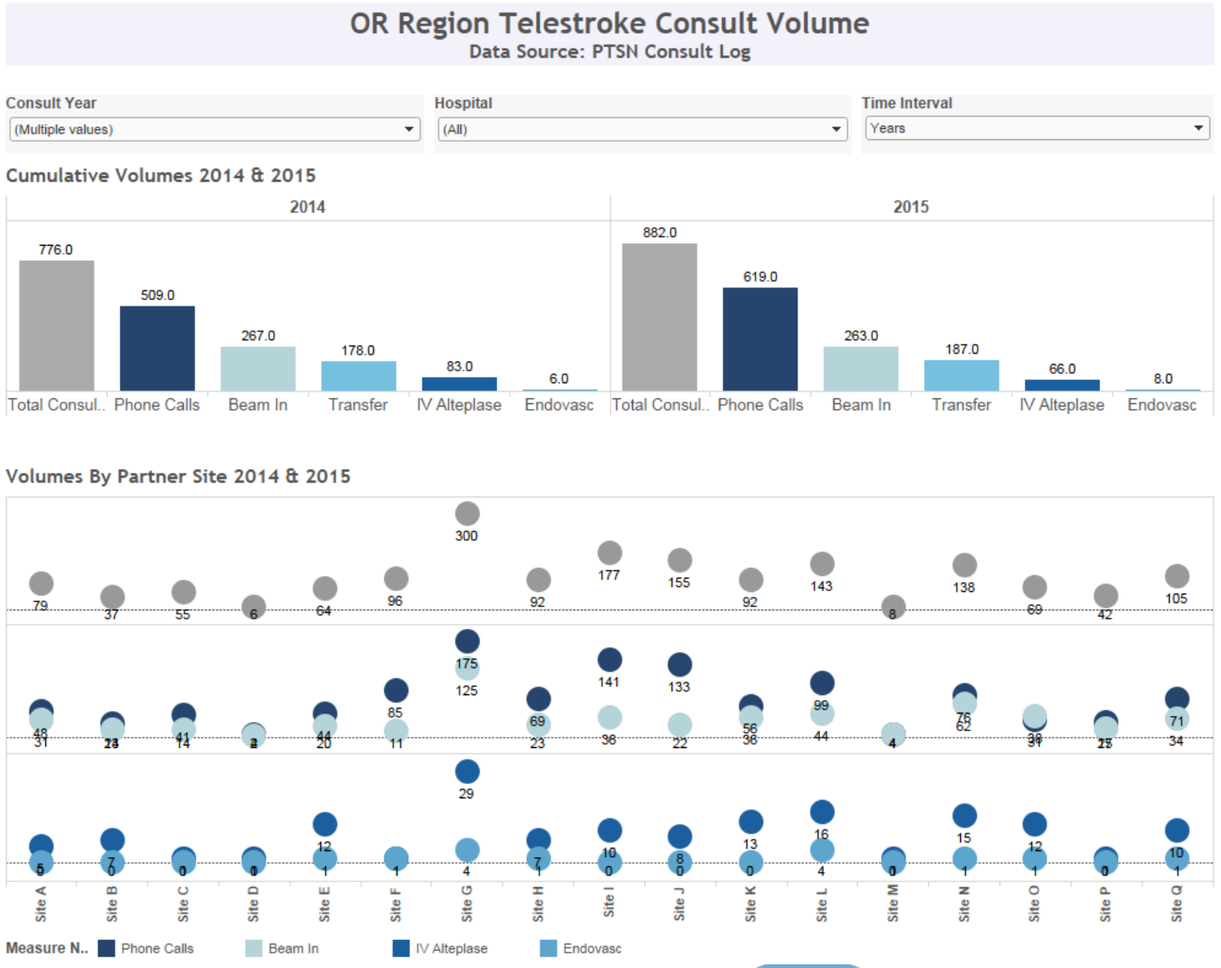


X 34 Sites and PBSI Team

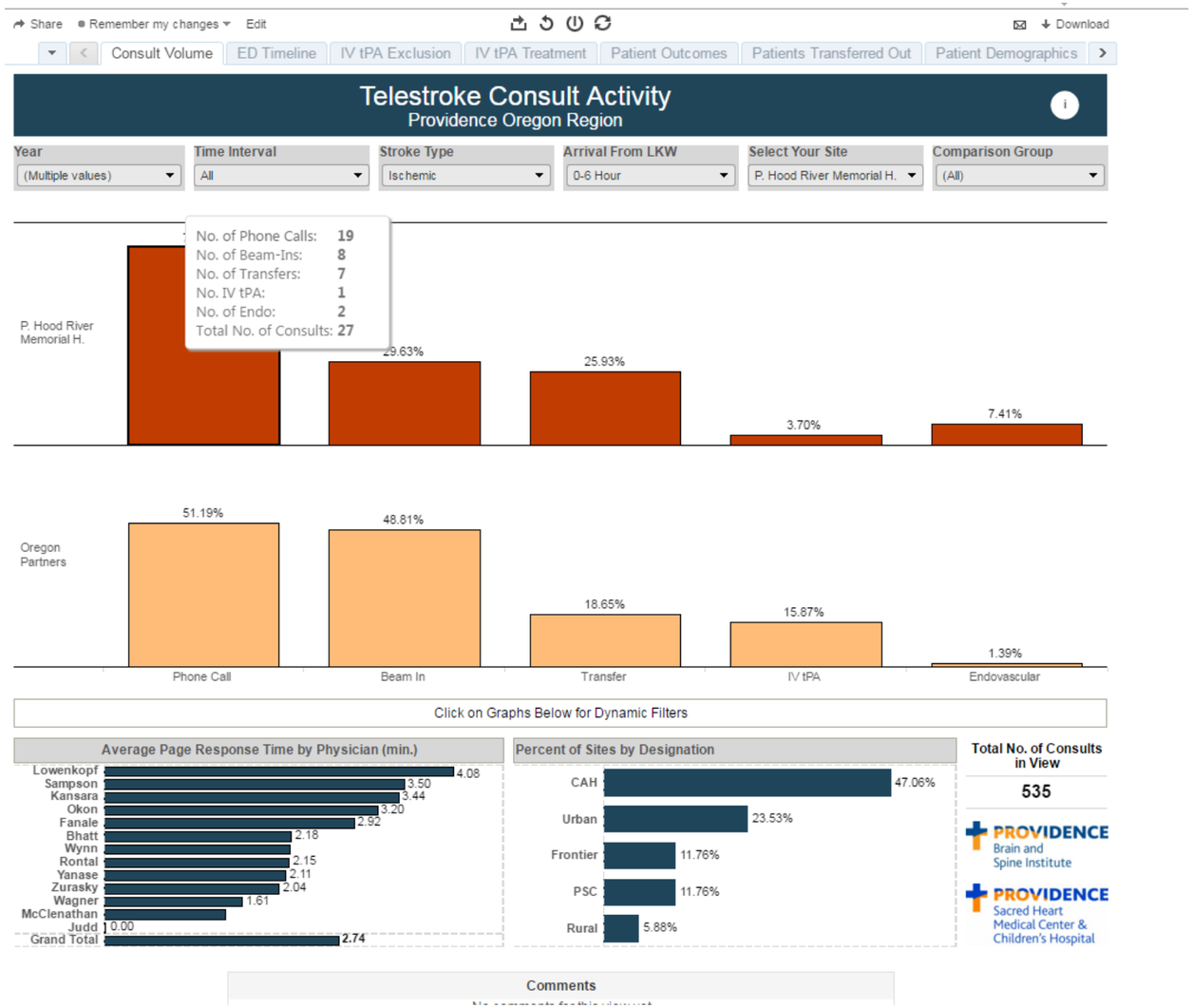
Reception and Adoption: Challenges

- Site Diversity
- Competing Priorities
- Technology (anticipated)

Acceptable



Reception and Adoption: Solutions



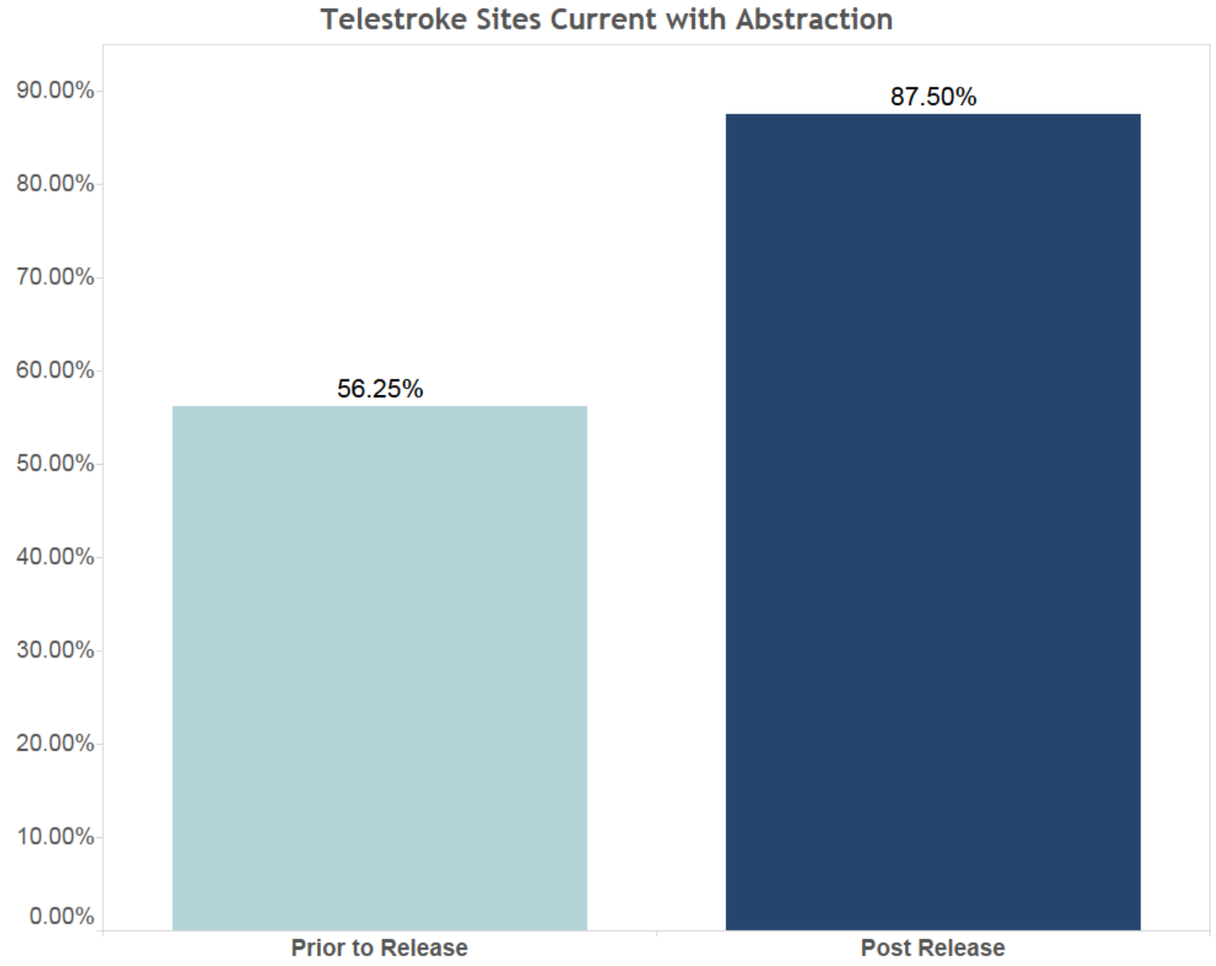
Acceptable

- National Standards
- Design
- Relationships/Training

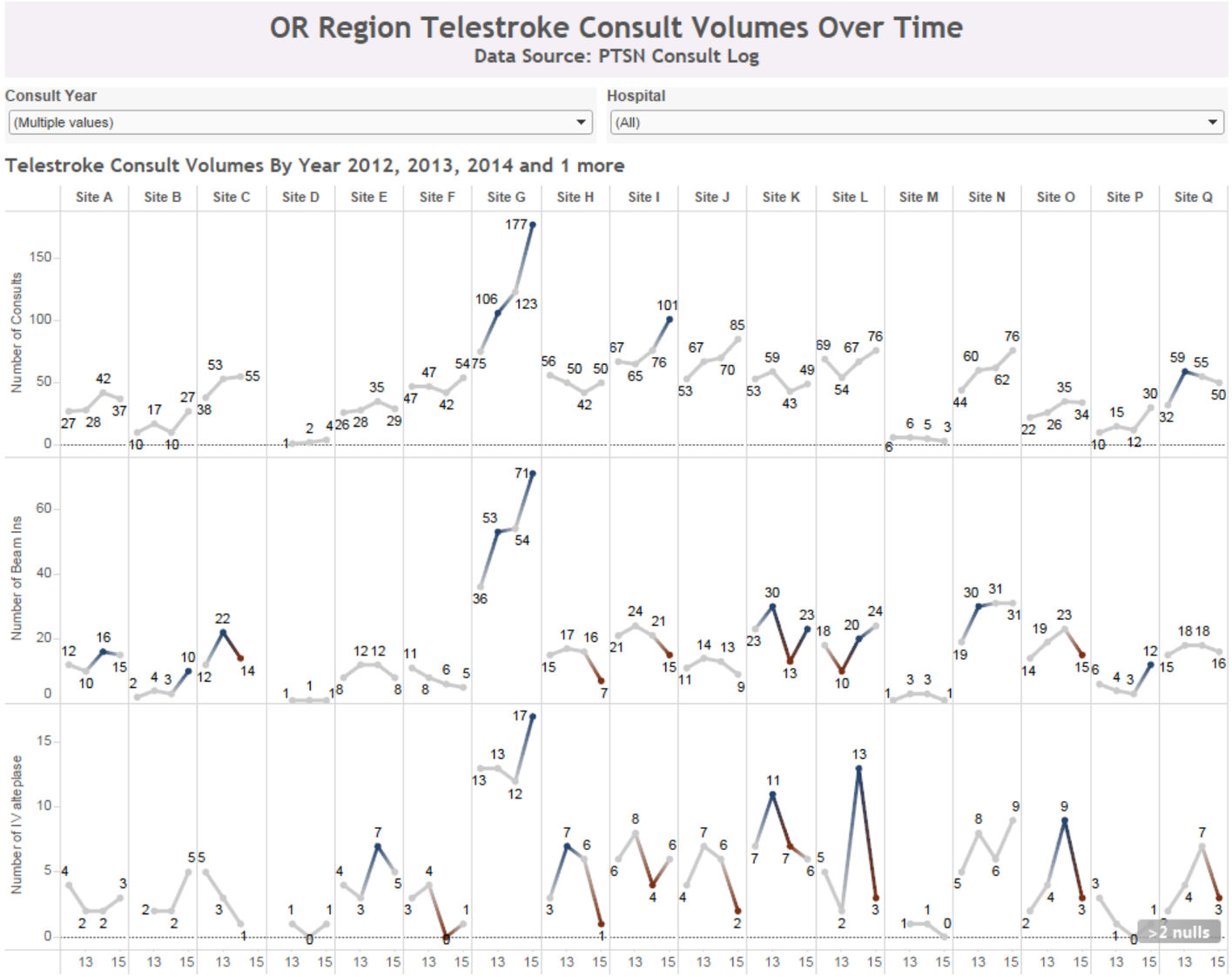
Reception and Adoption: Results

- 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

Acceptable!



Reception and Adoption: Response



PBSI Team: Late Adopter to High User

tableau

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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