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Telestroke/Teleneurology:

Using nursing innovation to design a collaborative solution

8.4.2023 | Neuroscience Institute

Disclosures

- Laura Williams, MSN, RN, CEN, NVRN-BC
  - No disclosures

Objectives

01

Explain the unique role of the Telestroke Nurses and their role in Code Stroke and Code IA workflows

02

Identify Telestroke best practices for hyperacute stroke management using telestroke services

03

Describe the impact that the Telestroke Nurse has on quality

Mission

To optimize our patients' recovery and health by providing stroke care that is evidence-based, innovative, and unparalleled.

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Telestroke historically looked like:

- Phone consultation with a neurologist to assess diagnosis
- Lack of imaging access leading to over/under triaging
- Delay in patient transfers due to lack of coordination and communication
- Turnover leading to lack of knowledge regarding clinical practice guidelines and protocols
- Lack of standardized code stroke process

Circ Cardiovasc Qual Outcomes. Author manuscript; available in PMC 2021 March 04

The Why behind the TeleStroke Team

The Problem

- Demand for acute stroke care growing significantly
- Worsening neurologist shortage (~20% shortfall by 2025), coupled with cost constrained environment, driving increasingly efficient staffing models
- Continued delivery of superior quality critical as outcomes and value metrics are increasingly scrutinized

The Model

- Deliver 24/7 acute stroke care across our entire network – including rural counties
- Only stroke network in the country that uses highly trained and specialized “telestroke nurses” who facilitate expeditious treatment of acute strokes to deliver disability saving therapy
- 24/7 availability of neuroradiology for immediate interpretation of images - including all rural sites

The Impact

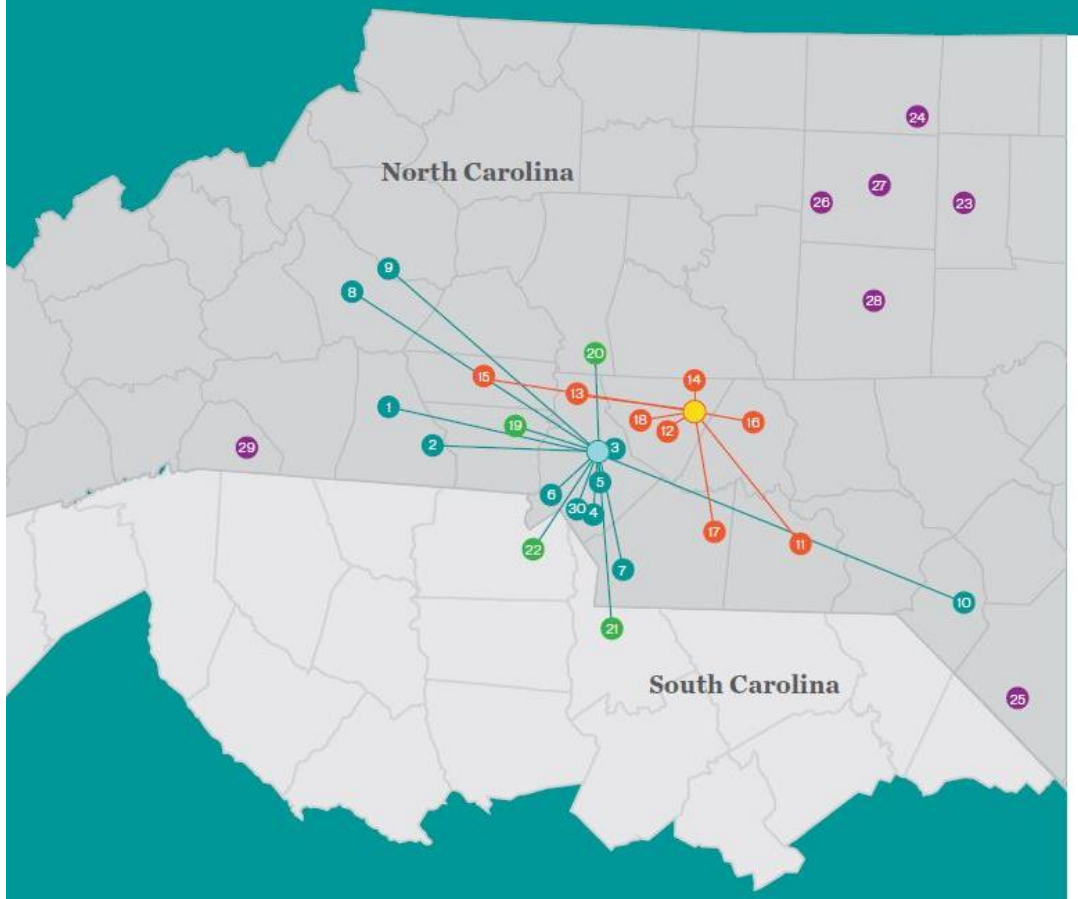
- Speed of transfer for emergent treatment at advanced centers has improved by over a third in 2020
- 25% increase in Our Door to CT metric within 20 mins from 2017-2020
- Joint Commission Door-to-Device goal in 2020 is 74% for Atrium’s Comprehensive Stroke Center, versus 40% other Comprehensive Centers in aggregate

Circ Cardiovasc Qual Outcomes. Author manuscript; available in PMC 2021 March 04.

Carolinas Stroke Network

- Evidence-based, standards of care for stroke diagnosis and treatment among participating hospitals throughout the region validated by evidence in research supported by the American Heart/American Stroke Associations
- 24/7 access to stroke-trained neurology experts to help determine the best treatment plan for each patient
- Coordination of rapid transfer to higher level stroke centers for patients needing more advanced, specialized care
- Provider & staff education on stroke treatment
- Support for advancing Atrium Health hospitals to Joint Commission Advanced Primary Stroke Center certification, where applicable

Carolinas Stroke Network



Metro Telestroke Network Site

1. Atrium Health Cleveland
2. Atrium Health Kings Mountain
3. Atrium Health Mercy, a facility of Carolinas Medical Center
4. Atrium Health Pineville
5. Atrium Health SouthPark Emergency Department, a facility of Carolinas Medical Center
6. Atrium Health Steele Creek
7. Atrium Health Waxhaw
8. CHS Blue Ridge - Morganton
9. CHS Blue Ridge - Valdese
10. Scotland Memorial Hospital
30. Atrium Health Providence Emergency Department, a facility of Atrium Health Pineville

11. Atrium Health Anson
12. Atrium Health Harrisburg
13. Atrium Health Huntersville
14. Atrium Health Kannapolis
15. Atrium Health Lincoln
16. Atrium Health Stanly
17. Atrium Health Union
18. Atrium Health University City

Non-Atrium Health Referral Site

19. CaroMont Regional Medical Center
20. Lake Norman Regional Medical Center
21. MUSC Lancaster
22. Piedmont Medical Center

Regional Telestroke Network Site

23. Alamance Regional Medical Center
24. Annie Penn Hospital
25. Columbus Regional Healthcare System
26. Cone Health MedCenter High Point
27. Cone Health Wesley Long Hospital
28. Randolph Health
29. St. Luke's Hopsital

Interventional Center

- Carolinas Medical Center
- Atrium Health Cabarrus

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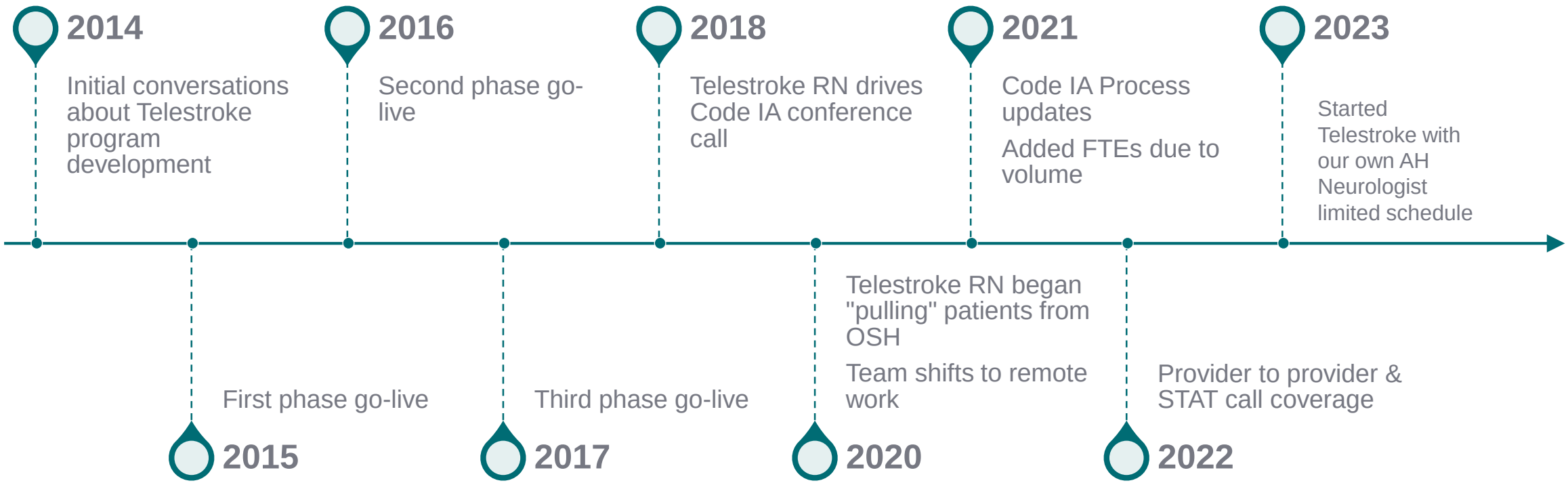
Telestroke Team

- Atrium Health has a unique model of care for stroke patients. To ensure quality and effective care for our stroke patients during the hyperacute phase of work-up, Atrium created the Telestroke department.
- The Telestroke department is made of RNs who provide virtual assistance to the bedside clinical team via camera.
- The Telestroke nurses work closely with a third party teleneurology group to help with care in the acute phase of care.

TeleStroke Timeline



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Telestroke RN Role

Function as the protocol experts for Atrium Health Greater Charlotte region and regional facilities

Connect	Support	Facilitate
• Neurologist to bedside team for assessments • Communicate with neurologist on and off camera • Connect Neurologist with neurointerventionalist for intervention patients	• Bedside RN with mixing and administering thrombolytic • Pump Programming • VS/Neuro Check documentation	• Transfer process for thrombectomy pateints • Conversations with transfer line • Process improvement metrics

Protocols and workflows

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Telemed J E Health. 2017 May 1; 23(5): 376–389. PMCID: PMC5802246
Published online 2017 May 1. doi: 10.1089/tmj.2017.0006 PMID: 28384077

American Telemedicine Association: Telestroke Guidelines

Bart M. Demaerschalk, MD, MSc, FRCP(C),[✉1] Jill Berg, PhD,[2] Brian W. Chong, MD,[1] Hartmut Gross, MD,[3] Karin Nystrom, MSN,[4] Opeolu Adeoye, MD,[5] Lee Schwamm, MD,[6] Lawrence Wechsler, MD,[7] and Sallie Whitchurch, BSN[8]

AND

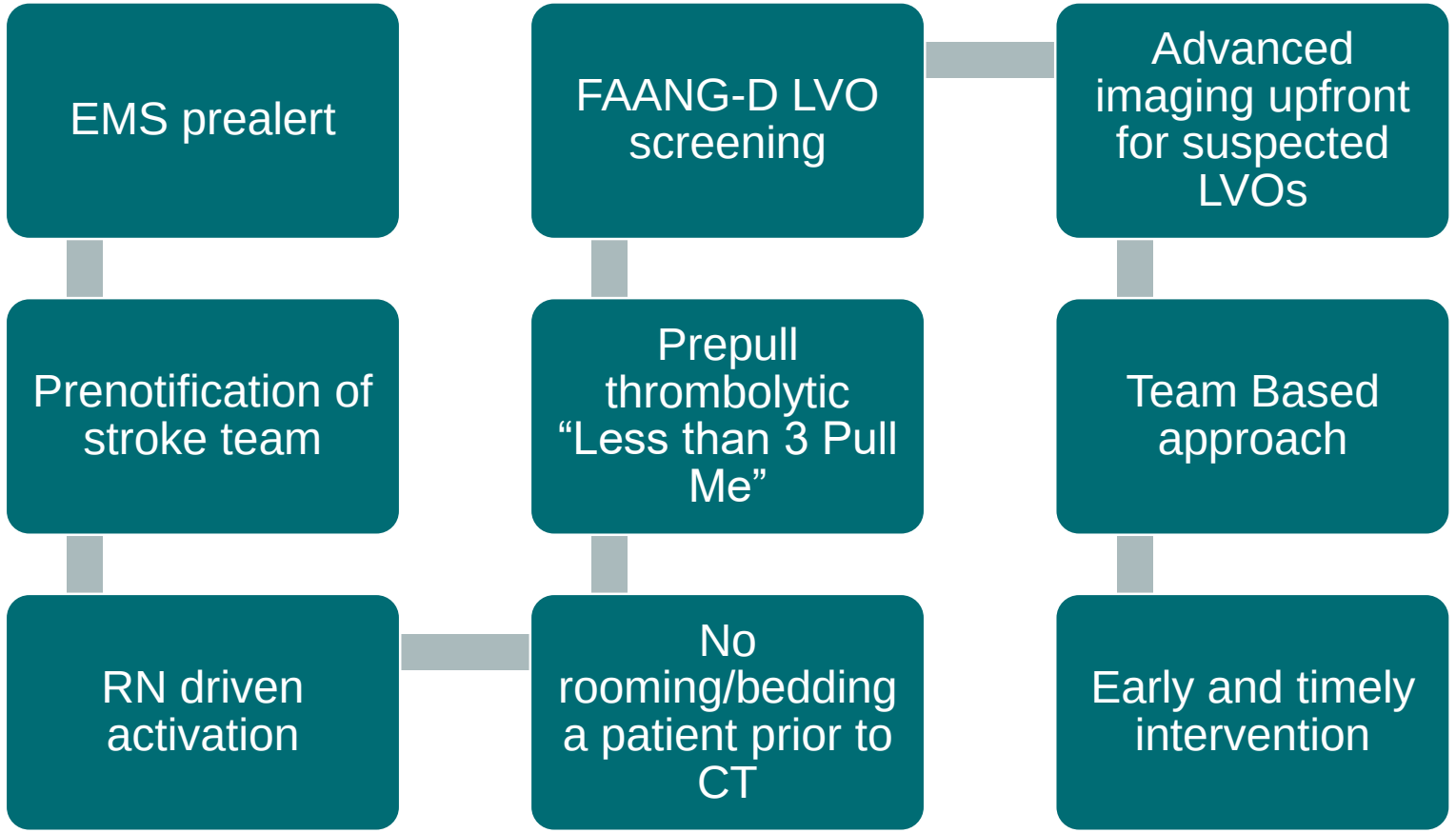
Stroke
Volume 50, Issue 12, December 2019; Pages e344-e418
https://doi.org/10.1161/STR.0000000000000211

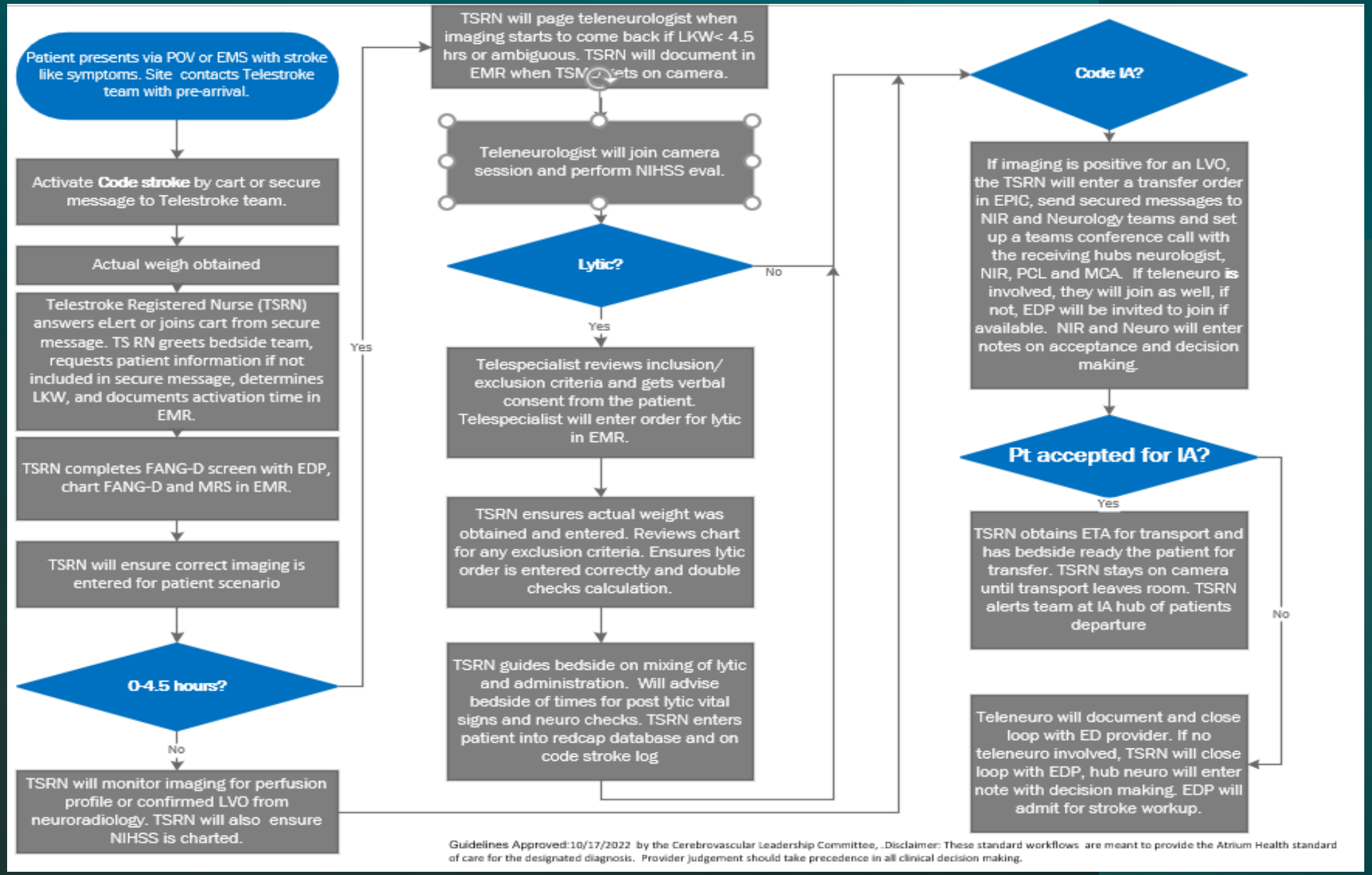
American Heart Association.

AHA/ASA GUIDELINE

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Telestroke Best Practice




Patient presents via POV or EMS with stroke like symptoms. Site contacts Telestroke team with pre-arrival.
Activate **Code stroke** by cart or secure message to Telestroke team.
Actual weigh obtained
Telestroke Registered Nurse (TSRN) answers eLert or joins cart from secure message. TS RN greets bedside team, requests patient information if not included in secure message, determines LKW, and documents activation time in EMR.
TSRN completes FANG-D screen with EDP, chart FANG-D and MRS in EMR.
TSRN will ensure correct imaging is entered for patient scenario
0-4.5 hours?
Yes
No
TSRN will monitor imaging for perfusion profile or confirmed LVO from neuroradiology. TSRN will also ensure NIHSS is charted.
TSRN will page teleneurologist when imaging starts to come back if LKW< 4.5 hrs or ambiguous. TSRN will document in EMR when TSRN gets on camera.
Teleneurologist will join camera session and perform NIHSS eval.
Lytic?
Yes
No
Telespecialist reviews inclusion/ exclusion criteria and gets verbal consent from the patient. Telespecialist will enter order for lytic in EMR.
TSRN ensures actual weight was obtained and entered. Reviews chart for any exclusion criteria. Ensures lytic order is entered correctly and double checks calculation.
TSRN guides bedside on mixing of lytic and administration. Will advise bedside of times for post lytic vital signs and neuro checks. TSRN enters patient into redcap database and on code stroke log
Code IA?
If imaging is positive for an LVO, the TSRN will enter a transfer order in EPIC, send secured messages to NIR and Neurology teams and set up a teams conference call with the receiving hubs neurologist, NIR, PCL and MCA. If teleneuro is involved, they will join as well, if not, EDP will be invited to join if available. NIR and Neuro will enter notes on acceptance and decision making.
Pt accepted for IA?
Yes
No
TSRN obtains ETA for transport and has bedside ready the patient for transfer. TSRN stays on camera until transport leaves room. TSRN alerts team at IA hub of patients departure
Teleneuro will document and close loop with ED provider. If no teleneuro involved, TSRN will close loop with EDP, hub neuro will enter note with decision making. EDP will admit for stroke workup.
Guidelines Approved:10/17/2022 by the Cerebrovascular Leadership Committee, .Disclaimer: These standard workflows are meant to provide the Atrium Health standard of care for the designated diagnosis. Provider judgement should take precedence in all clinical decision making.

Teaching Impact on Telestroke Nurse Recognition of Large Vessel Occlusion Computerized Tomography Perfusion Patterns

Laura Williams, MSN, RN, CEN; Maria Helms, MSN, RN, SCRN; Emily K. Snider, BSN, RN, SCRN; Brenda Chang, MS, MPH; Sam Singh, MS; Andrew W. Asimos, MD

Background and Purpose—A distinguishing feature of our Stroke Network is telestroke nurses who remotely facilitate evaluations. To enable expeditious transfer of large vessel occlusion (LVO) acute ischemic stroke patients presenting to nonthrombectomy centers, the telestroke nurses must immediately identify color thresholded computerized tomography perfusion (CTP) patterns consistent with internal carotid artery (ICA), middle cerebral artery (MCA) segment 1(M1), and MCA segment 2 (M2) LVO acute ischemic stroke.

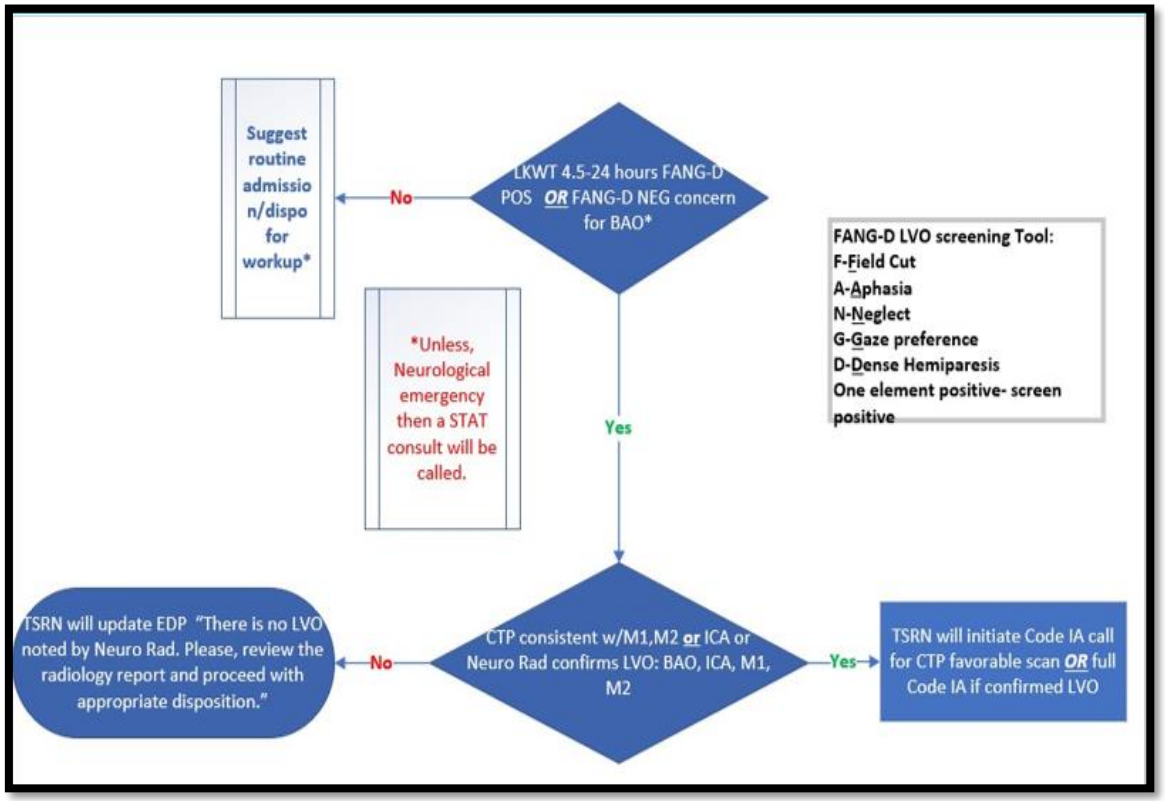
Methods—We developed a 6-month series of tutorials and tests for 16 telestroke nurses, focusing on CTP pattern recognition consistent with ICA, M1, or M2 LVO acute ischemic stroke. We simultaneously conducted a prospective cohort study to evaluate the impact of this intervention.

Results—Telestroke nurses demonstrated good accuracy in detecting ICA, M1, or M2 LVO during the first 3 months of teaching (83%–94% accurate). This significantly improved during the last 3 months (99%–100%), during which the likelihood of correctly identifying the presence of any one of these LVOs exceeded that of the first 3 months ($P<0.001$). There was a higher probability of correctly identifying any CTP pattern as consistent with either an ICA, M1, or M2 occlusion versus other types of occlusions or nonocclusions (odds ratio, 5.22 [95% CI, 3.2–8.5]). Over time, confidence for recognizing CTP patterns consistent with an ICA, M1, or M2 LVO did not differ significantly.

Conclusions—A series of tutorials and tests significantly increased the likelihood of telestroke nurses correctly identifying CTP patterns consistent with ICA, M1, or M2 LVOs, with the benefit of these tutorials and test reviews peaking and plateauing at 4 months. **(*Stroke*. 2020;51:1879-1882. DOI: 10.1161/STROKEAHA.119.028757.)**

A Telestroke Nurse/Neuroradiologist Model for Extended Window Code Stroke Triage

Anna Maria Helms, Laura Williams, Chelsea Cardona, Gary J De Filipp, Rahul R Karamchandani, Andrew W Asimos
Carolinas Stroke Network
Charlotte, NC



- This model for extended window code stroke triage can substantially reduce the routine involvement of a teleneurologist.
- For extended code stroke cases, there was no significant change in length of stay.
- Thirty-day readmission rates decreased with the implementation of the extended window triage.
- The use of this triage model has saved our system money.

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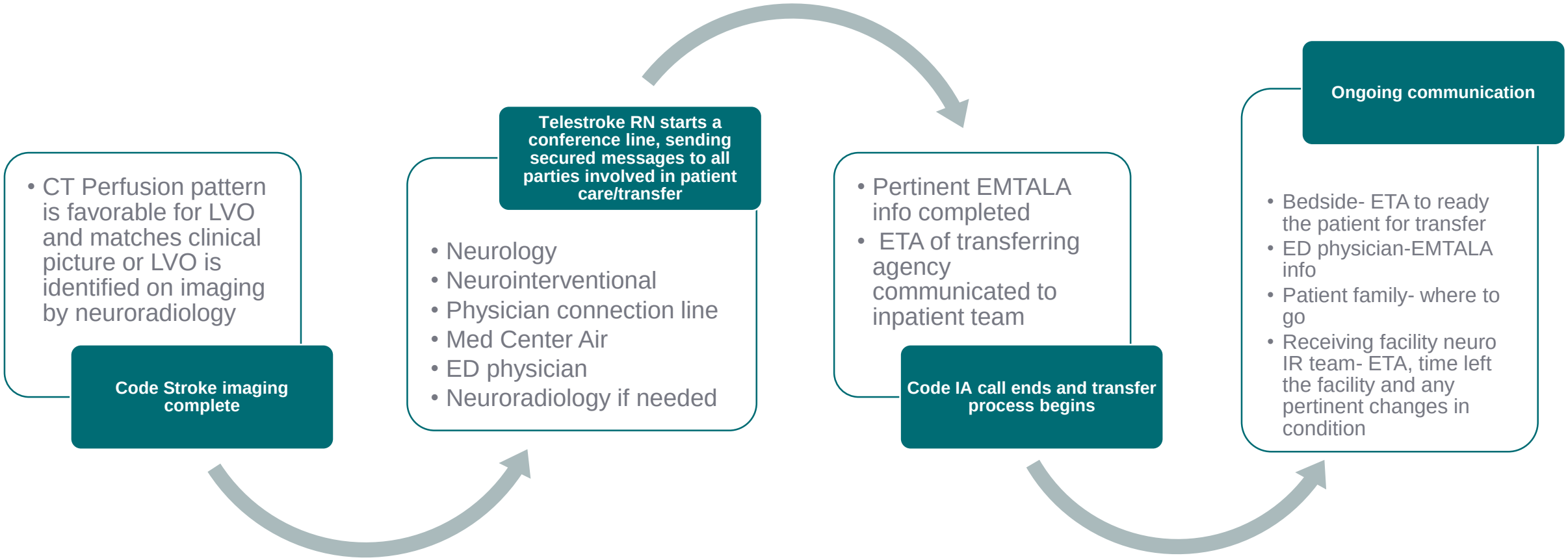
Additional Research Publications

- The database that our Telestroke RNs help to enter and maintain has resulted in the publication of 25 peer reviewed manuscripts of original research since 2020.

Code IA Process



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Telestroke Volumes

2021		2022		2023		YTD 2024	
Facilities supported	30	Facilities supported	33	Facilities supported	28	Facilities supported	28
Telestroke Encounters	6939	Telestroke encounters	7170	Telestroke encounters	7471	Telestroke encounters	5097
IV Lytic administration	585	IV Lytic administration	611	IV Lytic administration	548	IV Lytic administration	370
Transferred for IA	178	Transferred for IA	201	Transferred for IA	218	Transferred for IA	128
Quality measures							
Average Door to Needle: Presenting stroke patients at spokes	57 min	Average Door to Needle: Presenting stroke patients at spokes	54 min	Average Door to Needle: Presenting stroke patients at spokes	54 min	Average Door to Needle: Presenting stroke patients at spokes	55 min
Average Door in Door Out: Presenting stroke patients at spokes	115 min	Average Door in Door Out: Presenting stroke patients at spokes	130 min	Average Door in Door Out: Presenting stroke patients at spokes	112 min	Average Door in Door Out: Presenting stroke patients at spokes	96 min

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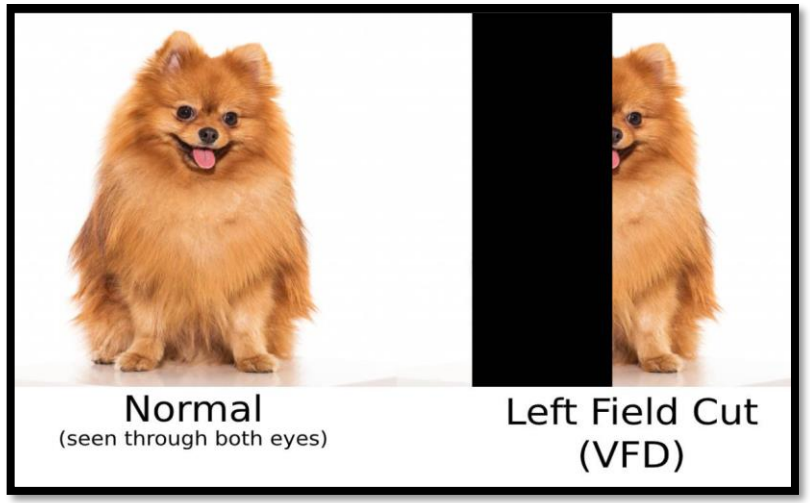
Facility Collaboration Initiatives and Impact on Care

- Less than 3 Pull Me: Reduction of Door to Needle times by 6 minutes 57 to 51 minutes
  - Driven by sites and Telestroke nurses
  - Early recognition of LKW
  - Prepulling IV Lytic kit from Omnicell
- Early Recognition of LVO- understanding Perfusion Scan: Reduction of DIDO by 18 minutes for ED presenting Code Strokes
  - Education provided by Medical Director of understanding and recognition of color-thresholded perfusion scan
  - Ability to recognize M1, M2 and ICA with high-rate of confidence
  - Recognition of LVO syndromes- use of FANG-D- assist bedside

FANG D

- F - Field Cut
- A – Aphasia
- A- Ataxia
- N - Neglect
- G - Gaze Preference
- D - Dense Hemiparesis



Binary score - One element of score makes the screening positive

Quality structure support

- Weekly quality meeting with NSI leaders
  - Review submitted cases and decide which direction, used for tracking/trending, work in conjunction with QAIC
- Quarterly quality meeting
  - Site based medical directors and site leaders to review data and workflow
- Weekly debrief meeting
  - Debriefings with program coordinator for weekly cases to address real time delays
- Site based stroke quality meeting
  - Participate in GWTG data review and quality improvement projects
- TNK and Code IA timeline emailed to facility representative

Quarterly quality meeting: Example

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Neuroscience Institute - Cerebrovascular

Department/Area	*TeleStroke - Pineville*	Target Condition	75%	Report Writer:	Stroup
Opportunity/Metric	Decrease Door to Activation to less than 15 mins 75% of time by 9/22	Actual	84%	Last Updated:	1-Nov-22

B

#	Countermeasures	Estimated Impact	Responsible	Start	Due	Completion Date	Scalable?
A	Education with staff on ROS- PV and EMS		Sosa	1-Jan	1-Oct		
B	Code Stroke Feedback Tool		Sosa	1-Sep			
C	Monthly quality meeting		Telestroke NM/Sosa	1-Jan			
D							
E							

Status of Action Items	% Complete			
	25	50	75	100
	25	50	75	100
	25	50	75	100
	25	50	75	100
	25	50	75	100

2022

Metrics Defining Success	Baseline	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec								YTD
Stretch		80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%								
Goal		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%								
Target Condition		70%	70%	70%	72%	72%	72%	75%	75%	75%	75%	75%	80%								
Patients Meeting Goal	579	46	43	61	53	64	55	47	64	46	53										533
Total Patients	787	57	56	77	61	77	70	62	76	62	63										662
Actual	74%	81%	77%	79%	87%	83%	79%	76%	84%	74%	84%										80%

Countermeasures, Actions & Activities (100% Complete)

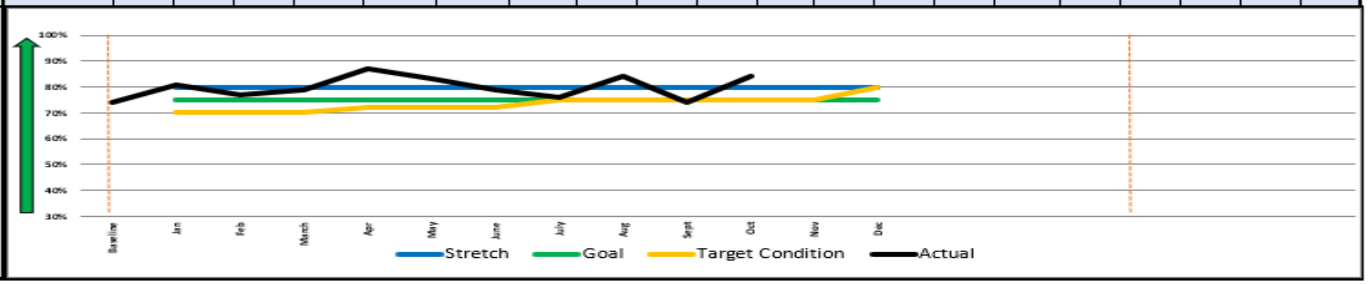
A

Notes/Comments:

Learnings:

Next Steps:

Barriers/Hot Spots:



Weekly debrief meeting: Example

Record ID	Code Stroke Activation	Symptom Recognition to Code Stroke Activation (15 mins)	Door to ED Physician (10 mins)	ED Physician to Code Stroke Activation (5 mins)	Door to Code Stroke Activation (15 mins)	EMS Pre-Notified	Telestroke RN Pre-notified	CT Order to CT Performed (10 mins)	Door to CT Performed (20 mins)	Door to CT Interpretation (25 mins)
34441	9/29/2022 9:29	18						4		
34425	9/28/2022 7:38		1	4	5			9	14	16
34374	9/25/2022 21:28		6	12	18			9	31	39
34366	9/25/2022 11:11		0	-10	-10	Yes	Yes	2	12	43
34363	9/25/2022 8:12		0	-8	-8	Yes	Yes	4	11	16
34341	9/22/2022 16:54		29	3	32			6	35	52
34339	9/22/2022 14:34		8	6	14			3	19	22
34337	9/22/2022 12:40		0	19	19	No		12	36	39
34301	9/20/2022 21:52		0	8	8	No		6	17	24
34297	9/20/2022 18:12		1	-1	0	Yes	No	15	17	26
34272	9/19/2022 18:20		0	-7	-7	Yes	Yes	3	6	20

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Timeline

Facility:	[redacted]
Patient Name:	
MRN:	
Date:	6/21/2023
EMS Pre-alert	POV
Door to Activation	-1
Door to CT	11
Leave for CT to topogram	5
NCCT To CTA	6
CTA to back in room	12
Total time in CT	23
Door to Needle	n/a
Door to Code IA intiated	46
Door to Decision	60
Decision to transport arrival	72
Transport arrival to departure	7
MCA Hotload?	ground
DIDO	141
TSMD:	[redacted]
ERMD:	
TSRN:	
Triage RN:	
TNK Admin RN:	

Facility:	[redacted]
Patient Name:	
MRN:	
Date:	6/28/2023
EMS Pre-alert	No
Door to Activation	13
Door to CT	7
Door to TS RN Page sent	25
Door to TS MD connected	39
TS RN page to TSMD connected	14
Leave for CT to NCCt completed	Not noted
NCCT to CTA completed	18
CTA to back in room	Note noted
Total time in CT	n/a
Door to NIH completed	53
NCCT to NIH completed	46
NIH to IV lytic order	6
Door to IV lytic order	59
lytic order to bolus admin	1
Door to Needle	60
TSMD:	[redacted]
ERMD:	
TSRN:	
Triage RN:	
lytic Admin RN:	

Metrics
-Door to Code Stroke Activation= 15 minutes
- Door to NCCT complete= 20 mintues
- TSRN page sent to TSMD connected= 10 minutes
- Door to Needle (bolus)= 45 minutes.

Reason for delays/opportunities:
-Delay with neurology connecting
-18 minutes between NCCT and CTA being performed
-Telestroke nurse was informed there was a meeting and now only charge nurses can mix TNK, needed to wait for charge nurse to come to room to mix once ordered.

Data and Performance Improvement

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Power BI Performance Dashboard

Direct communication between REDCap Code Stroke Database and Power BI

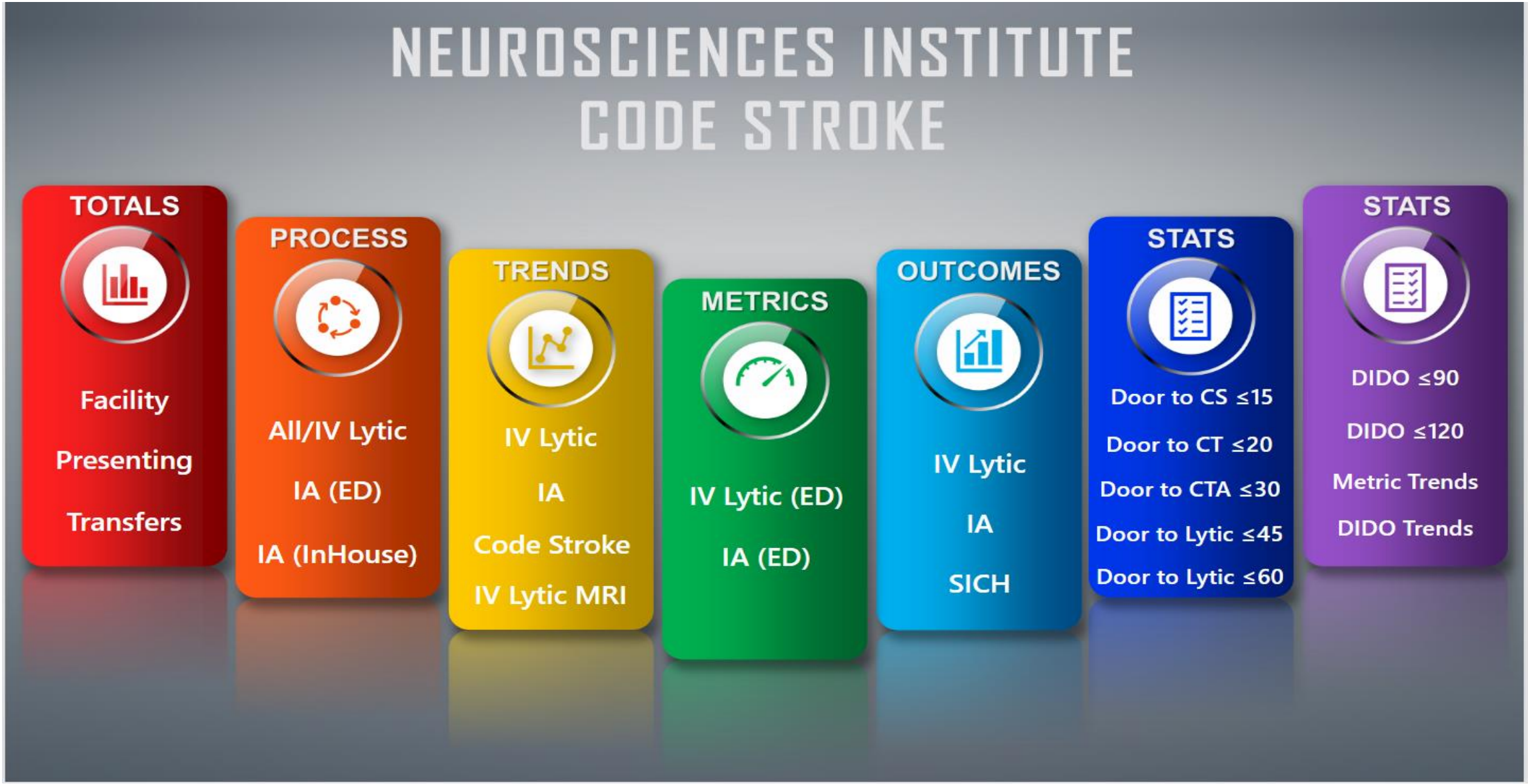
Automatic daily update of all reports within Power BI

Reports built around Code Stroke performance, Lytic/EVT treatment times, transfer performance, and outcomes

Ability to drill down to year, quarter, month as well as facility

Feedback on transfer center performance and outcomes

NEUROSCIENCES INSTITUTE
CODE STROKE



Data Collection

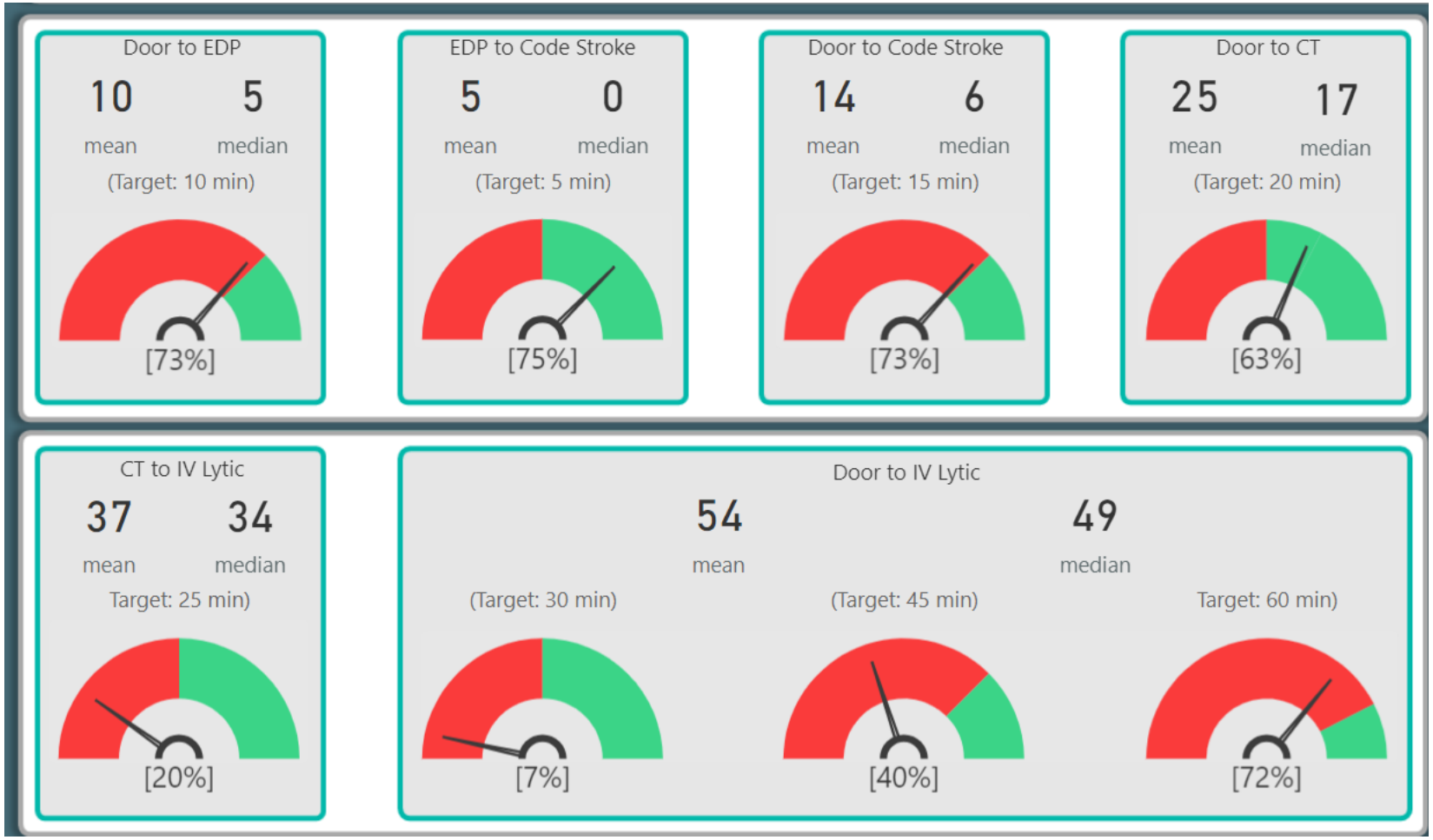
2022 EMS Volume 1145

YTD 7/1/2023 EMS Volume 1225

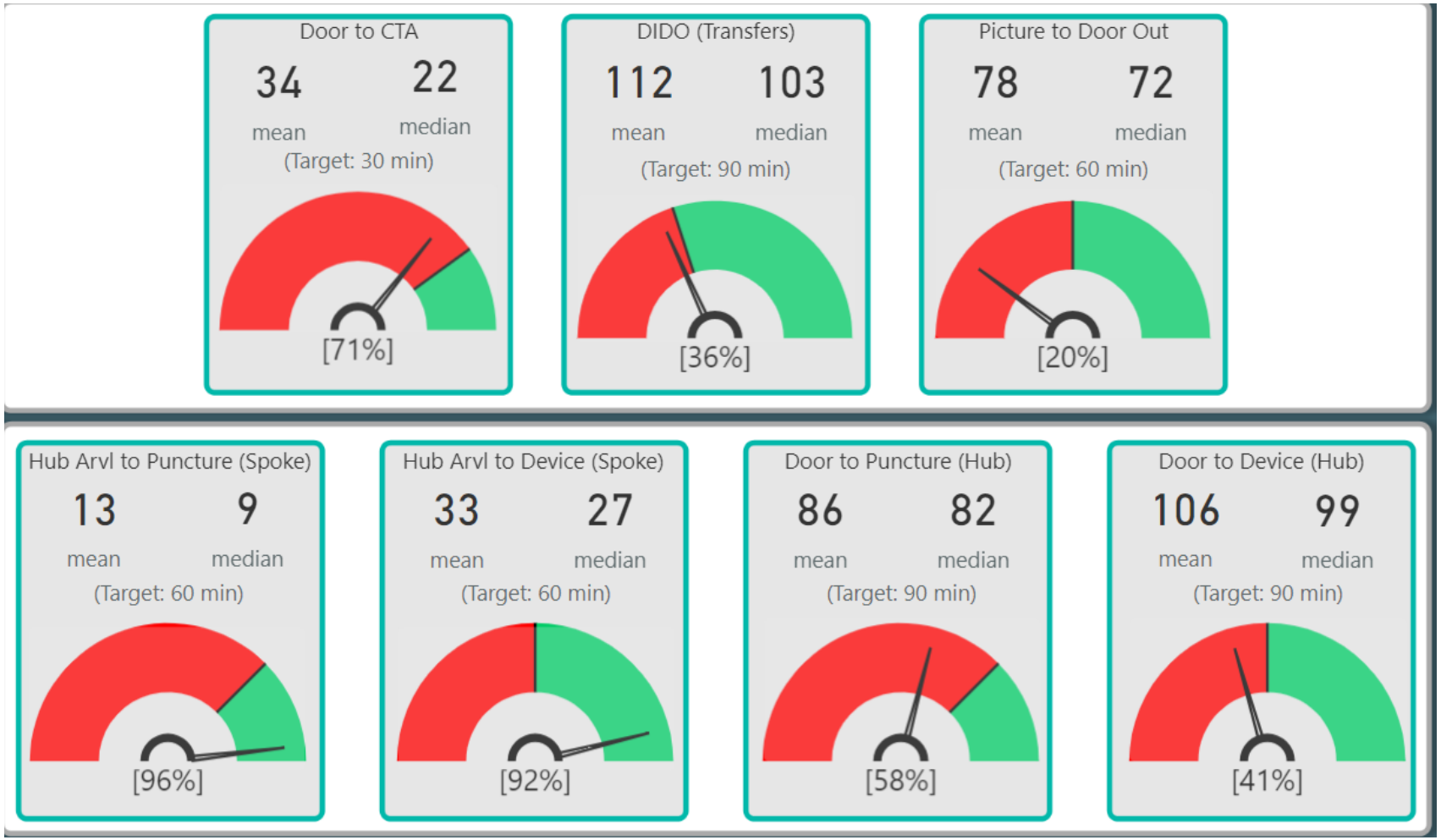
Metrics comparison


Community engagement
Triage STAT and P2P for Teleneurology
Pediatric stroke
Additional Responsibilities
Screen for research studies
Participate in stroke DSC
Realtime chart audits

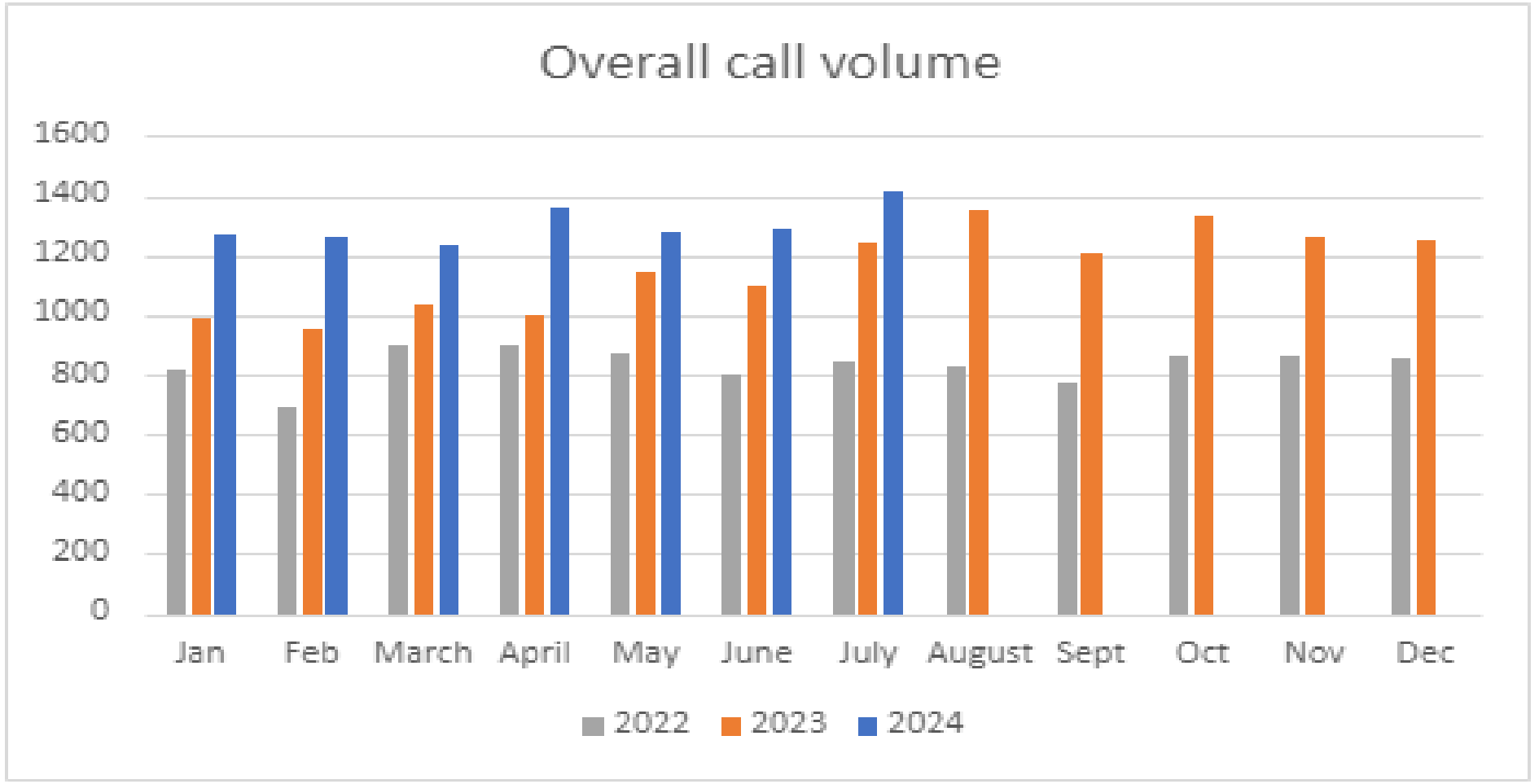
Metric Page- IV Thrombolytic 2023



Metrics Page-Code IA 2023



Call volumes



Summary

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What makes Telestroke nurses unique?

Ability to multitask across multiple platforms and applications

In depth training and knowledge of stroke protocol and imagining

Relationship with Neurologist, Neuroradiologist, Neurointerventionalist

Technology driven

Ability to see “big” picture

What is next for Telestroke?

Growth	Evolution of protocols	Ancillary Support
• Expand services to additional markets • Expand Teleneurology support • LVO Transfer • Telestroke University	• Evaluate additional resources such as APPs • Code ICH • Transfer and triage for neurosurgery • Mobile EMS consultation	• EEG • Collaboration with research nurse

Questions?

- Manager Telestroke RN
  - Laura Williams- laura.williams@atriumhealth.org