

Faster and Smarter at PSCs: Door to Needle, Door In Door Out, and Calibrated Patient Care

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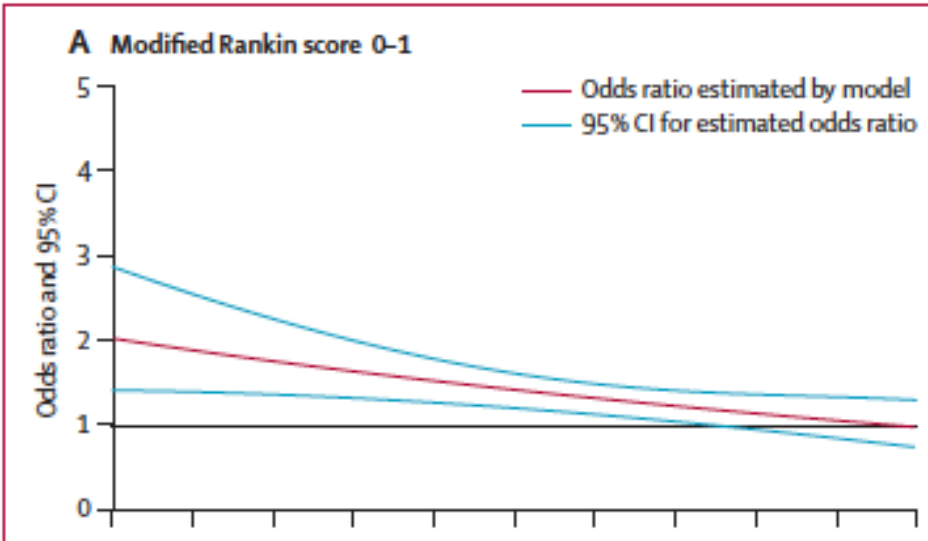
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Disclosures

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Time to treatment with intravenous alteplase and outcome in stroke: an updated pooled analysis of ECASS, ATLANTIS, NINDS, and EPITHET trials



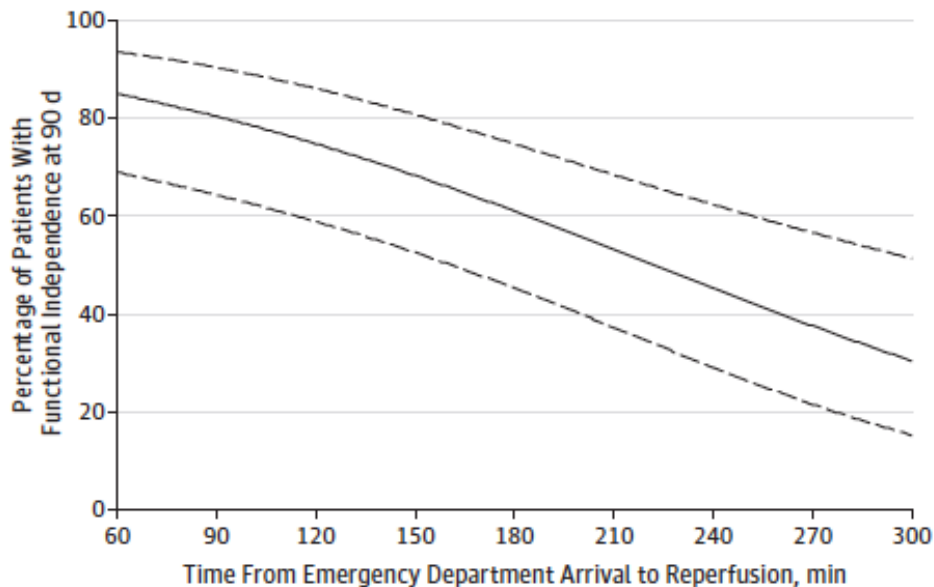
Time to Treatment With Intravenous Tissue Plasminogen Activator and Outcome From Acute Ischemic Stroke

“Faster onset to treatment, in **15-minute increments**, was associated w/

- reduced in-hospital mortality
- reduced symptomatic ICH
- increased achievement of independent ambulation at discharge
- increased discharge to home.”

Time to Treatment With Endovascular Thrombectomy and Outcomes From Ischemic Stroke: A Meta-analysis

A Functional independence (mRS 0-2) by time from emergency department arrival to actual substantial reperfusion



Door-to-Needle (DTN) Strategies

Target: Stroke Phase II Goals: 2014



- Primary Goal: Achieve Door-to-Needle Times within 60 minutes in 75% or more of acute ischemic stroke patients treated with IV tPA.
- Secondary Goal: Achieve Door-to-Needle times within 45 minutes in 50% or more of acute ischemic stroke patients treated with IV tPA.

Target: Stroke Phase III Goals: 2020

NATIONAL GOALS FOR PHASE III

PRIMARY GOALS

- Achieve door-to-needle times within 60 minutes in 85 percent or more of acute ischemic stroke patients treated with IV thrombolytics.
- Achieve door-to-device times (arrival to first pass of thrombectomy device) in 50% or more of eligible acute ischemic stroke patients within 90 minutes (for direct arriving patients) and within 60 minutes (for transfer patients) treated with endovascular therapy (EVT).

SECONDARY GOALS

- Achieve door-to-needle times within 45 minutes in 75 percent or more of acute ischemic stroke patients treated with IV thrombolytics.
- Achieve door-to-needle times within 30 minutes in 50 percent or more of acute ischemic stroke patients treated with IV thrombolytics.

Target: Stroke Best Practices

1. EMS Pre-Notification
2. Stroke Tools: Decision Support, Order-sets, Guidelines, Protocols, NIHSS
3. Rapid Triage Protocol & Stroke Team Notification
4. Single Call Activation System
5. Timer or clock attached to chart, clip board or patient bed
6. Transfer Directly to CT Scanner
 - Quickly determine if NIHSS ≥ 6 ; if so, concurrently perform CT angiography
7. Rapid Acquisition and Interpretation of Brain Imaging
8. Rapid Laboratory Testing (e.g. POC, procedures for lab prioritization)
9. Mix Alteplase Ahead of Time
10. Rapid Access and Administration of IV alteplase
 - “The initial tPA bolus should be administered while the patient is on the CT table”
11. Team-Based Approach
12. Prompt Data Feedback

Who Needs Labs before Alteplase?

- “presence of medical conditions associated with coagulation disorders, including the presence of cancer, alcoholism, renal or liver failure or drug abuse.”

Advanced DTN Strategies

- Patient Registration Prior to Arrival to review medical records and pre-order tests
- Patient History Prior to Arrival
- Emergency Provider focused training and directed treatment

Reducing in-hospital delay to 20 minutes in stroke thrombolysis

Neurology® 2012;79:306-313

Figure 1 Number of annually treated patients and median door-to-needle times

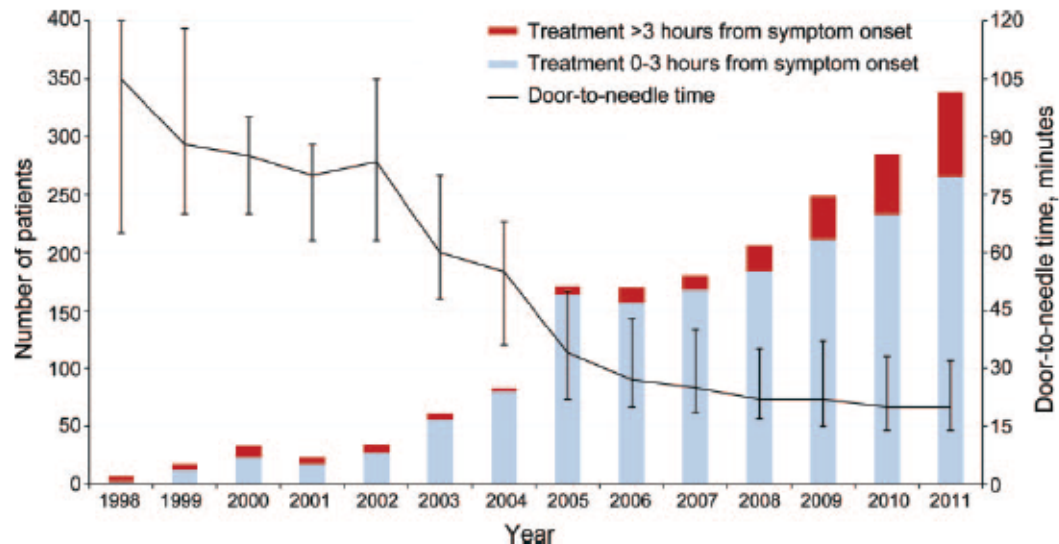


Table 1 Twelve measures to reduce treatment delays

Measure	Description	Year
EMS Involvement	Education of dispatchers and EMS personnel, stroke high-priority dispatch	1998
Hospital prenotification	EMS contacts stroke physician directly via mobile phone	2001
Alarm and preorder of tests	Laboratory and CT computer-ordered and alarmed at prenotification	2001
No-delay CT interpretation	Stroke physician interprets the CT scan, not waiting for formal radiology report	2001
Premixing of tPA	With highly suspect thrombolysis candidates, tPA premixed prior to patient arrival	2002
Delivery of tPA on CT table	Bolus administered on CT table	2002
CT relocated to ER	Patient transfers of several hundred meters, including elevators, were no longer needed	2003
CT priority and CT transfer	CT emptied prior to patient arrival, and patient transferred straight onto CT table, not ER bed	2004
Rapid neurologic evaluation	Patient is examined upon arrival, on CT table	2004
Preacquisition of history	Statewide electronic patient records and eyewitness interview before/during transportation	2005
Point-of-care INR	Laboratory personnel draw blood while patient on CT table, and perform instant POC INR	2005
Reduced Imaging	While all patients have a CT, advanced imaging reserved for unclear cases only	2005



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Reducing in-hospital delay to 20 minutes in stroke thrombolysis

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“However, the preliminary history relayed by the EMS, especially on symptom onset, was often not accurate, and reaching next of kin or eyewitnesses afterwards for treatment decisions was difficult. *The treating stroke physician therefore requested communication with the primary informants over a mobile phone already at prenotification, during EMS contact on-scene, and preferably to have the next of kin cotransported by EMS to allow for rapid additional history taking when need arose. Such history taking during transport was complemented by accessing the provincewide electronic patient records prior to patient arrival.*”

Fast Protocol for Treating Acute Ischemic Stroke by Emergency Physicians

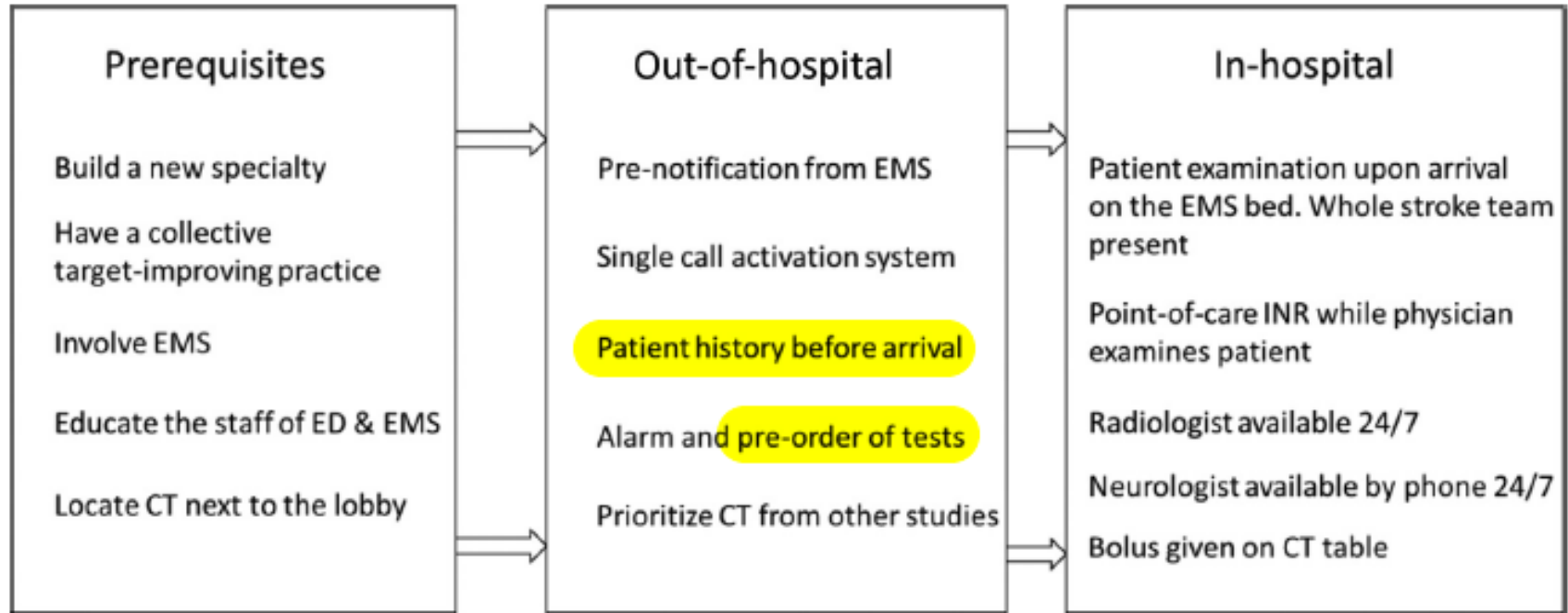
Iiro Heikkilä, MD*; Hanna Kuusisto, MD, PhD; Markus Holmberg, MD; Ari Palomäki, MD, PhD

Results: A total of 107 patients with comparable data were treated with tissue plasminogen activator in 2009 to 2012 (group 1) and 46 patients were treated during 12 months in 2013 to 2014 (group 2). Median door-to-needle time was 54 minutes before the reorganization and 20 minutes after it (statistical estimate of difference 32 minutes; 95% confidence interval 26 to 38 minutes). After adjusting for several potential cofounders in multivariable regression analysis, the only factor contributing to a significant reduction in delay was group (after reorganization versus before). Median onset-to-treatment times were 135 and 119 minutes, respectively (statistical estimate of difference 23 minutes; 95% confidence interval 6 to 39 minutes). The rates of symptomatic intracerebral hemorrhage were 4.7% (5/107) and 2.2% (1/46), respectively (difference 2.5%; 95% confidence interval -8.7% to 9.2%). Approximately 70% of treated patients were functionally independent (modified Rankin Scale score 0 to 2) when treated after the reorganization.

Conclusion: Implementation of a stroke protocol with emergency physician-directed acute care decreased both door-to-needle time and onset-to-treatment time without increasing the rate of symptomatic intracerebral hemorrhage. [Ann Emerg Med. 2019;73:105-112.]

Emergency Physician Training

- Training in the stroke unit at the neurology ward
- Theoretical teaching and practical training in diagnosing and treating patients with acute ischemic stroke
- Preparation with the electronic patient record after the prenotification given by EMS
- Shadowing of an experienced neurologist in acute neurologic emergencies
- Diagnosis and treatment of their own patients with clinical acute ischemic stroke, under the supervision of the specialist in the ED.
- Radiologists taught emergency physicians the evaluation of head computed tomography (CT) of patients with acute ischemic stroke.



Improved door-to-needle times and neurologic outcomes when IV tissue plasminogen activator is administered by emergency physicians with advanced neuroscience training☆☆☆

American Journal of Emergency Medicine 33 (2015) 234–237

Advanced neuroscience training

Fellowship training	Contact hours
Neurologic ICU	24
Neuroradiology	24
Stroke unit	16
Cerebrovascular neurosurgical intervention	16
Annual neurologic CME	16
Annual attendance at dedicated neuroscience conference also required	

DTN 83 min vs 35 min

Door-in Door-out (DIDO) for Large Vessel Occlusion (LVO) Acute Ischemic Strokes

The URMIC “Code LVO” Pathway

“Code LVO”: Goals

- Identify all Acute Ischemic Strokes due to Large Vessel Occlusions in our region meeting Level 1A recommendations for endovascular treatment
- Allow patients with ischemic strokes to remain at their local community hospital when transfer to a CSC is unlikely to be of benefit
- Median DIDO time of 60 minutes
- Median OSH door to CSC Skin Puncture time of 120 minutes

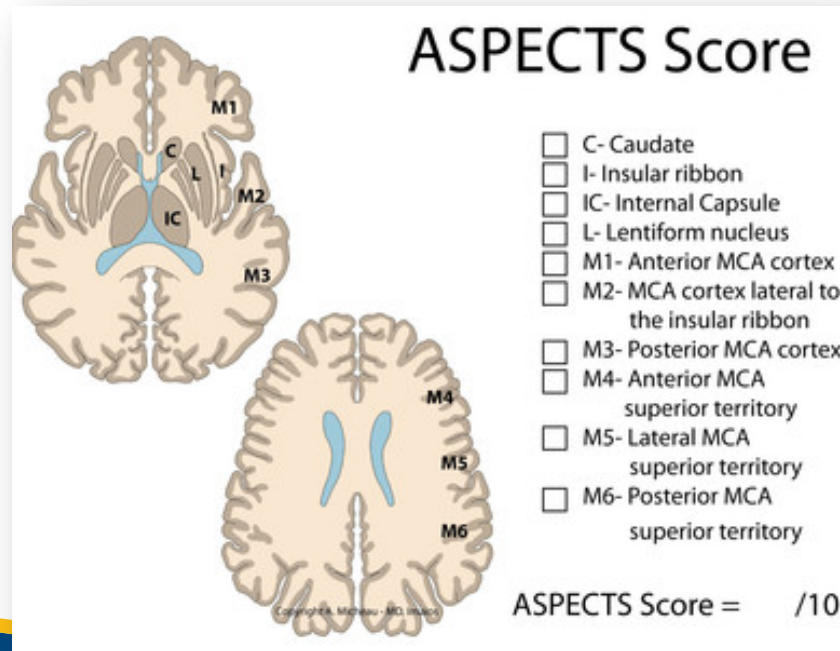
“Code LVO” Qualifying Criteria

NIHSS ≥ 6

ASPECTS ≥ 6

Anterior Circulation LVO (ICA or Proximal MCA, i.e. M1)

ASPECTS: **A**lberta **S**troke **P**rogram **E**arly **CT S**core



Look at all Cuts

CT cuts at level of Basal Ganglia

C/ IC/ L/ I

M1/ M2/ M3

CT Cuts > 1 cm rostral to Basal Ganglia:

M4/ M5/ M6

Lose 1 point for each area with EIC



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Lancet 2000; **355**: 1670–74

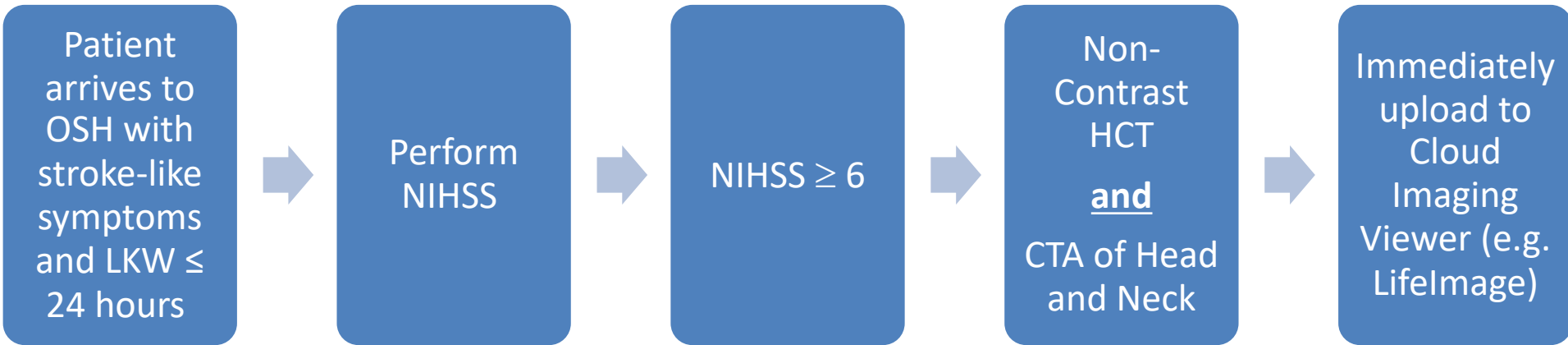
<http://www.aspectsinstroke.com/>



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“Code LVO”: Identification



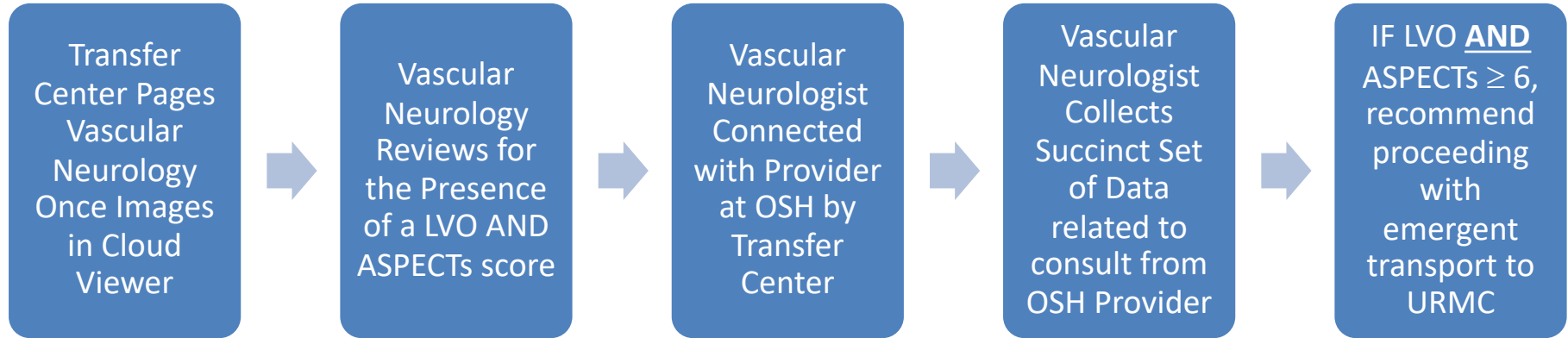
Code LVO: Parallel Processes

NIHSS ≥ 10

- HCT and CTA of Head and Neck
- Call Transfer Center and say "Code LVO at ____" and send facesheet
- Auto-Launch Transport (HEMS vs Ground)
- Routine ED evaluation for IV tPA

Note: NIHSS 6-9 should have CTA done on arrival. If local read is LVO, Auto-Launch transport and Call Transfer center, as per above

“Code LVO”: CSC Process



Information Obtained in Consult

- NIHSS
- Method of Transport
- Anticoagulant Use + INR or Last Dose of Medication
- tPA yes/no
- LKWT
- Family contact name & phone number
- +/- Baseline Functional Status

CSC Process, Confirmed Transfer

- OSH RN -> URMIC RN Report
- URMIC sends “Code LVO” Page to
 - Mobilize the OR and NeuroICU
 - Provide notification to ED, Neurology, and NSGY of patient’s ETA

“Code LVO” Results through 12/2018

Metric	Pre-Code LVO	Post-Code LVO	Absolute Diff
Hospital 1 Median DIDO	2:17	1:29	-0:48
Hospital 2 Median DIDO	2:07	1:43	-0:24
Hospital 3 Median DIDO	2:07	0:57	-1:10
Aggregate Median DIDO	2:10	1:20	-0:50
% DIDO < 60 minutes	1.1%	15.4%	+14.3%
Thrombectomy Attempt Rate	25.4%	53.9%	+29.5%
Mortality Rate	27.2%	16.7%	-10.5%

2018 “Code LVO” Results vs New York State

Metric	Code-LVO Hospitals	New York State	Difference
Median DIDO	1:20	2:10	- 0:50
% DIDO < 60 min	15.4%	3.7%	+11.7%

Acknowledgements

- Regional ED nurses and physicians
- Regional Stroke directors, providers and coordinators
- Critical care transport teams
- URM C Transfer center
- URM C ED and ICU teams
- URM C Cerebrovascular team
- URM C Radiology/ IR
- URM C OR teams and Anesthesiology
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- Diana Proper, MS, RT, URM C Neurosurgery Stroke Data Coordinator