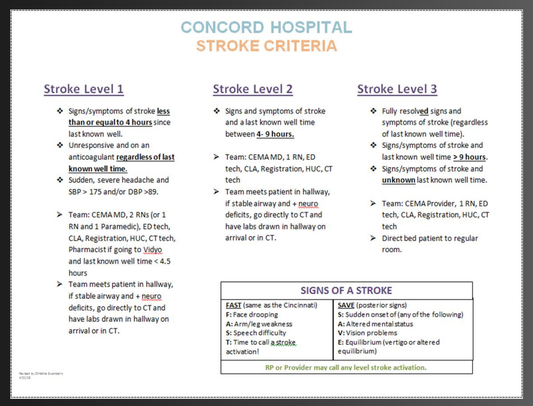
Three-Tier Stroke Activations at a Primary Stroke Center: A Quality Improvement Initiative

Christina Swanberry, BSN, RN, CCRN-K, SCRN, Lezli Clark, BSN, RN, CEN, CPEN,
Aimee Valeras, Ph.D., LICSW

Introduction:

•Concord Hospital redesigned stroke activations to provide timelier assessment and treatment to patients experiencing acute stroke while also increasing the recognition of posterior signs of stroke.
•Stroke activations were redesigned to follow best practices statements per the American Heart Association.[1]
•A three tier stroke activation process was designed to provide timely care with respect to appropriate resource allocation (below).



CONCORD HOSPITAL
STROKE CRITERIA

Stroke Level 1

- Signs/symptoms of stroke **less than or equal to 4 hours** since last known well.
- Unresponsive and on an anticoagulant **regardless of last known well time.**
- Sudden, severe headache and SBP > 175 and/or DBP >89.

➢ Team: CEMA MD, 2 RNs (or 1 RN and 1 Paramedic), ED tech, CLA, Registration, HUC, CT tech, Pharmacist if going to Vidyo and last known well time < 4.5 hours
➢ Team meets patient in hallway, if stable airway and + neuro deficits, go directly to CT and have labs drawn in hallway on arrival or in CT.

Stroke Level 2

- Signs and symptoms of stroke and a last known well time between **4- 9 hours.**

➢ Team: CEMA MD, 1 RN, ED tech, CLA, Registration, HUC, CT tech
➢ Team meets patient in hallway, if stable airway and + neuro deficits, go directly to CT and have labs drawn in hallway on arrival or in CT.

Stroke Level 3

- Fully resolved signs and symptoms of stroke (regardless of last known well time).
- Signs/symptoms of stroke and last known well time **> 9 hours.**
- Signs/symptoms of stroke and **unknown** last known well time.

➢ Team: CEMA Provider, 1 RN, ED tech, CLA, Registration, HUC, CT tech
➢ Direct bed patient to regular room.

SIGNS OF A STROKE	
FAST (same as the Cincinnati) F: Face drooping A: Arm/leg weakness S: Speech difficulty T: Time to call a stroke activation!	**SAVE** (posterior signs) S: Sudden onset of (any of the following) A: Altered mental status V: Vision problems E: Equilibrium (vertigo or altered equilibrium)
RP or Provider may call any level stroke activation.	

•Level 1: Aimed at capturing patients in the alteplase treatment window and patients experiencing hemorrhagic stroke. Patients are transported directly to the computed tomography (CT) scanner and an additional registered nurse (RN) is made available to assist in the calculations, mixing, and administration of alteplase.

•Level 2: Aimed at capturing patients outside of the alteplase treatment window, but remain in an endovascular therapy treatment window. Patients are transported directly to the CT scanner, but do not require a second nurse to respond unless additional medications are needed (e.g. blood pressure management).

•Level 3: Aimed at capturing patients with stroke symptoms that fully resolved or are out of the window for alteplase or endovascular therapy. Level 3 activations do not require an extra nurse to respond and allow more time for the patient to be examined prior to CT scan.

Background:

•Concord Hospital (CH) is a 295 bed community hospital that is certified by Det Norske Veritas (DNV) as a Primary Stroke Center. Concord Hospital serves approximately 300 patients with a primary discharge diagnosis of stroke or transient ischemic attack (TIA) per year.
•Concord Hospital experienced a 44% increase in stroke activation volume to be able to consider more patients for mechanical thrombectomy, as it became the standard of care in 2015.[3]
•Allocating resources to manage this increase in volume became difficult for a community hospital.

Population:

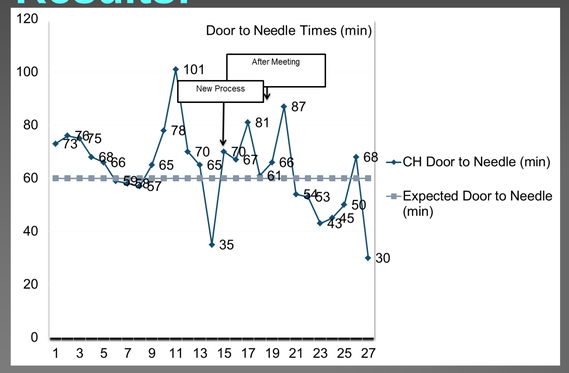
•The ED stroke activation process focused on any patient with signs and symptoms of stroke regardless of age, sex, or ethnicity.
•New Hampshire's and Concord Hospital's population is older on average than the US.[4] In 2016, the median age of CH patients with ischemic stroke was 73 years with a range of 29-101 years, the majority (51%) between the ages of 66-85. More male patients (57%) presented with acute ischemic stroke, in comparison to the national average (49%).[2]

Methods:

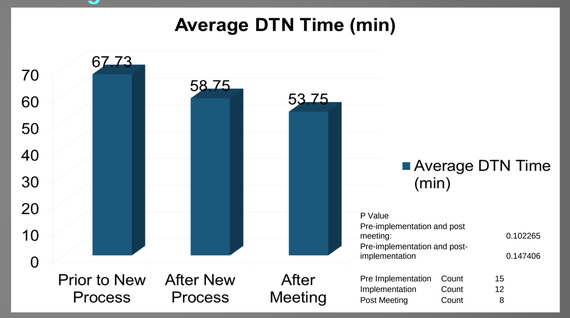
The process change to the three-tier activation was implemented on August 15, 2016 through mandatory varied educational opportunities geared towards specific disciplines, as follows:

Stakeholder Group	Education Provided
ED Staff (nurses, paramedics, ED techs, HUCs)	Online Module Newsletter Articles Team Chat (weekly update) Classroom 1:1 Training Simulation Lab
ED Leadership (Director, managers, educators, resource persons)	Online Module Newsletter Articles Team Chat (weekly update) Classroom 1:1 Training
ED Provider (Physician or PA)	Power Point Staff Meeting Newsletter Articles
EMS	Advisory Newsletter CHED/EMS Bulletin Board
CT Techs	Newsletter Staff Meetings
Lab CLAs	Newsletter Staff Meetings

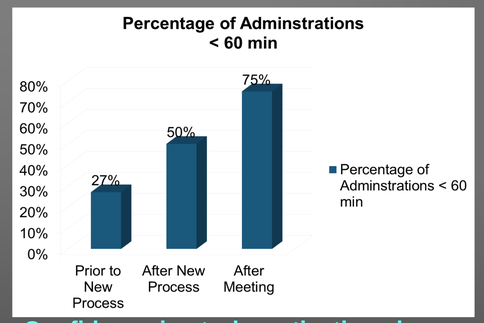
Results:



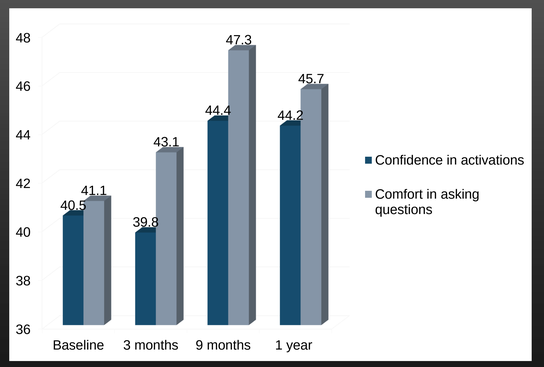
•Average door to needle time decreased



•Percentage of patients that received IV tPA in less than 60 minutes increased



•Confidence in stroke activations increased
•Comfort in asking questions about stroke processes increased

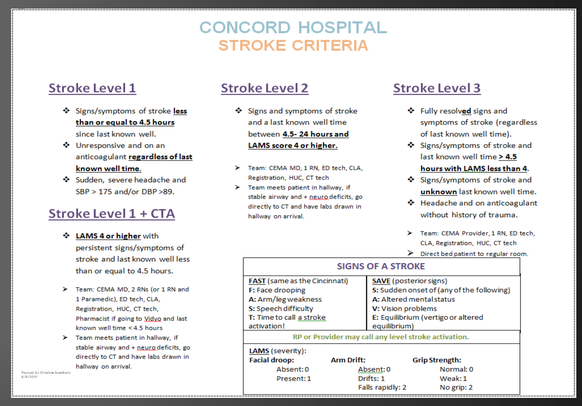


Conclusions:

•A three-tiered stroke activation process was successful at decreasing door to needle times while judiciously managing limited resources.
•Early buy in from all key stakeholders is critical to the success of the process change.
•Open communication and education between all stakeholders is necessary for major process improvement.
•This study is limited to a single Primary Stroke Center and may not be generalizable to other organizations.
•Due to the small sample size, results are not statistically significant.

Tentative Next Steps:

•ED stroke activations will continue to be reviewed and revised by the Stroke Program.
•Multidisciplinary stakeholder discussions regarding revisions to the stroke activation process are held quarterly during Stroke Steering Committee meetings.
•Plan to collect data on patient experience and satisfaction.



CONCORD HOSPITAL
STROKE CRITERIA

Stroke Level 1

- Signs/symptoms of stroke **less than or equal to 4.5 hours** since last known well.
- Unresponsive and on an anticoagulant **regardless of last known well time.**
- Sudden, severe headache and SBP > 175 and/or DBP >89.

Stroke Level 1 + CTA

- **LAMS 4 or higher** with persistent signs/symptoms of stroke and last known well less than or equal to 4.5 hours.

➢ Team: CEMA MD, 2 RNs (or 1 RN and 1 Paramedic), ED tech, CLA, Registration, HUC, CT tech, Pharmacist if going to Vidyo and last known well time < 4.5 hours
➢ Team meets patient in hallway, if stable airway and + neuro deficits, go directly to CT and have labs drawn in hallway on arrival.

Stroke Level 2

- Signs and symptoms of stroke and a last known well time between **4.5- 24 hours and LAMS score 4 or higher.**

➢ Team: CEMA MD, 1 RN, ED tech, CLA, Registration, HUC, CT tech
➢ Team meets patient in hallway, if stable airway and + neuro deficits, go directly to CT and have labs drawn in hallway on arrival.

Stroke Level 3

- Fully resolved signs and symptoms of stroke (regardless of last known well time).
- Signs/symptoms of stroke and last known well time **> 4.5 hours with LAMS less than 4.**
- Signs/symptoms of stroke and **unknown** last known well time.
- Headache and on anticoagulant without history of trauma.

➢ Team: CEMA Provider, 1 RN, ED tech, CLA, Registration, HUC, CT tech
➢ Direct bed patient to regular room.

SIGNS OF A STROKE	
FAST (same as the Cincinnati) F: Face drooping A: Arm/leg weakness S: Speech difficulty T: Time to call a stroke activation!	**SAVE** (posterior signs) S: Sudden onset of (any of the following) A: Altered mental status V: Vision problems E: Equilibrium (vertigo or altered equilibrium)
RP or Provider may call any level stroke activation.	

LAMS (severity):
Facial droop: Absent: 0, Present: 1
Arm Drift: Absent: 0, Drifts: 1, Falls rapidly: 2
Grip Strength: Normal: 0, Weak: 1, No grip: 2

References:

1.American Stroke Association. (2017). Target: Stroke^{sm} phase II: 12 Key best practice strategies. Retrieved from: http://www.strokeassociation.org/

2.Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, Das SR, de Ferranti S, Després J-P, Fullerton HJ, Howard VJ, Huffman MD, Isasi CR, Jiménez MC, Judd SE, Kissela BM, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Magid DJ, McGuire DK, Mohler ER III, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Rosamond W, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Woo D, Yeh RW, Turner MB; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation.* 2016;133:000-000

3.Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hoh BL, Jauch EC, Johnston KC, Johnston SC, Khalessi AA, Kidwell CS, Meschia JF, Ovbiagele B, Yavagal DR; on behalf of the American Heart Association Stroke Council. 2015 American Heart Association/American Stroke Association focused update of the 2013 guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke.* 2015;46:3020–3035

4.United States Department of Commerce. (2017). QuickFacts: New Hampshire; United States. Retrieved from: https://www.census.gov/