Can Prehospital Activation of a "Stroke Code" Decrease Time to Thrombolysis?

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Background

- Treatment for ischemic stroke with tissue plasminogen activator (tPA) is effective but time sensitive
- Many stroke centres expedite this process with a 'stroke code' protocol, but time of activation is variable

Objectives

- To compare 'prehospital' to 'in-hospital' activation of stroke code to determine if this affected time from emergency department (ED) arrival to tPA administration (door-to-needle time)

Methods

- A 12-month, prospective cohort study, involving Eastern Ontario paramedics and two Regional stroke centres
- Paramedics used a prompt card to identify a possible acute ischemic stroke, then patched to the closest stroke centre
- The prehospital activation center called a stroke code immediately, while the in-hospital activation centre deferred until ED physician assessment
- Continuous variables were compared using a Mann-Whitney U Test

Eastern Ontario

Figure 1. Patient Enrolment

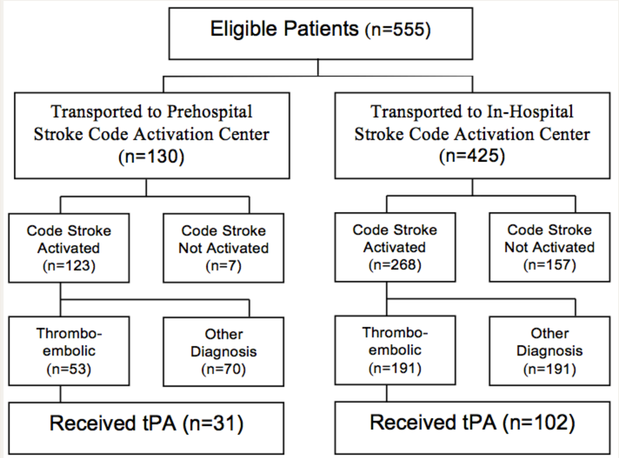
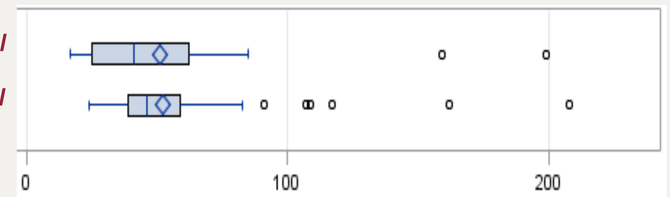


Figure 2. Median Door-to-Needle Time by Activation



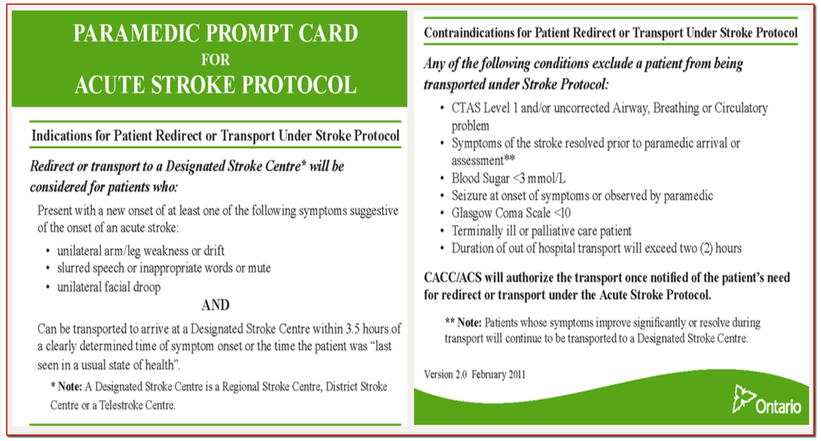
Prehospital: 41 minutes **Median difference: 5 minutes**
In-Hospital: 46 minutes **p value: 0.1546**

Table 1. Patient Characteristics

	Prehospital (n= 130)	In-Hospital (n= 425)	All (n=555)
Patient Characteristics			
• Mean age – years (SD)	72.2 (14.0)	72.4 (15.4)	72.3 (15.1)
• Male sex – n (%)	69 (53.1)	219 (51.5)	288 (51.9)
• Population (millions)	0.1	1.3	1.4
• Initial GCS – (mean)	13.2	13.7	13.6
• Final GCS – (mean)	13.5	13.9	13.8
• NIH score – (mean)	7.9	8.7	8.4
Final Diagnosis - n (%)			
• Stroke	62 (47.7)	221 (52.0)	283 (51.0)
○ Ischemic	53 (40.8)	191 (44.9)	244 (44.0)
○ Hemorrhagic	9 (6.9)	29 (6.8)	38 (6.8)
• Subarachnoid bleed	0 (0.0)	1 (0.2)	1 (0.2)
• TIA	22 (16.9)	74 (17.4)	96 (17.3)
• Other Neurologic	21 (16.2)	24 (5.6)	45 (8.1)
Prehospital adverse events - n (%)			
• Any adverse event	20 (15.4)	70 (16.5)	90 (16.2)
• Unstable hemodynamics	9 (6.9)	28 (6.6)	37 (6.7)
• Worse vitals or GCS	8 (6.2)	23 (5.4)	31 (5.6)
• Hospital MD Contacted	0 (0.0)	7 (1.6)	7 (1.3)
• Death	0 (0.0)	0 (0.0)	0 (0.0)
Adverse events in ED in 1st hour - n (%)			
• Any adverse event	3 (2.3)	27 (6.4)	30 (5.4)
• Unstable Hemodynamics	0 (0.0)	15 (3.5)	15 (2.7)
• Death	0 (0.0)	0 (0.0)	0 (0.0)

Table 2. Outcomes

	Prehospital (n= 130)	In-Hospital (n= 425)	All (n=555)
Stroke code called – n (%)	123 (94.6)	268 (63.1)	391 (70.5)
Thromboembolic stroke – n (%)	62 (47.7)	221 (52.1)	283 (50.1)
tPA given – n (%)	31 (23.9)	102 (24.0)	133 (24.0)
Median door-to-needle time (min)	41.0	46.0	46.0
- Range (min)	17-199	24-208	17-208
Any post tPA bleed – n (%)	5 (16.1)	12 (11.8)	17 (17.3)
Minor post tPA bleed – n (%)	3 (9.7)	6 (5.9)	9 (6.8)
Major post tPA bleed – n (%)	2 (6.5)	6 (5.9)	8 (6.0)
ED disposition – n (%)			
• Admitted	89 (68.5)	272 (64.0)	361 (65.0)
• Discharged	29 (22.3)	144 (33.9)	173 (31.2)
• Repatriated	12 (9.2)	3 (0.7)	15 (2.7)
• Died in ED	0 (0.0)	6 (1.4)	6 (1.1)
• Survival to Discharge	109 (83.8)	378 (88.9)	487 (87.7)
MRS at Discharge - (mean)	2.7	2.1	2.3



PARAMEDIC PROMPT CARD FOR ACUTE STROKE PROTOCOL

Indications for Patient Redirect or Transport Under Stroke Protocol

Redirect or transport to a Designated Stroke Centre* will be considered for patients who:

Present with a new onset of at least one of the following symptoms suggestive of the onset of an acute stroke:

- unilateral arm/leg weakness or drift
- slurred speech or inappropriate words or mute
- unilateral facial droop

AND

Can be transported to arrive at a Designated Stroke Centre within 3.5 hours of a clearly determined time of symptom onset or the time the patient was "last seen in a usual state of health".

*** Note:** A Designated Stroke Centre is a Regional Stroke Centre, District Stroke Centre or a Telestroke Centre.

Contraindications for Patient Redirect or Transport Under Stroke Protocol

Any of the following conditions exclude a patient from being transported under Stroke Protocol:

- CTAS Level 1 and/or uncorrected Airway, Breathing or Circulatory problem
- Symptoms of the stroke resolved prior to paramedic arrival or assessment**
- Blood Sugar <3 mmol/L
- Seizure at onset of symptoms or observed by paramedic
- Glasgow Coma Scale <10
- Terminally ill or palliative care patient
- Duration of out of hospital transport will exceed two (2) hours

CACC/ACS will authorize the transport once notified of the patient's need for redirect or transport under the Acute Stroke Protocol.

**** Note:** Patients whose symptoms improve significantly or resolve during transport will continue to be transported to a Designated Stroke Centre.

Version 2.0 February 2011

Ontario

Discussion

- Response to patients with a potential ischemic stroke remains a challenge that requires a multidisciplinary, coordinated response to minimize door-to-needle time
- Direct comparisons between any two stroke centres is challenging due to differences including, but not limited to, geography, hospital resources, size of the stroke team, ER physician assessment, and neurologist assessment
- Quality improvement projects occurred at the in-hospital activation centre prior to the study, which may be as effective as introducing a prehospital activation of stroke code to reduce door-to-needle time
- Limitations to this study include; no door-to-CT time, and no 30-day morbidity or mortality data

Conclusions

- Door-to-needle time was slightly faster with prehospital activation. However, it was not statistically significant, and did not reduce the rate of tPA administration, post tPA bleed, or survival to discharge
- Improving door-to-needle times requires a multidisciplinary approach tailored to the unique challenges of each stroke center
- The impact of prehospital stroke code activation on hospital resources and personnel needs further study

Special Thanks:

Dr. R. Dionne, Dr. G. Stotts, Dr. A. Jin, Dr. M. Siviloti, Jim Lumsden, Cathy Clement, Doug Socha, Cally Martin, Angela Marcantonio, Cindy Pollock