



Predictors of diagnostic neuroimaging delay in adult Ontario patients presenting with symptoms suggestive of acute stroke

Kirsteen Burton, MD, MBA, MSc, PhD (candidate, RCPSC CIP)

PGY-2 Resident: University of Toronto Dept. of Medical Imaging

No disclosures to reveal.

This study was funded by:

Canadian Institutes of Health Research;
Heart & Stroke Foundation;
Canadian Stroke Network

Background

- Rapid access to diagnostic neuroimaging is critical to the management of acute stroke patients.
 - **AHA guidelines**: imaging within 25 mins. of ED arrival.
 - 4.5 hour thrombolytic time window.
- Numerous studies have examined door-to-needle time, but few, door-to-imaging time (DIT).
 - Those that did: 1) did not attempt to identify factors that impacted DIT; 2) were underpowered;¹ 3) conducted before release of latest AHA guidelines.^{2,3}
- **Objective**: identify factors associated with neuroimaging delay; defined as neuroimaging > 25 mins.

¹Sauser et. al; Stroke 2014.

²Kelly et. al; Stroke 2012.

³Rose et. al; Stroke 2008.

Methods

- **Ontario Stroke Registry**: population-based; adult patients with suspected stroke; seen at all acute care hospitals in Ontario, Canada.
 - **Hospitals**: regional, district & non-stroke centres.
- **Period**: April 2010-March 2011 (13,250 eligible).
- **Exclusions**: patients in whom time of Sx onset was not exactly known; presented beyond 4 hours; died before neuroimaging; hospitals without neuroimaging capacity.
- **Hierarchical, multivariable Cox proportional hazards model**: receipt of rapid neuroimaging to: time b/w Sx onset & neuroimaging; adjusted for demographic, medical history, presentation & hospital factors.

Methods: model variables

- **Demographics:**
 - Age group; gender; income quintile; preferred language; pre-admission independence.
- **Presentation:**
 - NIHSS; business hours; place of residence (home, nursing home, complex continuing care).
- **Past medical history:**
 - Hx of stroke, TIA, ICH; carotid revascularization; DM; HTN; hyperlipidemia; dementia; other CV diseases.
- **Hospital:**
 - Stroke centre designation; rural setting; annual stroke volume.

Results

- 3,984 eligible patients (presented within 4 hours of Sx onset):
 - **Mean time from Sx onset:** 1.49 hours.
 - **Age:** 71.5% >64 years old.
 - **Stroke severity:** 59% NIHSS score ≤ 4 .
 - Neuroimaging performed within 25 mins. in 27.3% of patients.
 - Even designated stroke centres provide rapid neuroimaging in a low proportion of patients (26.2%).

Predictors: rapid neuroimaging

Positive predictors (HR, p-value)	Negative predictors (HR, p-value)
Time from Sx onset to ED presentation (0.5-1.0hr) (1.59, <0.0001)	Female gender (0.76, <0.0001)
NIHSS score >4 (3.54, <0.0001)	PMHx stroke, TIA, ICH (0.78, <0.001)
Arrived to hospital from nursing, retirement home or complex continuing care (1.21, 0.01)	Rural hospital (0.08, <0.001)
Regional stroke centre (5.60, <0.001)	

Discussion

- **Female patients:** consistent with findings from other studies which found delays in: neuroimaging; and door-to-doctor time.^{1,2,3}
- **Rural hospitals:** rural stroke patients are less likely to use EMS;⁴ hospitals with greater stroke patient volumes have greater neuroimaging utilization rates.⁵
- **Past Hx stroke/ICH/TIA:**
 - 1) Patient preferences +/- advanced care directives, the effect of which we did not estimate;
 - 2) Hampered patient/caregiver/health care team communication.

¹Kelly et. al; Stroke 2012.

²Gargano et. al; Stroke 2009.

³Di Carlo et. al; Stroke 2003.

⁴Ekundayo et. al; Circ Cardiovasc Qual Outcomes 2013.

⁵Saposnik et. al; Neurology 2007.

Conclusions/advances in knowledge

- In Ontario, there is a fundamental inadequacy in the management of patients with suspected, acute stroke.
- Neuroimaging delays are influenced by an array of patient demographic, presentation, medical history, and hospital factors.
- There is an urgent need for quality improvement initiatives to address the issues and increase the numbers of patients who receive appropriate management.
- There's room to improve.

www.ihpme.utoronto.ca

Co-authors:

Dr. Alan Moody^{1,2}

Dr. Moira Kapral^{3,4}

Dr. Murray Krahn^{3,4}

Dr. Andreas Laupacis^{3,4}

¹UofT Dept. of Medical Imaging

²UofT Institute of Medical Sciences

³UofT Dept. of Medicine

⁴UofT Inst. of Health Policy, Management & Evaluation

Email:

kirsteen.burton@utoronto.ca

IHPME



Institute of Health Policy, Management & Evaluation
UNIVERSITY OF TORONTO

Institute of Health Policy, Management and Evaluation
University of Toronto
Health Sciences Building, 155 College Street, Suite 425
Toronto, ON M5T 3M6 Tel: 416-978-4326 Fax: 416-978-7350
ihpme@utoronto.ca www.ihpme.utoronto.ca