St. Michael's

Inspired Care.
Inspiring Science.

Assessing the factors that affect 'time to CT Scan' and the effect on outcomes in moderate to severe Traumatic Brain Injury (TBI).

Sobrian-Couroux S, McFarlan A & Rizoli S

BACKGROUND

St. Michael's
Inspired Care.
Inspiring Science.

TBI has high morbidity and mortality.

Glascow Coma Scale (GCS) *(Teasdale & Jennette, 1974).*

CT scans (*Toyama, et al., (2005), Coles J P (2007), and Kim J J, & Gean A D, (2011)*).

The consensus among traumatologist:

CT scan ASAP - preferably within 1 hour of injury.

Quality indicators for evaluating care in hospital:

24-h CT scanner
Emergency Department (ED) time
Hospital deaths
(*Stelfox H T, Bobranska-Artiuch B, Nathens A, Straus S.E, (2010)*).

SITE

St. Michael's
Inspired Care.
Inspiring Science.

Saint Michael's Hospital (SMH) Level 1 Trauma Centre

OBJECTIVES

St. Michael's
Inspired Care.
Inspiring Science.

The purpose of the study is to determine if a longer 'time to CT scan' impacts mortality.

Factors affecting Time to CT:

- Age
- GCS on admission
- Type of admission
- Time of initial CT scan
- Time in ED
- Time in trauma bay

Outcomes:

- LOS ICU
- Discharge disposition

DESIGN

St. Michael's
Inspired Care.
Inspiring Science.

Single site, REB approved, retrospective chart review.

- Dx with moderate to severe isolated head injuries (June 30, 2010 to July 01, 2013);
- 100 consecutive eligible patients;
- Information from Trauma Registry comprise pre-admission to initial CT scan at SMH;
- Outcome – discharge status / mortality.

ELIGIBILITY

St. Michael's
Inspired Care.
Inspiring Science.

Inclusion:

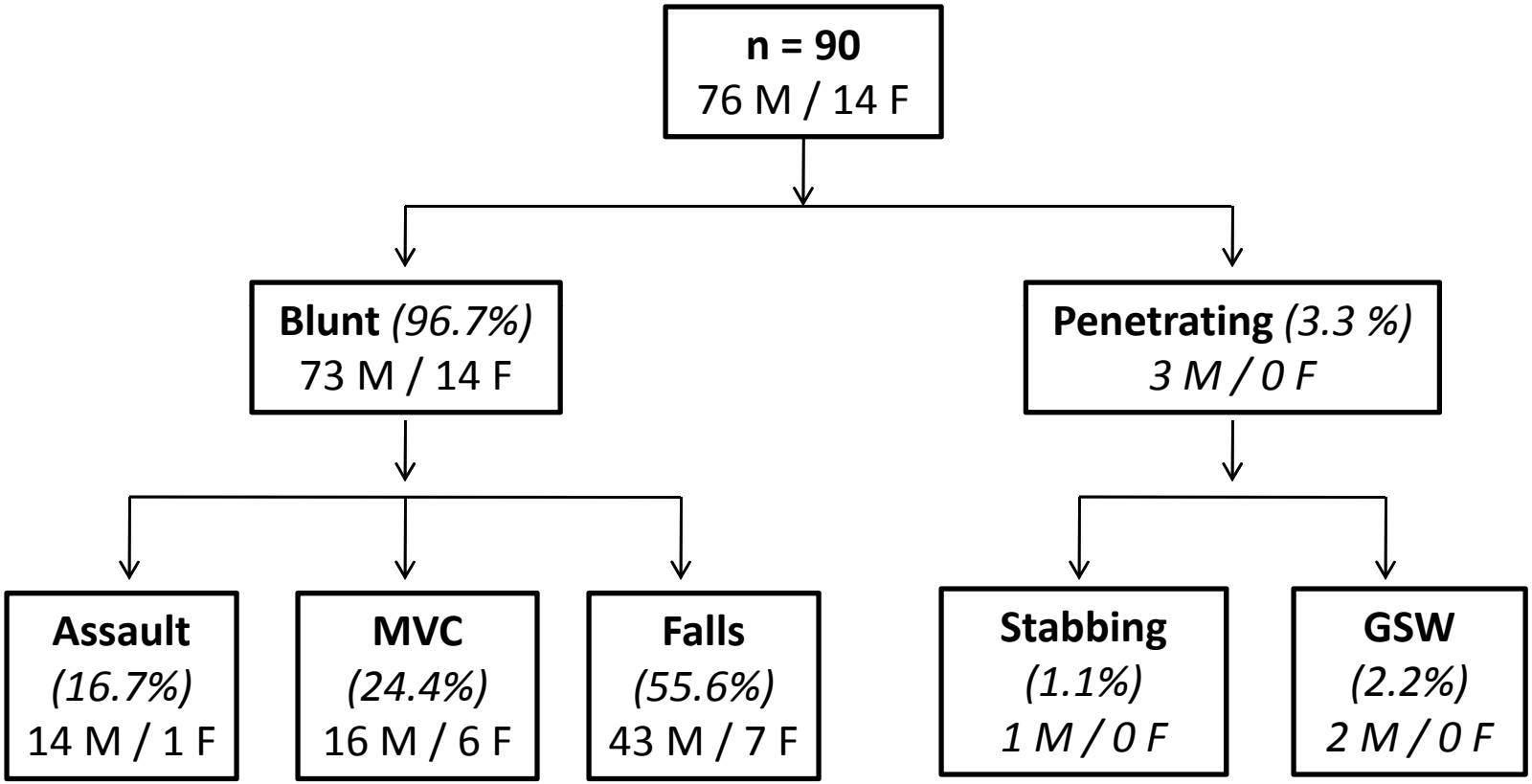
1. Isolated head injury with GCS $\leq$ 12
2. AIS head $\geq$ 4 and other body regions < 3
3. Admission either through trauma or non-trauma activations
4. Age $\geq$ 18

Exclusion:

1. Expired within 24 hours of admission
2. AIS head < 4 and other body regions $\geq$ 3

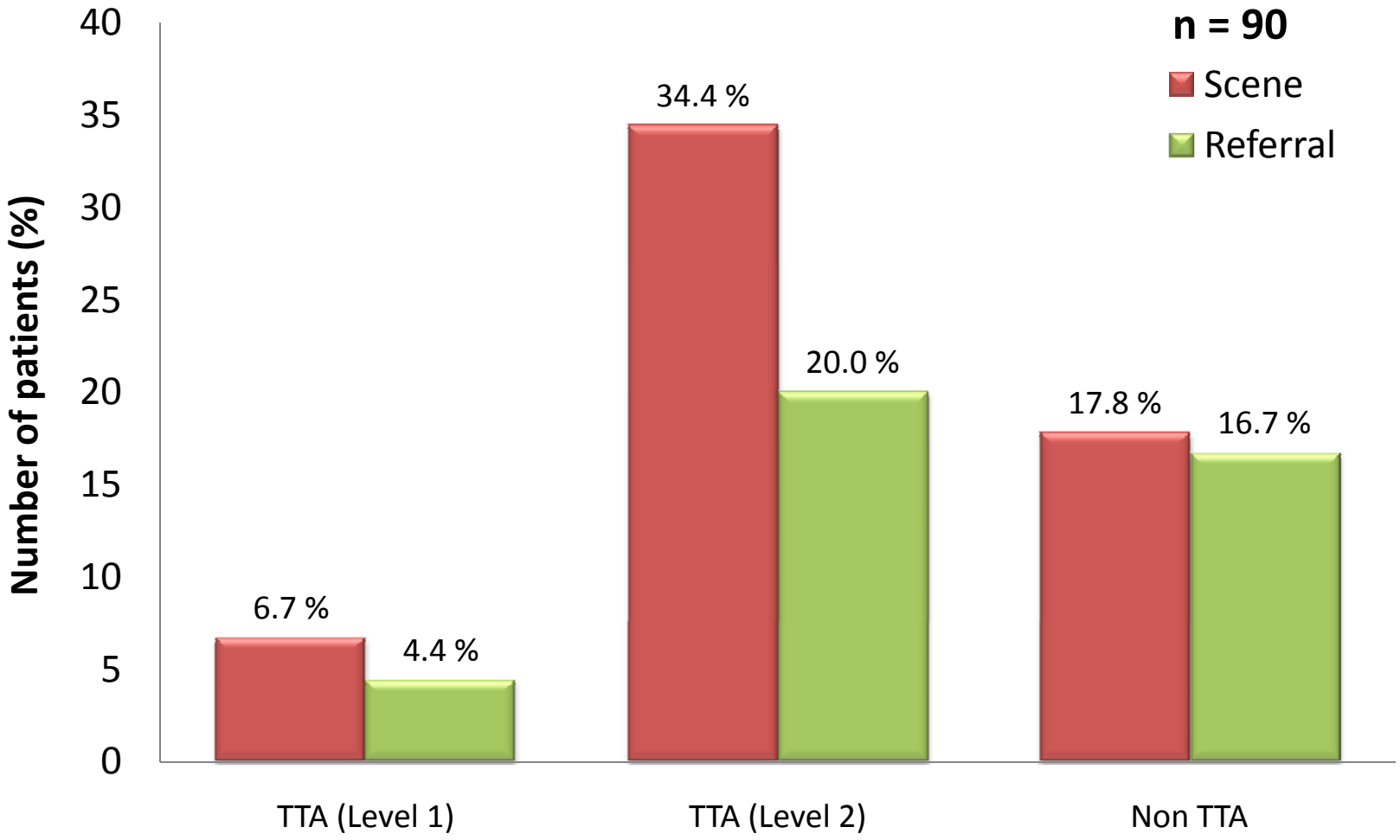
INJURY MECHANISM

St. Michael's
Inspired Care.
Inspiring Science.



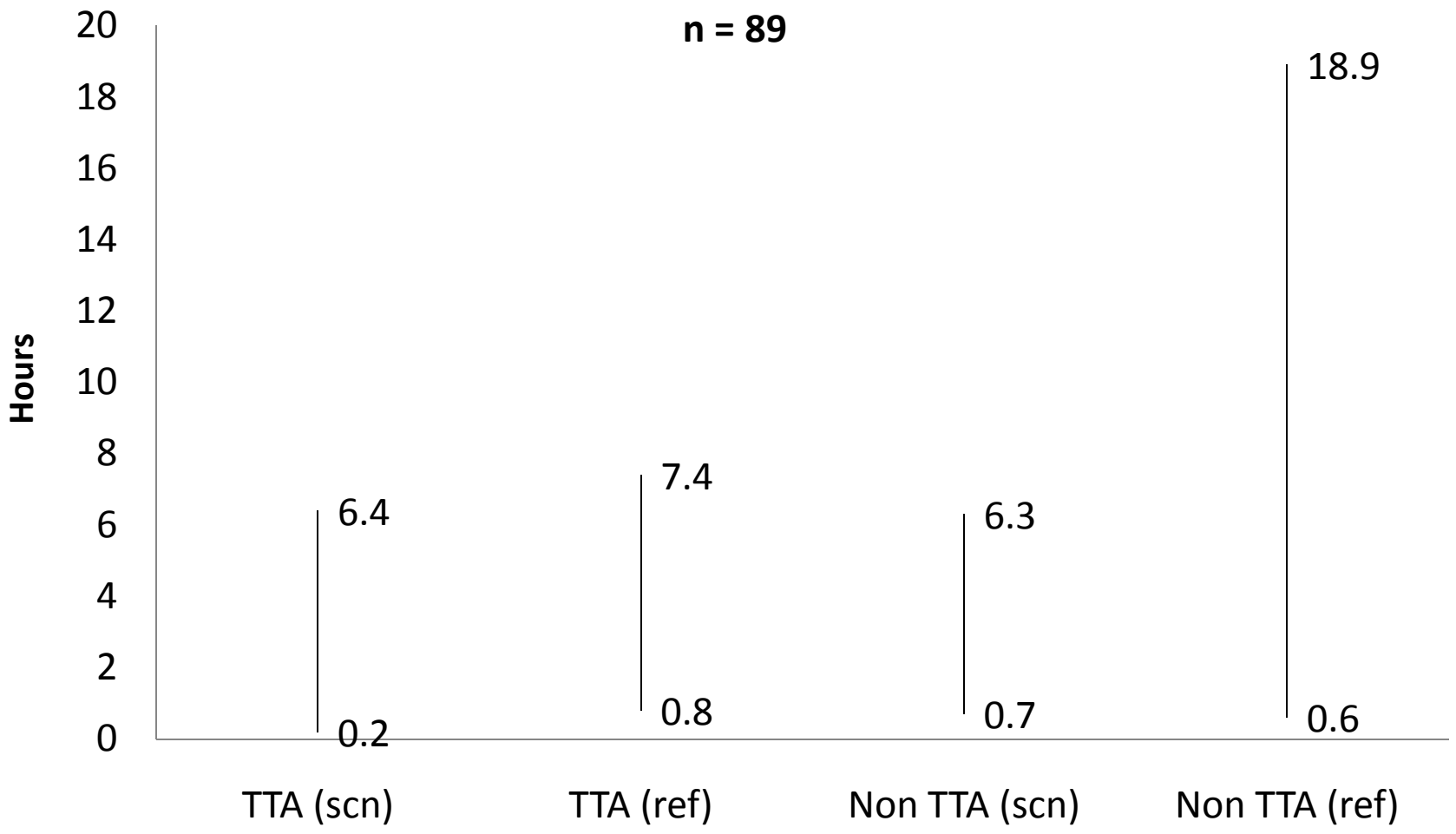
ADMISSION TYPE

St. Michael's
Inspired Care.
Inspiring Science.



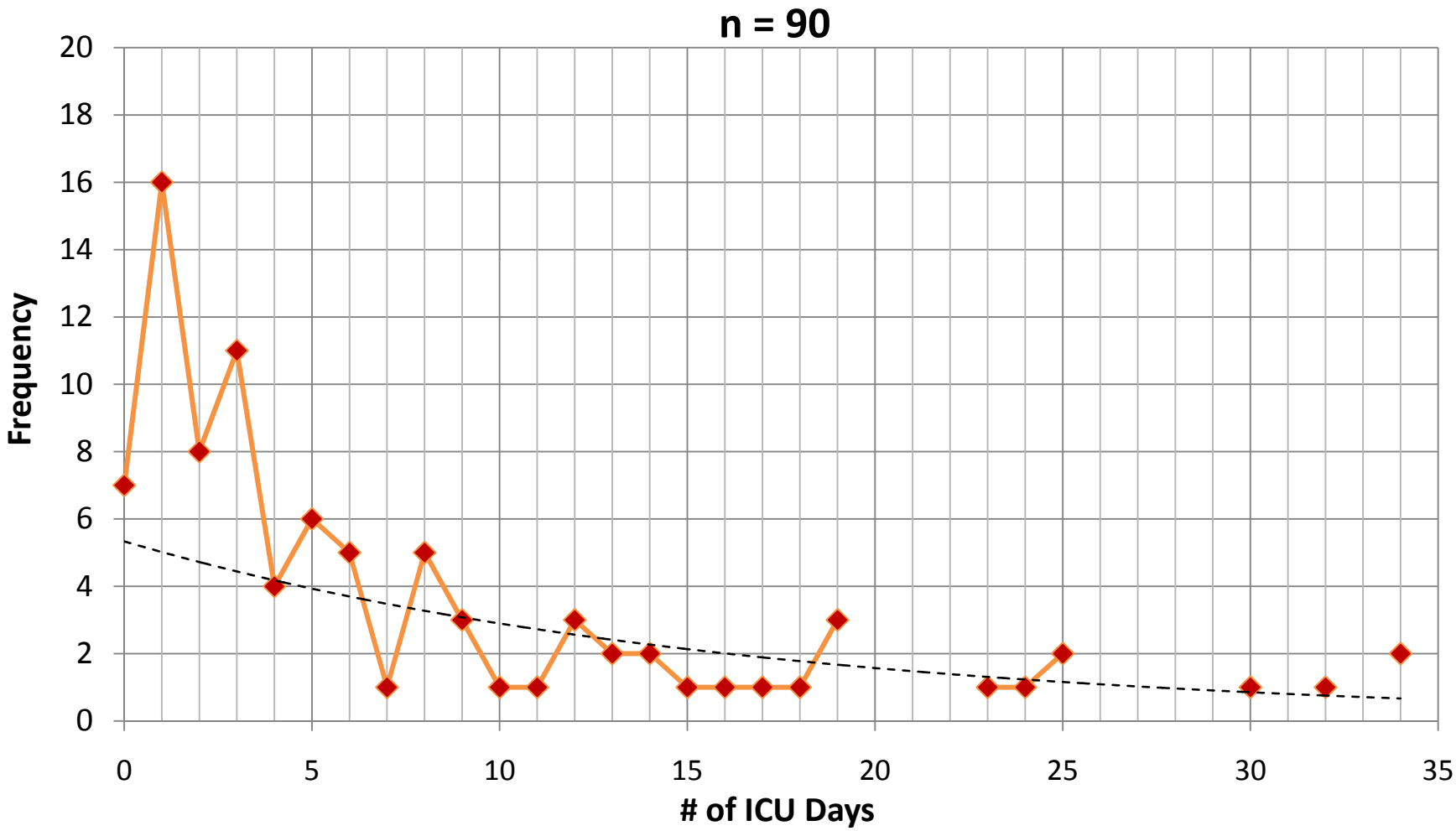
TIME TO CT (SMH)

St. Michael's
Inspired Care.
Inspiring Science.



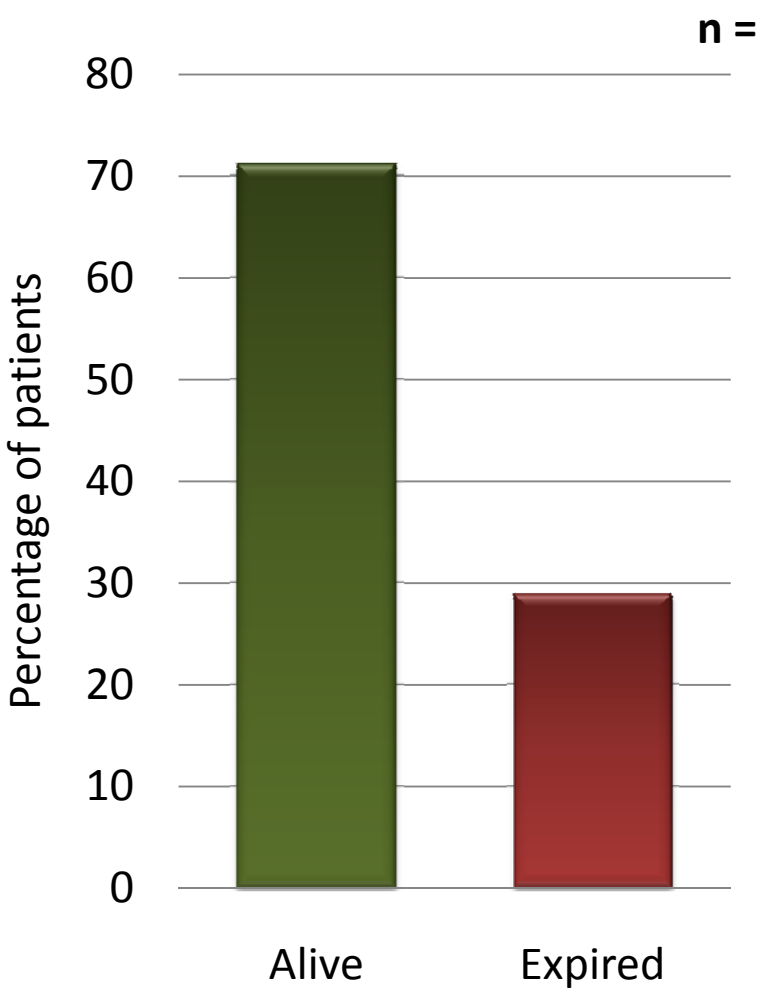
ICU DAYS

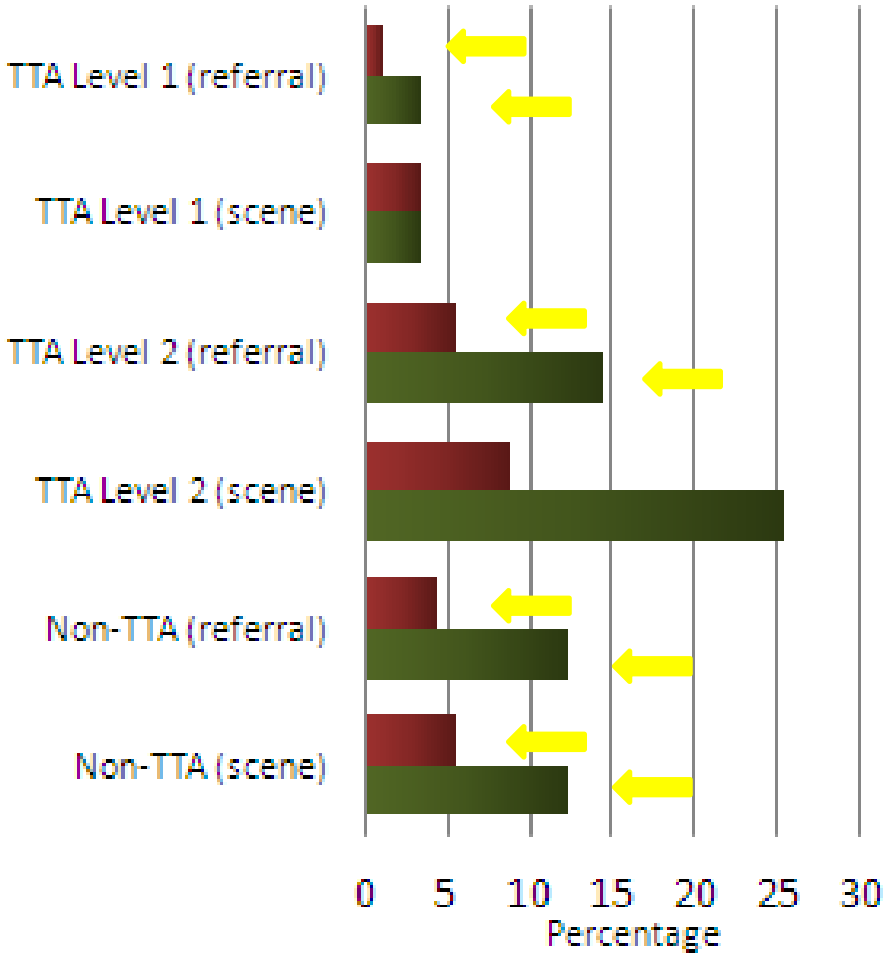
St. Michael's
Inspired Care.
Inspiring Science.



DISPOSITION

St. Michael's
Inspired Care.
Inspiring Science.





CORRELATION

St. Michael's
Inspired Care.
Inspiring Science.

	Age	Mech of Injury	Time in ED	CT time from Admit (SMH)	Initial CT from Injury	Activation	ICU Days	Total GCS SMH	Time in Trauma Bay	Disposition
Age	-----									
Mech of Injury	-.378	-----								
Time in ED	.183	-.065	-----							
CT time from Admit (SMH)	.235	-.159	.146	-----						
Initial CT from Injury	.158	-.092	.204	.669	-----					
Activation	-.248	.131	-.458	-.381	-.220	-----				
ICU Days	-.052	.020	-.320	.056	-.165	.051	-----			
Total GCS SMH	-.018	-.023	-.260	-.072	-.116	.153	.190	-----		
Time in Trauma Bay	-.042	.160	.116	.068	-.076	.c	-.173	-.163	-----	
Disposition	.258	-.237	-.035	-.006	.133	-.002	-.116	.236	.198	-----

LIMITATIONS

St. Michael's
Inspired Care.
Inspiring Science.

Accuracy of the results

- Dependent on the availability of data.

Fairly small patient population

- Only moderate and severe injury.

Difficult to account for clinical decisions in the Trauma Bay.

The study was performed at a single centre.

CONCLUSION

St. Michael's
Inspired Care.
Inspiring Science.

Approx 1/3 expired pts were non-TTA.

Approx 1/3 expired pts were referrals.

- Proper documentation of clinical assessments from referral facility
- Provide advice regarding intermittent care to referring facility
- Repeat CT scan as required
- Activate all moderate and severe TBI as traumas (level 3)
- Trauma referral service with neurology consultation
- Portable CT scanner in ED

THANK YOU

St. Michael's
Inspired Care.
Inspiring Science.

Acknowledgements:

Dr. Barto Nascimento

REFERENCES

St. Michael's
Inspired Care.
Inspiring Science.

Advance Trauma Life Support (ATLS)
http://www.facs.org/trauma/atls/index.html

Ahmed N. (2006) *St. Michael's Hospital, Trauma Team Leader Policies & Procedures*.

American College of Surgeons' Trauma Quality Improvement Program.
http://www.facs.org/trauma/ntdb/tqip.html

Batchelor JS, Jenkins DW, Dunning J. (2003) *Minor head injuries in adults: a review of current guidelines*. Trauma 5:191-198

Billette Jean-Michel and Janz Teresa (2011) *Injuries in Canada: Insights from the Canadian Community Health Survey.* Statistics Canada Catalogue no. 82-624-X

Chestnut Randall M., Ghajar Jamshid, Maas Andrew I.R., Marion Donald W., Servadei Franco, Teasdale Graham M., Unterberg Andreas, von Holst Hans, Walters Beverly C. (n.d.) *Early Indicators of Prognosis in Severe Traumatic Brain Injury*. Brain Trauma:153-255
www.braintrauma.org/pdf/protected/prognosis_guidelines.pdf

Coles JP. (2007) *Imaging after brain injury.* British Journal of Anaesthesia 99;1:49-60

Copes WS, Sacco WJ, Champion HR, & Bain LW. (n.d.) *Progress in Characterising Anatomic Injury*. Proceedings of the 33rd Annual Meeting of the Association for the Advancement of Automotive Medicine, Baltimore, MA, USA 205-218

Elovic Elie, Baerga Edgardo, & Cuccurullo Sara. (2004) *Predictors of Outcome after TBI*. National Institutes of Health bookshelf ID NBK27291

Farshchian Nazanin, Farshchian Firoozeh, & Rezaei Mansour. (2012) *Correlation Between Glascow Coma Scale and brain CT-scan findings in traumatic patients*. Congress of Iranian Neurosurgeons 4;1

Glauser Jonathan. (2004) *Head injury: Which patients need imaging? Which test is best?* Cleveland Clinic Journal of Medicine 71; 4: 353-357

Gupta Prashant K, Krishna Atul, Dwivedi Amit N, Gupta Kumkum, Bala Madhu, Garg Gouri, & Agarwal Shivani. (2011) *CT Scan Findings and Outcomes of Head Injury Patients: A Cross-Sectional Study*. Journal of Pakanstan Medical Students 1;3:78-82

Hidayat Sagvan Kh. (2007) *Acute Head Trauma – CT Scanning Study*. Dohuk Medical Journal 1;1:78-88

Hukkelhoven Chantal WPM, Steyerberg Ewout W, Rampen Anneke JJ, Farace Elana, Habbema J Dik F, Marshall Lawrence F, Murray Gordon D, & Maas Andrew IR. (2003) *Patient age and outcome following severe traumatic brain injury: an analysis of 5600 patients*. Journal of Neurosurgery 99:666-673

Kim Jane J, & Gean Alisa D. (2011) *Imaging for the Diagnosis and Management of Traumatic Brain Injury*. Neurotherapeutics: The Journal of the American Society for Experimental NeuroTherapeutics 8:39-53

Marco Catherine A & Marco Joanna L. (2012) *Traumatic Brain Injury*. AHC Media LLC

Maas Andrew IR, Hukkelhoven Chantal WPM, Marshall Lawrence F, & Steyerberg Ewout W. (2005) *Prediction of Outcome in Traumatic Brain Injury with Computed Tomographic Characteristics: A Comparison between the Computed Tomographic Classification and Combination of Computed Tomographic Predictors*. Neurosurgery 57;6:1173-1182

REFERENCES (con't)

St. Michael's
Inspired Care.
Inspiring Science.

Mayo Clinic
http://www.mayoclinic.com/health/traumatic-brain-injury

MRC CRASH Trial Collaborators. (2008) *Predicting outcome after traumatic brain injury: practical prognostic models based on large cohort of international patients*. British Medical Journal 336:425

Murray Gordon D, Butcher Isabella, McHugh Gillian S, Lu Juan, Mushkudiani Nino A, Mass Andrew IR, Marmarou Anthony, & Steyerberg Ewout W. (2007) *Multivariable Prognostic Analysis in Traumatic Brain Injury: Results from the IMPACT Study*. Journal of Neurotrauma 24:329-373

Oertel M, Kelly DF, McArthur D, Boscardin WJ, Glenn TC, Lee JH, Gravori T, Obukhov D, McBride DQ, & Martin NA. (2002) *Progressive hemorrhage after head trauma: predictors and consequences of the evolving injury*. Journal of Neurosurgery 96;1:109-116

St. Michael's Hospital, Toronto, Ontario, Canada. Trauma Services
http://www.stmichaelshospital.com/programs/trauma/trauma-services.php

St. Michael's Hospital, Toronto, Ontario, Canada. Trauma Services Annual Report (2011)

Stelfox Henry T, Bobranska-Artiuch Barbara, Nathens Avery, & Straus Sharon E. (2010) *Quality Indicators for Evaluating Trauma Care*. Archives of Surgery 145;3:286-295

Teasdale G, & Jennett B. (1974) *Assessment of coma and impaired consciousness. A practical scale.* The Lancet 13;2(7872):81-4

Thomas Bradley W, Mejia Vicente A, Maxwell Robert A, Dart Benjamin W, Smith Philip W, Gallagher Michael R, Claar Sean C, Greer Stephan H, & Barker Donald E. (2010) *Scheduled Repeat CT Scanning for Traumatic Brain Injury Remains Important in Assessing Head Injury Progression*. Journal of the American College of Surgeons 210;5:824-830

Thomas Huw. (2011) *Glasgow Coma Scale (GCS)*. Egton Medical Information Systems Limited; Document ID: 2197 Version: 29
www.patient.co.uk/doctor/glasgow-coma-scale-gcs

Thurman David, & Guerrero Janet. (1999) *Trends in Hospitalizations Associated With Traumatic Brain Injury*. Journal of American Medical Association 282;10:954-957

Tong Wu-song, Zheng Ping, Xu Jun-fa, Guo Yi-jun, Zeng Jing-song, Yang Wen-jin, Li Gao-yi, He Bin, & Yu Hui. (2011) *Early CT sings of progressive hemorrhagic injury following acute traumatic brain injury*. Neuroradiology 53:305-309

Toyama Yoshihiro, Kobayashi Takuya, Nishiyama Yoshihiro, Satoh Katashi, Ohkawa Motoomi, & Seki Keisuke. (2005) *CT for Acute Stage of Closed Head Injury.* Radiation Medicine 23;5:309-316

Trauma Association of Canada.
http://www.traumacanada.org/Default.aspx?pageId=983074

United States Food and Drug Administration. (2013) *Radiation Emitting Products and Procedures: Computed Tomography (CT)*.
http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm115317.htm