

Value over Volume: Do Inpatients Who Fall Receive Appropriate Head CT Scans in an Acute Tertiary Hospital?

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BACKGROUND

Trillium Health Partners (THP) is one of Canada's largest and busiest hospitals with over 1,300 beds, 3 campuses, serving a population of more than 1.5 million residents in the western Greater Toronto Area.

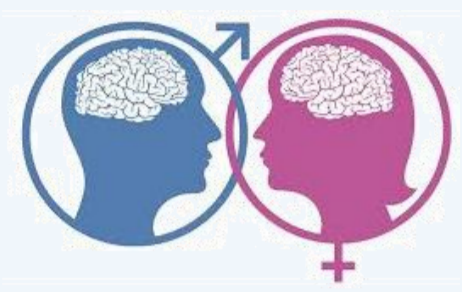




Falls: the most commonly reported patient safety incident at this hospital



- Average hospital cost and length of stay (LOS) for a seriously injured faller is significantly greater than that of a non-faller (\$44,203 vs \$13,507; 45 days vs 11 days)¹



- Falls affect patients of both sexes, all ages, and occur at any time of day².
- Falls can lead to negative mental health outcomes, such as fear of falling, loss of autonomy and greater isolation, confusion, immobilization and depression²



- Fear of missing a traumatic intracranial injury plays a significant role in ordering head CTs.³
- Majority of these head CTs are negative (85% to 99%).²⁻⁴
- No evidence-based algorithm exists to help predict which inpatients should be imaged following their inpatient fall, and which can be safely monitored with no imaging.²

STUDY AIM

- To quantify the prevalence of clinically significant and acute intracranial injuries* identified by head CT for inpatients who fell.
- To assess the appropriateness of head CTs against evidence-based algorithm such as Choosing Wisely's Canadian CT Head Rule (CCHR).



*An acute brain injury post-fall is defined as any acute changes noted on the head CT. Such change would show any new intracranial bleed that was not present before, with or without, midline shift,⁴

STUDY METHODOLOGY

The study design is a retrospective analysis of inpatient charts for those patients who experienced a fall between January 1 to December 31, 2017.

- Inclusion Criteria:
 - All medicine and rehab inpatient falls reported (n = 772)
 - All repeat falls were treated as distinct fall episodes
- Exclusion Criteria:
 - Pediatric inpatients (age <18 years), emergency department patients, outpatients and visitors, and intensive care unit patients

Inpatient falls were identified using the hospital's incident reporting system – RL6 (RL Solutions). The criteria used to define post-fall head CT were:

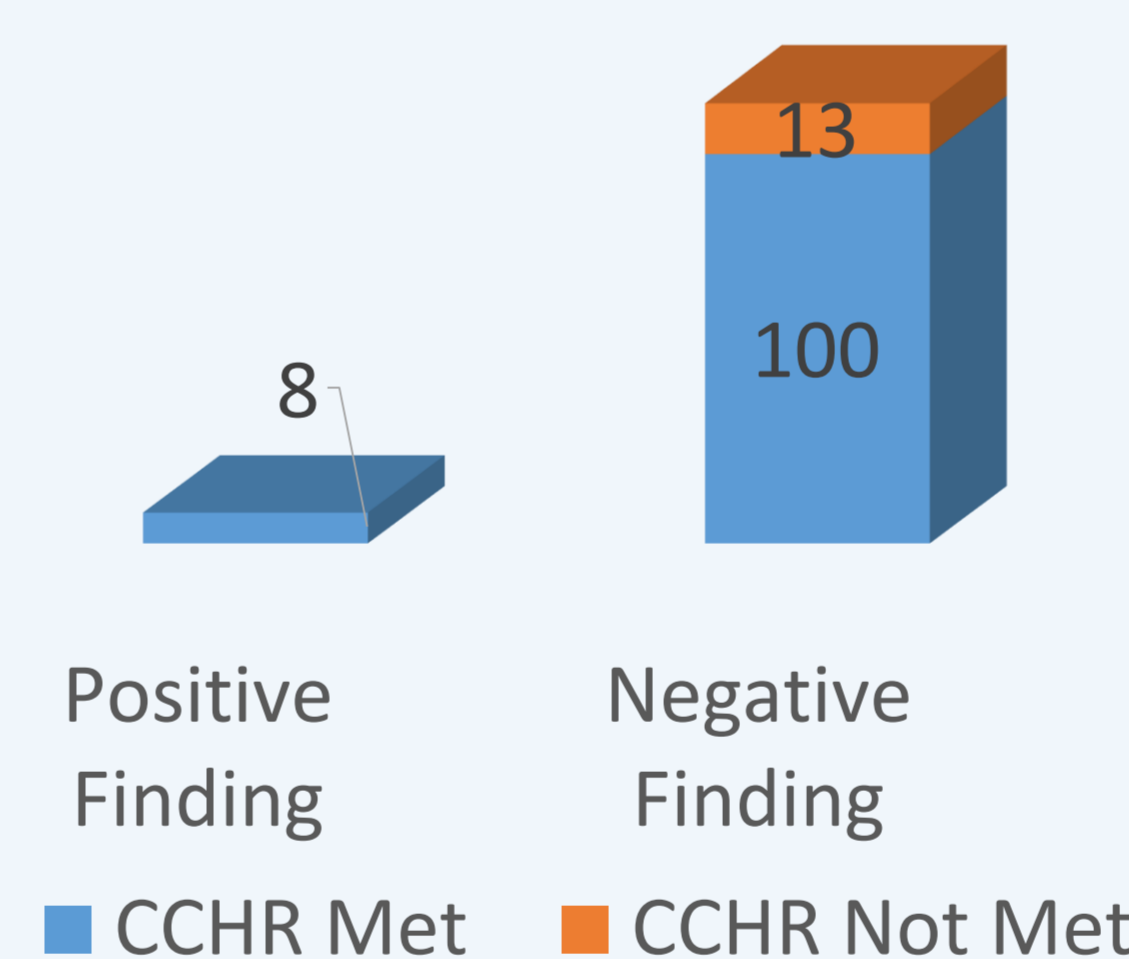
- The study was ordered to evaluate intracranial injury
- The study was ordered and performed within 24 hrs of the event

RESULTS/ANALYSIS

TABLE 1: Characteristics of inpatients who fell

Characteristics	Imaged (n=121)		Not Imaged (n =651)
	Positive	Negative	
Program			
Medicine	4	84	480
Rehab	4	29	171
Sex			
Male	4	61	388
Female	4	52	263
Age**			
18 – 64	0	21	100
>65	8	92	551
Time of fall*			
800-400	4	39	238
400-1200	2	25	227
1200-800	2	49	186
Location of fall			
Patient Room	5	98	543
Ex. Bathroom/Bed			
Hallway	0	11	34
Walker	0	1	1
Wheelchair	2	0	10
Chair	1	2	39
Nursing Station	0	0	9
Ambulatory			
Bed fast	0	20	134
Chair fast	4	23	161
Walks occasionally	4	51	265
Walks frequently	0	18	87
Dementia			
Yes	5	63	331
No	3	50	320
Anticoagulants			
Enoxaparin	1	32	215
Heparin	1	21	101
Apixaban	0	15	38
N/A	4	38	259

GRAPH 1: Head CT scans that met CCHR Criteria



Canadian CT Head Rule (CCHR)

- Glasgow Coma Scale <15 at 2 hrs after injury
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture
- Vomiting ≥ 2 episodes
- Age ≥ 65 years

CONCLUSION

Almost all CT heads ordered on inpatients with falls in a large Canadian tertiary hospital's medicine and rehabilitation wards meet the existing CCHR criteria, yet only a small proportion had any positive finding and none required neurosurgical intervention. CCHR may therefore not be a feasible tool to discriminate risk in this population. Moreover, the fear of missing a clinical important intracranial hemorrhage seems inappropriately high based on this data, and may be a driver of inpatient CT head ordering following a fall.

Limitations:

- Study only captured inpatient falls in Medicine and Rehab programs (noting that, bulk of hospital falls occurred in these program ~ 80%)
- Study did not investigate serial head CT scans
- Study did not assess appropriateness of positive head CT against other rules such as: National Emergency X-Radiography Utilization Study II (NEXUS-II), Scandinavian Neurotrauma, New Orleans Criteria, etc.

Next Steps:

- Cost analysis of all head CT scans in this population
- Derivation of an inpatient CT head rule or guideline

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Note: * - P<0.05, ** - P<0.001 Level of Significance (Chi Square)