

# Examining Canada's return visits to the emergency department after a concussion

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## CLINICIAN'S CAPSULE

### What is known about the topic?

In Canada, there is no standardized discharge or follow-up protocol for patients diagnosed with a concussion in the emergency department (ED).

### What did this study ask?

What proportion of patients return to the ED within 14 days of a concussion diagnosis, and what are their characteristics?

### What did this study find?

Of those patients with a concussion, 10% returned to the ED within 2 weeks, most commonly for a persistent headache.

### Why does this study matter to clinicians?

Evidence-based discharge instructions and specialized follow-up for patients diagnosed with a concussion in the ED may decrease return rates.

scan with normal results, and 42% were given new discharge instructions.

**Conclusions:** Approximately 10% of patients diagnosed with a concussion in a Canadian hospital setting returned to the ED within 14 days of their index visit. Our study suggests the opportunity to reduce this burden to both the healthcare system and the patient through careful discharge instructions outlining anticipated symptoms following a concussion (specifically, headache) or referral to a concussion clinic.

## RÉSUMÉ

**Objectifs:** L'étude visait à : 1) cerner la proportion de patients qui, après avoir obtenu leur congé du service des urgences (SU) à la suite d'un diagnostic de commotion cérébrale, y sont retournés dans les 14 jours suivants; 2) caractériser les motifs de reconsultation.

**Méthode:** L'étude consistait en l'examen de dossiers médicaux d'adultes chez qui un diagnostic de commotion cérébrale avait été posé au moment du congé, après une consultation aux SU des hôpitaux rattachés au groupe des Hamilton Health Sciences et à l'Urgent Care Centre, en 2016. Une collecte de données a ensuite été effectuée concernant les patients qui sont retournés au SU dans les 14 jours suivants. A suivi une comparaison des caractéristiques cliniques entre les personnes qui ont consulté de nouveau et celles qui ne sont pas retournées au SU.

**Résultats:** Au total, 389 patients ont été retenus dans l'étude; sur ce nombre, 38 (10%) sont retournés au SU dans les 14 jours suivants. Ceux qui avaient subi une commotion dans le cadre d'activités sportives ou qui avaient été dirigés vers un centre spécialisé étaient moins susceptibles de consulter de nouveau ( $p=0,03$ ) que ceux qui avaient été victimes d'un assaut ( $p=0,01$ ). Parmi les patients qui sont retournés au SU, 42% ont été soumis à une tomodensitométrie, qui s'est révélée normale, et 42% ont reçu de nouvelles instructions au moment du congé.

## ABSTRACT

**Objectives:** The purpose of this study was to identify 1) the proportion of patients discharged from the emergency department (ED) with a diagnosis of concussion and return within 14 days, and 2) the characteristics that prompt a return.

**Methods:** A health records review was conducted on adult patients with a discharge diagnosis of a concussion who accessed care through Hamilton Health Sciences EDs and Urgent Care Centre in 2016. Subsequent data were collected from those who returned to the ED within 14 days. Clinical characteristics of returners were compared to those of non-returners.

**Results:** Of the 389 patients included in the study, 38 (10%) returned within 14 days. Patients who sustained a concussion in a sport-related context or were referred to a specialized clinic were less likely to return ( $p=0.03$ ). Those who suffered an assault-related concussion were more likely to return ( $p=0.01$ ). Of those who did return, 42% received a CT

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**Conclusion:** Environ 10% des patients chez qui un diagnostic de commotion cérébrale avait été posé dans un hôpital, au Canada, sont retournés au SU dans les 14 jours suivant la consultation initiale. Aussi y aurait-il possibilité de réduire le fardeau des nouvelles consultations tant pour le système de soins de santé que pour les patients en donnant des renseignements clairs, au moment du congé, sur les symptômes

possibles d'une commotion cérébrale (notamment les céphalées) ou en dirigeant les patients vers un centre spécialisé dans le traitement des commotions.

**Keywords:** Concussion, emergency department, head injury, return visit

## **INTRODUCTION**

Greater public awareness has led to an increase in the number of patients seeking medical care with possible concussions.<sup>1</sup> In the last 5 years, emergency department (ED) visits for sport-related brain injuries in Ontario and Alberta have increased by 46%, with 94% being concussion-related.<sup>2</sup> Individuals discharged with a concussion diagnosis often experience ongoing symptoms, which can prompt recovery concerns.<sup>1</sup> Many Canadians do not have a family physician,<sup>3</sup> and, thus, a return to the ED may be their only available option for additional care. Ganti et al.<sup>4</sup> observed a 5% rate of return to the ED within 72 hours of the index diagnosis of a mild traumatic brain injury at one hospital in the United States. Post-concussive syndrome was the most common complaint, including headache, vomiting, or altered mental status, followed by pain.<sup>4</sup> Little is known about the ED return rate among patients diagnosed with a concussion in the Canadian context.

This study sought to identify what proportion of patients discharged from the ED with a diagnosis of a concussion return within 14 days of the index visit in a Canadian setting. A subsequent focus was to describe the population of ED returners and compare them with non-returners.

## **METHODS**

### **Study design**

A health records review was conducted on a consecutive sample of adult patients who were diagnosed with a concussion at either the Hamilton Health Sciences (HHS) ED or Urgent Care Centre (UCC) between January and December 2016. Charts were identified using International Classification of Disease (ICD) 10 codes S060 (concussion, brain) and F07.2 (post-concussional syndrome) and reviewed by two independent researchers

(LM and RT, Appendix 1). Demographics and clinical encounter details were recorded in a password-protected Microsoft Excel sheet designed *a priori*. Inclusion criteria were ages  $\geq 18$ , clinical presentation adhering to the Zurich Consensus definition of concussion,<sup>1</sup> and injury within 14 days of the index visit (Appendix 2). The diagnosis of a concussion included one or more of subjective symptoms (e.g., headache, nausea, irritability) and physical signs (e.g., loss of consciousness, amnesia, vomiting). The Zurich definition states that a concussion “typically results in the rapid onset of short-lived neurological function that resolves spontaneously.”<sup>1</sup> Patients were included even if only subjective symptoms were noted and no neurological impairment was documented. Additional information was collected on patients who returned to an HHS site within 14 days of the index visit. Patients were excluded if they had an intracranial hemorrhage identified on a computed tomography (CT) scan or were admitted to the hospital at the index visit. Each patient’s electronic health record for 2016 was manually reviewed to identify any missed return visits, previous visits, or duplicate entries. All patients had equal access to imaging, and patients seen at the UCC who required a CT scan were transported to an appropriate site. The Hamilton Integrated Research Ethics Board approved this study.

### **Statistical analysis**

The proportion of patients returning to the ED within 14 days is calculated from the total sample of adult patients discharged from the ED with a concussion diagnosis. Dichotomous variables are presented as frequencies and percentages and were compared between groups (i.e., ED returners v. non-returners) using a Fisher exact test. Continuous variables are presented as medians (range) or means (standard deviation [SD]) and were compared using a Kruskal–Wallis or t-test, respectively. All statistical tests were performed using STATA/SE version 13.1 (StataCorp LP, College Station, TX, USA).

**RESULTS**

Of the 389 identified adult patients discharged from the ED with a diagnosis of a concussion, 38 (9.8%) returned to the ED within 14 days. The demographics and clinical characteristics of returners and non-returners are described in Table 1. Patients who suffered an assault-related concussion were more likely to return

(21% v. 6%,  $p = 0.01$ ), whereas those who suffered a sport-related concussion or were referred to a concussion clinic were less likely to return (5% v. 23%,  $p = 0.03$ ; and 5% v. 25%,  $p = 0.04$ , respectively). Additionally, the distribution of the Canadian Triage and Acuity Scale (CTAS) scores, and the time between injury and index visit were statistically significantly different between returners and non-returners.

**Table 1. Patient demographics and visit characteristics on the index visit**

	Patients who did not return n = 351	Patients who returned n = 38
Female, n (%)	189 (54)	23 (61)
Age in years, median (range)	32 (18–87)	32 (18–86)
Urgent Care Centre	108 (31)	10 (26)
Canadian Triage and Acuity Scale, n (%)		
1	1 (< 1)	1 (3)
2	47 (13)	10 (26)
3	227 (65)	19 (50)
4	75 (21)	7 (18)
5	1 (< 1)	1 (3)
Mechanism of injury, n (%)		
Fall	101 (29)	7 (18)
Motor vehicle collision	61 (17)	6 (16)
Accidental trauma	86 (25)	14 (36)
Sports	81 (23)	3 (7.9)
Assault	22 (6)	8 (21)
Time between injury and visit in days		
Median (range)	1 (0–14)	0 (0–14)
Mean (standard deviation)	1.9 (2.8)	0.89 (1.8)
Symptoms/signs reported at index visit, n (%)		
Loss of consciousness	57 (16)	4 (11)
Headache	286 (81)	27 (71)
Vomiting	63 (18)	9 (24)
Amnesia	40 (11)	5 (13)
Seizure	2 (1)	1 (3)
Glasgow Coma Scale (GCS) = 15 <sup>a</sup>	190 (54)	18 (47)
CT head rule documented, n (%)	59 (17)	2 (5)
CT head ordered, n (%)	109 (31)	10 (26)
Previous diagnosis of concussion, n (%)	62 (18)	3 (8)
Discharge, n (%)		
Follow-up documented	197 (56)	20 (53)
Referral clinic		
General practitioner	143 (71)	16 (80)
Concussion clinic	51 (25)	1 (5)
Other	8 (4)	3 (15)
Any discharge instructions documented	294 (84)	29 (76)
Red Flags to return documented <sup>b</sup>	168 (48)	14 (37)
Head Injury Routine (HIR) given <sup>c</sup>	152 (43)	14 (37)

<sup>a</sup> GCS data were recorded for 219 patients only.

<sup>b</sup> Red flags to return were defined as persistent nausea/vomiting, worsening headache, or new neurologic deficit.<sup>1</sup>

<sup>c</sup> A copy of the HIR can be found at <http://hamiltonhealthsciences.ca/documents/Patient%20Education/HeadInjuryAndConcussion-trh.pdf>.

Patients returned to the ED on average within a few days of the index visit (mean = 3.7; SD = 1.8) (Table 2, Appendix 3). The most common reason for returning to the ED was the presence of a headache (66%). Almost half of the returning patients underwent a CT scan (42%, compared with 33% of all patients on the index visit. *Note: No intracranial abnormality was found on any of the CT scans in this study population*). Approximately 42% of returning patients received new discharge instructions (i.e., different than what they received at their index visit) and/or a Head Injury Routine (HIR) informational handout (Appendix 4).

## DISCUSSION

### Interpretation

We observed that 10% of patients diagnosed with a concussion returned to the ED within 14 days of their index visit. Headache, followed by dizziness and nausea or vomiting, respectively, was the most common complaint on a return to the ED. Of the return visitors, many underwent a CT scan and/or received different discharge instructions than from their index visits. Given that there were no intracranial abnormalities identified among the return visit CT scans and patients were within the expected window of symptom occurrence, these visits theoretically could have been prevented with specific discharge education and arrangements for follow-up. The Canadian CT Head Rule applies only to patients presenting within 24 hours of injury; however, future studies may look to identify which patients returning after more than 24 hours with a symptomatic minor head injury can safely be managed without neuroimaging.<sup>5</sup>

### Previous studies

Multiple studies highlight that patients' understanding of discharge instructions and their recovery outcomes are improved when both verbal and written instructions are given.<sup>6,7,8</sup> Snell et al. (2011) have shown that patient understanding on concussions, their recovery expectations, strategies for symptom management, and instructions for a gradual return-to-activity improve recovery outcomes.<sup>9</sup> The HIR handout, including information on the previous topics, was available at the study centres. However, despite a relatively high

compliance (83% of visits) among physicians in our study in documenting some form of discharge instruction, only 43% of patients received the HIR. Although we observed no association between receiving the handout and the ED return rate, details regarding the discharge encounter and HIR adherence were not captured in this study.

Patients who were referred to a concussion clinic were less likely to return to the ED. The clinic provides patients a forum to ask questions and access to specialty care (with a neurologist) if symptoms persist. Although studies investigating specialized follow-up after a mild head injury show no long-term benefit in symptom duration or final outcome, our study found that those referred were less likely to return to the ED.<sup>10-12</sup> The relative low rate-of-return among athletes could reflect either a proclivity to avoid healthcare professionals in order to prematurely return-to-sport or the opposite phenomenon whereby athletes are more likely to follow up with their team physician if available to be cleared for sport.<sup>13</sup> However, research points towards the former because one study reported that 40% of athletes will return to sports on the day of injury.<sup>13</sup> A higher rate-of-return among assault victims could represent a perceived necessity to document ongoing symptoms for those wishing to pursue legal action, comparable with the trends of work-place-related injuries requiring compensation.<sup>14</sup>

### Limitations

The term *concussion* lacks a robust definition making it difficult to succinctly identify patients. We identified patients using ICD codes and the Zurich Consensus definition. Adherence to ICD coding may result in an underrepresentation of presenting cases, and, although the Zurich criteria are internationally recognized, they were designed for use in sport-related concussions. We also did not rigorously follow the Zurich Consensus definition of a concussion in that we included patients without a history of neurological impairment. Details not charted by the attending physician cannot be captured in the data collection and thus may not be an accurate depiction of the clinical conversation. Furthermore, we could not capture return visits outside of the study centres, and so data may underestimate the proportion of returners. Finally, although this study involved multiple centres, physicians are from a single group, which may affect generalizability.

### **Clinical implications**

Our study suggests the potential to reduce the burden to both the healthcare system and the patient through careful discharge instructions outlining anticipated symptoms following a concussion (specifically, headache) or a referral to a concussion clinic.

### **CONCLUSION**

Approximately 10% of patients diagnosed with a concussion in a Canadian hospital setting returned to the ED within 14 days, most commonly for a headache. There were no missed intracranial abnormalities discovered at any of the return visits. Factors associated with a lower rate of return included sports injuries and a referral to a specialized clinic.

### **SUPPLEMENTARY MATERIAL**

The supplementary material for this article can be found at <https://doi.org/10.1017/cem.2019.22>

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