Concussions in Canada

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Analysis and discussion of injury issues in the country

Concussions pose a significant injury risk to Canadians, particularly because they are often misunderstood in terms of diagnosis and recovery procedures. Additionally, there has been a lack of Canadian data focused on the issue of concussions, resulting in a gap between knowledge and practice. The purpose of this Compass Report is to provide a high-level view of Canadian concussion-related hospitalization data available and present some conclusions in order to assist health care practitioners in working with this unique injury issue.

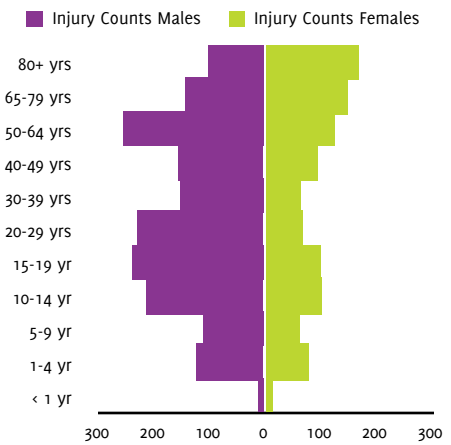
Definitions

Concussions are a form of brain injury, defined in the 2012 Zurich consensus statement on concussion in sport[1] as an injury that can potentially result from a variety of energy transfers to the body, such as a direct blow to the head or elsewhere. The symptoms of concussions usually appear shortly after the causal event, but in some cases may not be noticed for 1-2 days. Symptoms are typically short-lived and resolve in a sequential fashion, but this symptomatology does vary from case to case.[1] Whereas some brain injuries can be observed through neuroimaging techniques, concussions tend to involve disturbances of one's function, rather than visible structural damage.[1]

Etiology

An analysis of the Hospital Morbidity Database (HMDB) revealed 2,766 concussion-related injuries that resulted in hospitalizations across Canada in the fiscal year 2010/2011. It is important to note that many concussion-related injuries will not result in a hospital admission. As such, we can assume that these data represent only the most severe concussion-related injuries. Table 1 presents a breakdown of the external causes for these concussion-related hospitalizations. As is apparent in the table, falls and transport related incidents accounted for 81% of concussions that resulted in hospitalizations in the described fiscal year. For transport related crashes the most common contributor to concussion was motor vehicle traffic crashes (MVTCs), with 17% of total concussions being related to this transport incident. Falls classified as other contributed to the greatest number of fall related concussions, with 25% of total concussions being attributed to this injury category.

FIGURE 1. Hospitalized concussions by age & sex, HMDB 2010/11, all ages, Canada



Age & Gender

Overall, as demonstrated in Figure 1, males tend to account for more concussion-related hospitalizations than females. In terms of males, there appear to be peaks in concussion-related hospitalizations in the teen/young adult years, and again in middle-aged years. For females, there is also an apparent increase in the teenage years, albeit less pronounced than in males. In addition, female hospitalizations for concussions appear to increase with age, beginning in the 40-49 age group.

In terms of age differences, Table 2 reveals several interesting age related patterns. Specifically, those aged 10-19 account for 28% of transport related admissions, 15% of fall-related concussion admissions, but 55% of concussion admissions related to being struck by or against objects, including sports equipment and falling objects. When comparing to other age cohorts in the struck by/against grouping, it can be observed that

TABLE 1. Hospitalizations associated with concussions, HMDB 2010/11, all ages, Canada

External Cause of Concussion	Count	Percentage (%)
Unintentional Injuries	**2594**	**94%**
Transport	**930**	**34%**
Transport - Pedestrian	81	3%
Transport - Pedal cyclist	164	6%
Transport - MVTC	473	17%
Transport - ATV, snowmobile	119	4%
Transport - Animal rider	64	2%
Transport -Other	29	1%
Falls	**1306**	**47%**
Falls - on same level	252	9%
Falls - Stairs/ladders	232	8%
Falls - Skis/skates	130	5%
Falls - other	692	25%
Other Unintentional	**358**	**13%**
Struck by/against	300	11%
Bitten by animal	7	<1%
Other/Unspecified	51	2%
Suicide	**9**	**<1%**
Violence	**138**	**5%**
Undetermined / Other / Missing	**7**	**<1%**
Complications / Sequelae	**18**	**1%**
Total	**2766**	**100%**

youth tend to be over-represented in this injury category. Those 50 and older account for 23% of transport-related admissions, 49% of fall-related concussion admissions, but only 9% of struck by/ against concussion admissions. When comparing to other age groups, older adults have an increased burden of fall related concussion admissions.

Length of Stay

Considering length of stay for concussion-related hospital admissions, as indicated in Table 3 it is apparent that more than half of those admitted for concussions stay 1 day or less. This is expected, as concussion-related injuries typically do not warrant long hospital stays. Data demonstrate that the number of concussion-related hospital admissions tend to decrease as length of stay is extended.

Discussion

Overall, transport incidents and falls contribute to the majority of concussion related hospital admissions in Canada. One exception exists for those aged 10-19, where more than half of concussion admissions were classified as stuck by/ against. Injuries in this category relate to being struck by or against objects, including sports equipment, falling objects or other people, which is indicative of a potential risk for concussions among youth participating in various sport activities. This corresponds with much of the literature on sport and recreational injuries, and demonstrates that further efforts may need to be focused on educating youth and their parents/coaches around safe game play and proper concussion treatment/recovery, particularly safe play, return to play and return to learn guidelines, as well as diagnosis recommendations. For more information on such initiatives, please see the various resources available on the Parachute website:

www.parachutecanada.org/active-and-safe

Around gender, males tend to experience more concussion admissions than females and seem to be at high risk during the adolescent and older-adult years. Lastly, stays in the hospital for concussion injuries tend to be short term. Given that the frequent causes of concussion-related hospital admissions are transport incidents or falls, there is a great deal of value in exploring prevention techniques that target these key issues. For example, law enforcement should be engaged to gain a deeper understanding of how concussion messaging could be incorporated into traffic safety, and fall prevention efforts should strive to include information on concussion prevention and treatment.

Other resources that might be of interest for those working to target concussion related injuries include:

- Ontario Regional Injury Data Report[2]
- Consensus statement on concussion in sport[1]
- Pocket Concussion Recognition Tool[3]
- Concussion Clinical Toolkit[4]

TABLE 2. Concussion related hospitalizations, by age group and major external cause grouping, HMDB 2010/11, by age group, Canada

Age group (years)	Transport	Falls	Struck by/ against	Other Un-intentional	Suicide	Violence	Other
<1	*	25	*	*	*	*	*
1-4	16	165	18	20	*	*	*
5-9	41	100	28	31	*	*	*
10-14	104	114	88	95	*	*	*
15-19	156	75	77	81	*	24	*
20-29	160	67	24	31	*	38	*
30-39	115	43	14	18	*	36	*
40-49	123	82	18	24	*	19	*
50-64	147	168	22	40	*	16	*
65-79	50	224	7	12	*	*	9
80+	18	243	*	*	*	*	6
TOTALS	**930**	**1306**	**300**	**58**	**9**	**138**	**25**
***Suppressed due to small number of cases or value of zero.**						**TOTAL**	**2766**

TABLE 3. Length of hospital stay for concussions (percent of cases per stay duration), HMDB 2010/11, all ages, Canada

1 day or less	2-3 days	4-7 days	8-19 days	20-29 days	30 days +	TOTAL
1407 (51%)	592 (21%)	367 (13%)	255 (9%)	58 (2%)	87 (3%)	2766

Methodology

Hospitalization data were obtained from the Hospital Morbidity Database (HMDB) at the Canadian Institute for Health Information (CIHI) for the 2010/11 fiscal year and were provided by the Public Health Agency of Canada. ICD-10 codes S00-S09 were originally analyzed, with any cases therein where concussions were present, either as most responsible diagnosis (MRD) or in addition to the MRD, being presented as concussion injuries within this report.

Acknowledgements

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References

[1] McCrory, P., Meeuwisse, W.H., Aubry, M. et al.(2013). Consensus statement on concussion in sport: the 4th international conference on concussion in sport held in Zurich, November 2012. *British Journal of Sports Medicine, 47*, 250-258.

[2] Ontario Injury Prevention Resource Centre (2013). Ontario Regional Injury Data Report. Parachute: Toronto, ON.

[3] Pocket Concussion Recognition Toolkit. http://www.parachutecanada.org/downloads/programs/safekidsweek/Pocket-Concussion-Recognition-Tool2013.pdf

[4] Concussion Clinical Toolkit. Retrieved May 7, 2013, from http://www.cattonline.com/

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