



Improving concussion management in Canadian youth

Student leads: Saurabh Sati (MBA '17) and Melanie Yu (Commerce '17)

Faculty lead: Professor Dilip Soman

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Abstract

This brief research note reviews the current situation in Canada regarding concussion amongst youth. It identifies significant information gaps and offers some recommendations on how to address these gaps. In specific, it notes the lack of data pertaining to concussion incidence in Canada, details the journey of a concussion patient, highlights decisions points where errors can occur, and details some of the plausible reason behind any such errors. In conclusion, the note proposes a few recommendations including the creation of a central, informational website where all basic information pertaining to concussion in youth is available along with easy access to other resources.



Introduction

Midway through the 2015 movie *Concussion* there is a powerful scene where Will Smith urges the officials sitting across him in a restaurant to “Tell the truth”. Smith plays Dr. Bennet Omalu, a Nigerian forensic pathologist who finds himself going up against the NFL - National Football League - (Fainaru-Wada & Fainaru, 2013) when sport authorities deny his scientific research (Omalu et al., 2005) that showed the impact of repeated concussions on football players’ brains. The NFL eventually agreed to a settlement that could cost up to \$1 billion (Belson, 2016) - the truth pertaining to the risks of brain injuries in general, and concussions in specific, is very much in the open now. And with the recent dramatic rise in concussion amongst the Canadian youth (Canadian Institute for Health Information, 2016), this is a truth that all stakeholders need to consider very seriously.

A concussion is a traumatic brain injury, medically defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces (McCrory et al., 2012). In everyday language one can describe a concussion as an injury that happens when the brain bounces around or get twisted inside the skull – usually caused by a blow to the head (Centers for Disease Control and Prevention, 2015). In Canada, as in the United States, concussion shot to prominence when leading sports figures including Sidney Crosby were victims (Osler, 2015), and in the recent years, more and more information on concussion management has become available. Yet clear information gaps exist – with one of the biggest lacunae pertaining to concussions amongst youth (Public Health Agency of Canada, 2016). This research note focuses on areas in concussion management amongst Canadian youth (5-18 years old) and offers some recommendations on how to address these gaps.

The note begins with a review of the current situation in Canada regarding concussion amongst youth – both in terms of the sheer size of the population being affected and in terms of policy / regulations currently in place. Subsequently the note examines the journey of a concussion patient and narrows down the specific decision points where errors may take place in the when managing concussions amongst Canadian youth. Then the note details some possible reasons behind any erroneous decisions and offers a few examples of best practices that have worked in other parts of the world. In conclusion, the note proposes a few specific recommendations to improving concussion management in Canadian youth.

Concussions in Canadian youth – current landscape

One of the first things a researcher looking for concussion data in Canada may notice is that there are no consistent reports quantifying the concussion problem in Canada. There are several province-specific numbers (for example Ontario Neurotrauma Foundation, 2015) that provide an insight into how many Canadians in a geographic region suffered from a concussion in the past, but there is a lack of a single source of information for concussions across Canada. And what data is available suffers from being spread out across varying time ranges that do not encourage



for any comparison / trend analysis of concussion amongst youth across Canada (for example Rajabali, Ibrahimova, Turcotte, & Babul, 2013).

Consequently, there are no precise statistics that can convey the size of the problem. What the available numbers do indicate is that youth below 18 years of age are amongst the populations most affected by concussion (Ontario Neurotrauma Foundation, 2015) and that incidence of concussion amongst youth, especially sport-related concussion, is growing at an alarming rate (Canadian Institute for Health Information, 2016). Combine this with research indicating that concussions in youth sports are actually under reported (Williamson & Goodman, 2006) and one begins to see the immediate need to focus attention on this issue.

And attention has been increasing – in June 2016, Ontario passed Rowan’s law (Legislative Assembly of the Province of Ontario, 2016), the country’s first law concerning management of concussion amongst youth. There is a considerable amount of work to be done in the policy domain before Canada can match efforts of some other countries. In the U.S for example every state has a law dealing with concussion in youth (National Federation of State High School Associations, 2014) – but this is an important first step. Movement is expected at the national level as well with a private member’s bill that aims to create a comprehensive national concussion policy being the process of becoming a legislation (Treleaven, 2013).

As these policy measures continue to unfold there is also an immediate need to improve the awareness of concussion management amongst youth who are an especially vulnerable population. The primary stakeholders in a concussion injury in a youth - those who would be able to note the symptoms and take protective action - are the injured youth, his/her parents, his/her teachers, his/her coaches and the health care professionals treating the concussion. Their actions decide if a concussion is diagnosed/treated correctly and it is on their actions that that any awareness campaign should focus. But to understand how to improve awareness regarding concussion, one needs to understand what happens to a concussion patient from the moment he/she is injured to the time when he/she has fully recovered.

Journey of a concussion patient

As noted above, a concussion might occur when a person sustains a blow to the head. It can also happen without a direct impact on the head – for example from a jolt or a blow to the body that causes the head to move back and forth in a rapid manner (U.S. Department of Health and Human Services, 2010). In the case of a concussion, this results in the brain bouncing around or twisting and this causes changes in brain function. These changes lead to certain symptoms that may be noticeable to the person injured and/or the people around him/her.



Figure 1: Decision points immediately following a concussion

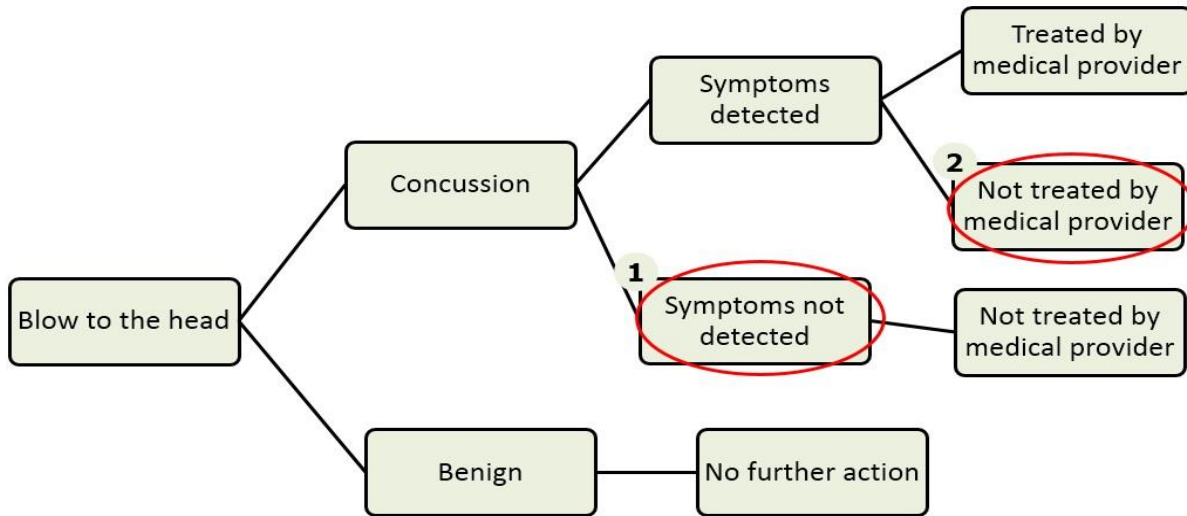


Figure 1 shows the journey of a concussion patient. There are two primary decision points, in the immediate aftermath of a blow to the head or body jolt to a youth that possible concussion may go undetected or untreated. The first scenario is where the injured youth and the people around him/her simply do not detect the symptoms of a possible concussion and consequently do not take any precautionary actions to protect the youth. It is important to note here that a concussion is an invisible injury – there are no physical signs of the injury as opposed to say a cut in the arm that is clearly visible. Not only is the injury not visible to the naked eye, a concussion may often not be visible on a Magnetic Resonance Imaging (MRI) scan or similar medical examinations (Shenton et al., 2012). Hence, the externally observable symptoms of a concussion become vital in a correct diagnosis and subsequent correct management of the injury.

Scenario 2 occurs when concussion symptoms are visible and noticed by the youth and/or the people around him/her but still there is no action to protect the youth. In this situation, the symptoms get noticed and yet ignored for a multitude of reasons – the injury might not be taken seriously or the patient may be unwilling to leave whatever activity he/she is involved in. These are related but different situations and there are differing reasons behind the lack of protective action in each situation.

Correct injury management is vital in both scenarios since over 90 percent of concussions will be resolved successfully in the next few weeks after the injury if they are managed carefully (Children's Hospital of Orange County, 2013). On the other hand, if a concussion goes undiagnosed, the injured person is at risk of Second Impact Syndrome – a scenario where injured person returns to normal life and before the first concussion has healed, there is a second blow to the head. The Second Impact Syndrome is an extremely serious medical situation that can result in permanent brain damage and can even be fatal (Bey and Ostick, 2009). Research also suggests that youth may be particularly vulnerable to concussions (Moser, 2002) due to their



developing brain making it critical to correctly diagnose each concussion amongst youth and follow appropriate concussion management protocols.

Reasons for errors in decision making

Scenario 1, where concussion symptoms are not recognised, indicates a lack of awareness regarding what signs/symptoms may be associated with a concussion and the needs/demands of each stakeholder are in managing a concussion. A lot of progress has been made in regard to information dissemination in the recent years, thanks especially to international consensus conferences on sports concussion research (in 2001, 2004, 2008 and 2012) whose proceedings have resulted in certain standards (definitions etc.) and have been shared across the world. Yet there are misconceptions regarding concussions amongst all stakeholders, including amongst the medical professionals who treat the injury, such as the belief that a concussion by definition would involve a loss of consciousness when we know today that most concussions happen without the injured person becoming unconscious (Tator, 2012).

There is a lot of information on concussion in youth available online through a multitude of sources including Parachute Canada, Canadian Concussion Collaborative and Coaching Association of Canada. Yet there seems to be a gap when it comes to a central website that covers all basic information regarding concussion in Canadian youth and, equally importantly, provides this information to the users in an easy-to-understand manner.

This gap becomes more obvious when one examines the resources created by the U.S. authorities, especially the HEADS UP Concussion in Youth Sports initiative (HEADS UP to Youth Sports, 2015). The HEADS UP website offers a pool of information resources, in an easy accessible format and language, with specific tools catering to the needs and demands of every stakeholder including the youth, the guardians, the teachers and youth coaches. An evaluation of the initiative also suggested that it has successfully communicated new information on concussions to the stakeholders (Covassin, Elbin, Sarmiento, 2012).

In scenario 2, where the injured youth and/or people around him/her notice the symptoms of a possible concussion and still take no protective action, completely different forces are at play. There is evidence that both youth athletes as well as youth sports officials under-report concussion to sports authorities (Williamson and Goodman, 2006). Research amongst collegiate athletes also suggests that there are several reasons why an athlete does not report a concussion including not considering concussion to be serious injury and an unwillingness to leave the game or activity they are involved in (Davies and Bird, 2015). It is important to consider these social factors when creating any information tool covering concussion amongst Canadian youth

Again, while there are multiple online channels stressing the dangers of a concussion there is no simple focused awareness campaign on concussion amongst Canadian youth that stresses the dangers of continuing to play on or undertake daily activities despite a concussion. Rowan Stringer, after whom Ontario's law on concussion management in youth is named, is a tragic



example of what can go wrong if concussion symptoms are ignored (Hall, 2016) and this severe danger must be communicated clearly, especially to the youth themselves.

In each of these scenarios, it is important that the concerned youth and the people immediately around him/her (including parents, teachers and coaches) are well aware of dangers of concussions and the recovery protocols. Return-to-Play and Return-to-Learn need to easily recognised terms and not words one needs to look up on Google. Along with the ongoing policy measures, concussion management amongst youth needs an action-oriented information tool that is easily accessible, incorporates social factors and understandable. The Active and Safe Injury Prevention Initiative that ran from 2011-2013 is one example of a campaign working with multiple stakeholders to improve youth safety and can serve as a useful best practice example (Public Health Agency of Canada, 2014).

Recommendations

When the NHL agreed on a settlement regarding brain injuries sustained while playing in the league, it agreed to, amongst other steps, a commitment to safety-related initiatives in youth football (NFL, 2014). As the foregoing analysis shows, there is a clear need for a similar prioritisation of concussion management amongst Canadian youth. Some policy measures are already in place or are in the process of adoption – below are a few more specific steps that may help concretise and enforce this prioritisation:

- a) Establishment of a national database on concussion – Research on concussion amongst Canadians, especially amongst Canadian youth, suffers from a lack of a central data centre to monitor national trends over different timeframes. Government authorities including the Public Health Agency of Canada (PHAC) would benefit from creating a central platform for information sharing on concussion including updated figures on concussion cases reported in each province, number of concussion cases segregated by age groups, gender, activities during which the injury took place etc. This would help identify the most vulnerable segments of the population and track the magnitude of the problem over time.
- b) Creation of a portal focusing on managing concussions in Canadian youth – Alongside the database, such a portal would directly address what is already identifiable as a vulnerable group – the youth. The portal needs to be easy to grasp and tailored to the needs of each different stakeholder. It should be able to provide clear rules and tips on how to detect and take protective measures following a suspected concussion and be action-oriented in detailing recommended next steps after a suspected concussion. The portal would also need to connect to other resources including other more comprehensive sources of information available online such as the Concussion Ed app by Parachute (Government of Canada, 2016) – thereby serving as an easy access point for detailed knowledge on concussion management.



- c) National awareness campaign on concussion highlighting available resources and the benefits of a safety first approach – The database and the portal are vital in addressing concussion amongst youth but they would need to build a user base to be effective. A national awareness campaign, ideally linked to brain health related event such as Brain Injury Awareness Month (Health Canada, 2016) would be extremely beneficial in generating an initial awareness of the resources available to the various stakeholders. The campaign does not need to solely focussed on the above two resources – it also can address benefits of other measures such as baseline testing (Van Kampen, Lovell, Pardini, Collins, & Fu, 2006). The primary goal of the campaign would be to educate all stakeholders on the importance of accurately detecting a concussion and the dangers that could be associated with a false diagnosis. It would also disseminate simple, memorable rules of thumb, address relevant social factors and debunk common myths pertaining to concussion – shining a light on the right protocols for managing concussion in youth.



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