

**DRAFT Final Report
Sports: Review of Concussion Recognition and
Management Tools**

January 5, 2013

**Submitted to Recognition and Awareness
Working Group
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Executive Summary

Concussions account for 8.9% of all high school athletic injuries and almost 12% of high school athletes who sustained a concussion had a previous concussion within the previous year. With nearly 60% of all high school students in the U.S. participating in organized sports, this is a huge population at risk for concussive injury. Monitoring of subjective symptoms is the foundation of all sport concussion management programs.

The objectives of the project were to: 1) identify and review existing concussion recognition and management tools for sports using scientific and grey literature searches and consultation with stakeholders, 2) suggest the most appropriate method and/or approach for the tools to promote practice uptake and use by school coaches, teachers, nurses, trainers, athletic therapists in Ontario, and 3) assess level of awareness and utilization of existing tools with school-based audiences including teachers, coaches, trainers, athletic therapists, players and parents.

The inclusion criteria for the concussion tool review included: appropriate for children aged 5-18 years, understandable and practical to administer (usability), applicable across sports, and alignment with the Consensus Statement on Concussion in Sport.

The methodology of the project included scientific literature searches of four databases (Medline, Medline In-Process & Other Non-Indexed Citations, Embase and Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews). Four thousand abstracts were reviewed. A second literature search was performed using the Summons and SportDiscus databases which generated 675 articles. Canadian, U.S. and international organizations and concussion apps were searched. Stakeholder consultation consisted of the Ministry of Education, Ministry of Tourism Culture and Sport, Parachute, Peterborough Youth Sports Program, provincial Injury Prevention Programs, OPHEA, and the Ontario Public and Catholic School Supervisory Officers' Associations. A Focus Group of experts also met to inform recommendations on the content, format and knowledge translation of a concussion tool suitable for use in sports in children aged 5-18 years of age.

The search generated a total of 47 concussion tools used in North America (plus 10 sport-specific) across 24 organizations. Coaches were the most frequent target audience of concussion tools. Tools were also available for parents, teachers and athletes. CDC had the largest number of concussion tools (n=23) including clipboards, wallet cards, fact sheets, information sheets, check list, clipboard stickers and palm cards. CDC, ThinkFirst, Montreal Children's Hospital and Peterborough Youth Sports Program had multiple concussion tools. ThinkFirst, Montreal Children's Hospital and Peterborough Youth Sports Program have developed concussion tools in Canada. ThinkFirst had seven concussion tools for coaches,

athletes, teachers, trainers, parents. In addition, ThinkFirst also had a concussion card for Football Canada and Hockey Canada. Concussion tools included wallet cards, pocket cards and 8 ½ x 11 for Fact Sheets and Information Sheets. There was little published on the evaluation of concussion tools in the scientific literature. Only CDC evaluated and published the results of their toolkits. CDC's evaluation of the Heads Up High School Sports showed that 90% of coaches who responded to the survey had used one of the tool kit materials. The materials that were most useful were: booklet (79%), wallet card (60%), video (59%) and athlete's fact sheet (57%). The pocket card was the most useful component of the tool kit. The evaluation of Heads Up: Concussion in Youth Sports reported that 91% of the coaches said they would use the clipboard and fact sheet (86%). The scientific literature demonstrated that the CDC tool kit showed positive changes in coaches' attitudes and behaviours related to concussion prevention and management.

The literature supports that concussion education must be disseminated to athletes, coaches, trainers, athletic therapists, leagues, teachers, health care professionals and the media. Education should comply with the international consensus statements and convey consistent messages. Concussion tools are one avenue to promote concussion recognition and awareness. Based on research conducted by Daria Parsons, in collaboration with Dr. Charles Tator, with input from a Focus Group of experts, the final recommendations include the following:

General Recommendations

- One concussion tool should be available to standardize information for coaches, teachers, athletes and parents to ensure consistent messaging across target audiences.
- One concussion tool should be available across sports.
- SCAT2 is intended for use by physicians and is not suitable for use by coaches and teachers in schools. The components of the PocketSCAT2, however, should be included on the concussion tool to be used by teachers, coaches and athletic therapists.
- Medical professionals should be involved in decisions regarding return to play and return to school
- Return to play activities may vary by sport e.g. running in football or skating in hockey.
- The concussion tool should be translated into other languages.

Format of the Concussion Tool

- The suggested format of the concussion tool should be double sided 8 ½ x 11 inch clipboard format.
- Because schools require paper copies of forms for coaches, a hard copy of the concussion tool should be available for schools.
- The tool should be available by download for teachers, coaches, players and parents.

- The concussion tool information should be legible when printed in black and white (colour copies should not be required).
- QR codes should be included on the concussion tool so the content can be uploaded to smart phones.
- An app should be developed based on the recommended concussion tool for use by athletes, parents and coaches.

Content of the Concussion Tool

- Because the ThinkFirst concussion tool aligns with the International Consensus Conference on Concussion in Sport and was developed by a Canadian expert panel, the ThinkFirst tool for coaches was the initial template for the concussion tool recommended for this project.
- The concussion tool must align with the content of the Consensus Statement on Concussion in Sport to increase credibility. A new Consensus Statement will be released in March 2013 and so the concussion tool should be updated at that time.
- The concussion tool should align with the content of the Ontario Safety Guidelines from OPHEA including the caveat on special needs.
- The concussion card should state that signs and symptoms may be different for students less than 10 years and also that young students may not be able to clearly communicate their symptoms.
- Signs and symptoms listed on the concussion tool should be applicable to all age groups to facilitate concussion recognition in children and youth in sports and in the playground.
- It is important to include return to activity information that includes return to school and return to play rather than exclusively focusing on return to play.
- The tool should recommend that a student suspected of having a concussion must be assessed by a medical professional.
- Memory questions should be age and sport-specific.
- The concussion tool should include a website where stakeholders can find more information e.g. sport specific information, prevention tips e.g. websites such as ThinkFirst, CDC and OPHEA.
- The concussion tool should include a date of production.

Specific content to be included as informed by the Focus Group

- Description of what is a concussion
- What to do if concussion occurs/Access ABCs
 - What to do when an athlete is unconscious/ Emergency Action Plan e.g. when to call 911 (using ACLS and First Aid training guidelines for ABC terminology)
 - Athletes do not have to lose consciousness to have a concussion.

- Signs & Symptoms
- What causes concussion?
- Memory testing
- Balance testing should be included on the concussion tool because it is recommended by the International Consensus Conference but should be labelled optional.
- Return to school and play
- When to see a doctor (in large print).
- URL link to more information

Content not required on the concussion tool (not enough space)

- How long will it take to get better
- Prevention tips

Knowledge Translation of the Concussion Tool

The most appropriate method and/or approach for the tools to promote practice uptake and use by coaches, teachers, nurses, trainers, and athletic therapists include the following:

- The Ministry of Education, Ministry of Health and Long Term Care and Ministry of Tourism, Culture and Sport, OPHEA and Parachute and other organizations can distribute the concussion tool and post it on their websites.
- Organizations can add their own logo to the concussion tool but the information provided should be maintained and ThinkFirst should be credited with the content.
- There should be collaboration with government to prioritize key audiences e.g. the Ministry of Education and Ministry of Culture, Tourism and Sport work with after school providers, recreational leaders in addition to coaches, and teachers.
- OPHEA should add the recommended concussion tool to the Safety Guidelines on their website.
- There are two central streams for educating coaches: 1) training programs and 2) sport governing bodies. The concussion tool should be distributed across all sport organizations.
- Physicians and nurses should be added to the list of audiences.
- The concussion tool should be given to parents for children less than 10 years of age who sustain a concussion.
- There should be a press release for the concussion tool.

Background

Epidemiology of Concussion

Sport-related concussion in youth continues to be a major public health concern (Bramley, Patrick, Lehman, & Silvis, 2011)(Tator, Concussions are Brain Injuries and Should be Taken Seriously, 2009). The pediatric population is at most risk for concussion and concussion is one of the most commonly reported injuries in children and adolescents who participate in sports and recreational activities (Adler, 2011). The literature shows the following:

Sports-related concussion

- In the United States, there are an estimated 300,000 sports-related concussions annually (Marar, McIlvain, Fields, & Comstock, 2012).
- The number of sports-related concussions appears to be increasing (McKeever & Schatz, 2003).

Pediatric sports-related head injury

- The majority of sports-related head injury occurs in athletes less than 20 years of age (Kelly, Lissel, Rowe, Vincenten, & Voaklande, 2001).
- Between 2001 and 2009, the number of sports and recreation-related visits to the emergency department due to pediatric traumatic brain injury increased by 62% with the highest rates in those 10-19 years of age (Centers for Disease Control and Prevention, 2011).
- During 2001-2005, 65% of sports concussions seen in emergency departments occurred in individuals aged 5 to 18 years (Centers for Disease Control and Prevention, 2011).

High school sports-related concussion

- Nearly 60% of all high school students in the U.S. participating in organized sports which is a large population at risk for concussive injury (Kirkwood, Yeates, & Wilson, 2006).
- Concussions accounted for 8.9% of all high school athletic injuries (Gessel, Fields, Collins, Dick, & Comstock, 2007).
- In high school sports, football accounted for the highest rate of concussions (6.4), followed by boys' hockey (5.4) and boys' lacrosse (4.0) (Marar, McIlvain, Fields, & Comstock, 2012).
- Concussions represented a greater proportion of total injuries among boys' hockey (22%).
- Girls had a higher rate of concussion than boys.

Recognition of Concussion

Recognition and initial management of concussion are important for treatment and return to play for athletes (Martineau, Kingma, Bank, & McLeod, 2007). Despite an increase in awareness, concussion often remains undiagnosed (Saffary, Chin, & Cantu, 2012). Given there are no visual signs of concussion (Broglia & Guskiewicz, 2009) and no diagnostic test available, the recognition and diagnosis of concussion is primarily based on the presence of signs and symptoms (Eckner & Kutcher, 2010). The diversity of symptoms among athletes, however, makes concussion recognition a complex issue. (Broglia & Guskiewicz, 2009). Concussion symptoms may be vague and inconsistent (Martineau, Kingma, Bank, & McLeod, 2007), may not appear for a few days (Valovich, Bay, Heil, & McVeigh, 2008) or may be short lived and, therefore, easily ignored (Saffary, Chin, & Cantu, 2012). In addition, an athlete may minimize or deny symptoms to remain in play (Goldberg & Dimeff, 2006) which can lead to the underreporting of concussions in youth. This issue of underreporting of concussion was demonstrated in a study by McCrea et al which suggested that less than half (47%) of athletes reported their concussion (McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004).

The most common concussion symptoms reported are headache (94%), dizziness (76%), concentration difficulty (55%), confusion (45%), light sensitivity (36%) and nausea (31%) (Broglia & Guskiewicz, 2009). To date, there are no biomarkers for concussion recovery and it is not feasible to perform functional MRI or diffusion tensor imaging on all children with concussion (Guskiewicz & Valovich McLeod, 2011)(Ashare, 2012). Monitoring of subjective symptoms, therefore, is the foundation of all sport concussion management programs (Krol, Mrazik, Naidu, Brooks, & Iverson, 2011).

If not treated appropriately, concussion can lead to long term cognitive, academic, behavioural and emotional problems (Guskiewicz, et al., 2003). Recognition and management of concussion is particularly important in sports because re-injury can result in post concussive syndromes or second impact syndrome (SIS) which involves the athlete obtaining a second head injury before fully recovering from a previous injury (Aloi & Rempe, 2008). The prevention of concussion is important, especially when dealing with subsequent concussions, which may result in brain swelling, brain damage, long-term disabilities and even death (Senelick, 2012). One study showed that almost 12% of high school athletes who sustained a concussion had previously been concussed within one year of the new injury (Marar, McIlvain, Fields, & Comstock, 2012). Given research has demonstrated children take longer to recover from a concussion than adults, more conservative management is required in this population (Guskiewicz & Valovich McLeod, 2011).

Over the last ten years, there has been a dramatic increase in the awareness of concussion in sports among coaches, athletes and the public, however, many individuals are still uninformed about the signs and symptoms and management guidelines (Tator, Sport Concussion Education and Prevention, 2012). Education is a critical component of concussion prevention and efforts must continue to enable coaches, trainers, athletic therapists, parents and physicians to recognize the signs and symptoms of concussion (Purcell & Carson, 2008).

Because little can be done to treat concussions (Saffary, Chin, & Cantu, 2012), the recognition and management of concussion is a critical but challenging problem faced by personnel responsible for athletes. The recognition and management of concussions require education, public awareness and collaboration among coaches, athletes, medical professionals and athletes.

Concussion Policies and Legislation

Lack of knowledge among athletes, coaches, trainers and parents may result in failure to recognize and report concussions (Echlin, et al., 2010). According to the Canadian Medical Association (CMA) *Policy on Head Injury and Sport*, children and youth may not be cognitively aware enough to recognize the signs and symptoms of concussion (Canadian Medical Association, 2011). They recommend that coaches, trainers and sports therapists receive nationally standardized and certified education about the signs and symptoms and appropriate management of concussion. The CMA also recommended that information on the signs and symptoms of concussion be provided to parents and students.

Given that 60% of all high school students in the U.S. participate in organized sports (Kirkwood, Yeates, & Wilson, 2006), there is a need for widespread concussion awareness in schools (Sady, Vaughan, & Gioia, 2011). One approach to improving concussion awareness in schools is through legislation. In the U.S. the state of Washington was the first to pass legislation (Lystedt Law, 2009) that required educational material is made available to coaches, athletes and parents (Washington State Department of Health, 2012). Currently, almost 80% of states have passed similar concussion legislation (Presagia, 2012). State laws support the management of concussion because they require children to be removed from play after sustaining a sports-related concussion and to not return until being evaluated by a medical professional (Evans, 2011). Legislation also includes return to play guidelines outlining education and policies needed for managing concussions' effects on learning (Concussion Act, 2011).

In Ontario, the Education Amendment Act (Concussions), 2012, part of a provincial concussion strategy, is proposed legislation that will help protect students involved in school sports from the potentially serious effects of concussion by providing resources to parents, teachers and school staff on how to manage concussion.

The Value of Prevention Education

Although numerous articles have been published on the clinical management of sports-related concussion, few studies focus on educational materials and strategies for injury prevention education in school settings (Sawyer, Hamdallah, White, Pruzan, Mitchko, & Huitric, 2010). A few of the published studies that demonstrate the value of prevention education are outlined below:

Bicycle Helmets

An evaluation of school based, bicycle helmet program found that educational intervention that included the provision of bicycle helmets increased reported helmet use, especially when parental reinforcement was added (Hendrickson & Becker, 2000).

ThinkFirst

A Canadian study of the ThinkFirst Canada Smart Hockey program (in 11 to 12 year old hockey players) demonstrated that an educational video on the prevention of brain and spinal cord injury in ice hockey, resulted in improvements knowledge and behaviours after athletes viewed the video. The authors suggested that parent and administrator education should also be implemented (Cook, Cusimano, Tator, & Chipman, 2003).

Soccer

Bramley et al. demonstrated that high school soccer players who received concussion education (72%) were more likely to notify their coaches of concussion symptoms than those who did not receive education (36%) (Rivara, 2012). One of the conclusions of the study was that education is the cornerstone of early identification of concussion given that symptoms must be reported for concussion to be diagnosed.

Project Rationale

Clearly, recognizing and managing the effects of concussion are vitally important to those involved with sports. Given its high prevalence in the pediatric population, identification of concussion is critical in delivering appropriate care and support to those who need them. Recognition and management tools for concussion are important because concussions are often overlooked or misdiagnosed for a number of reasons such as a lack of awareness of the seriousness of brain injuries and their resulting consequences. To date, there has not been a comprehensive review of existing concussion tools which has led to inconsistent and deficient approaches by all groups involved (including teachers, coaches, trainers, athletic therapists, players and parents). As part of the provincial Concussion/mTBI Strategy, the Recognition and Awareness Working Group deemed it important to identify and provide a review of evidence-based concussion recognition and management tools for use in sports.

Project Goal and Objectives

The primary aim of this project was to identify existing and validated evidence-based concussion recognition and management tools for sports using scientific and grey literature searches and consultations with stakeholders. The project objectives include:

Objective 1: *Suggest the most appropriate method and/or approach for the tools to promote practice uptake and use by school coaches, teachers, nurses, trainers, and athletic therapists in Ontario.*

Objective 2: *Assess level of awareness and utilization of existing tools with school-based audiences including teachers, coaches, trainers, athletic therapists, players and parents. If tools are known to school audiences, identify to what extent they are utilized.*

Objective 3: *Finalize and compile a list of concussion recognition and management tools in sport in the Ontario environment and provide user friendly descriptions for each. The goal is to identify tools that are practical and feasible that can be administered in a reasonable amount of time.*

The results of this project will provide guidance on the current state of concussion screening tools for use in sports-related concussions. Recommendations may suggest an existing tool that could be implemented in Ontario schools or may demonstrate the need for development of additional tools for schools. The project may also inform the implementation of Bill 39: Education Amendment Act (Concussions), 2012.

<http://www.concussionsontario.org/the-projects-raa/#evidencebasedconcussionmTBIscreeningtools>

The findings of this study may be expanded at a future date to other non-school settings in which concussions frequently occur.

Methodology

The consideration for the review of concussion tools include:

- Appropriate for children aged 5-18 years
- Practical to administer by teachers, coaches, trainers, athletic therapists, players and parents (usability/user friendly)
- Understandable to teachers, coaches, trainers, athletic therapists, players and parents
- Applicable across a range of sports
- Valid, inter-rater reliability and sensitivity
- Accessible
- Cost efficient

- Aligns with Consensus Statement on Concussion in Sport (Zurich)

Not Reviewed in this Project

- Concussion tools for physicians
- Posters
- Road shows
- Websites
- Videos
- Webinars/Courses

The project included a scientific and grey literature review, stakeholder consultation and a focus group of experts was held in November 2012 to review the findings and make recommendations on the content, format and method of knowledge translation of a tool suitable for use in sports in children ages 5-18 years of age with a focus on school sports.

Scientific Literature Review

Background documents provided by the Ontario Neurotrauma Foundation and Dr. Charles Tator were reviewed prior to beginning the project. A scientific literature review was conducted to identify academic publications regarding concussion recognition and management tools used by teachers, coaches, trainers, athletic therapists, players and parents by a UHN librarian who specializes in Medical Education and Neuroscience and Surgical Service. Medical Subject Headings (MeSH) and relevant databases were identified. A total of four databases (Medline (OvidSP), Medline In-Process & Other Non-Indexed Citations (OvidSP), Embase (OvidSP), Cochrane Central Register of Controlled Trials (OvidSP) and Cochrane Database of Systematic Reviews (OvidSP)) were used to conduct a systematic review of concussion tools. Figure 1 shows a list of the MeSH headings and the inclusion and exclusion criteria's used in the first literature search. A total of 3915 articles were identified from these searches. The titles and abstracts of the articles were reviewed to determine relevancy and 49 articles were printed and read for this project.

A second search was performed using two other databases Summons and SportDiscus (Figure 2). A total of 475 abstracts were identified from these searches. The titles and abstracts of the articles were reviewed to determine relevancy and 11 articles were printed and read for this project.

Sixty one articles were printed from all the scientific literature review.

Figure 1: Search history record for systematic review of concussion tools

Review/Search Topic: Sport Concussion recognition and management tools; limited to English where possible				Searcher: Marina Englesakis		
Investigator(s): Dr. Charles Tator, Daria Parsons				Date: September 2012		
Databases	Database Dates covered	Date Database was searched	# Citations	# Duplicate Citations	Total Citations remaining	Notes/Comments
Medline (OvidSP)	1946 – September Week 1, 2012	Thursday, September 13, 2012	1827	- 1	1826	
Medline In-Process & Other Non-Indexed Citations (OvidSP)	Date: September 13 2012	Friday, September 14, 2012	80	0	80	
Embase (OvidSP)	1974 – September 14 2012	Friday, September 14, 2012	1989	-782	1207	
Cochrane Central Register of Controlled Trials (OvidSP)	September 2012	Friday, September 14, 2012	3	-2	1	Medline, Embase duplicates removed at source
Cochrane Database of Systematic Reviews (OvidSP)	August 2012	Friday, September 14, 2012	16	0	16	
		Totals:	3915	-785	3130	Provided in EndNote library

Figure 2: Search History for Concussion Tools using Summons and SportDiscus

Review/Search Topic: Sport Concussion recognition and management tools; limited to English where possible						
Investigator(s): Dr. Charles Tator, Daria Parsons				Date: November 2012		
Databases	Database Dates covered	Date Database was searched	# Citations	# Duplicate Citations	Total Citations remaining	Notes/Comments
ProQuest (concussion card) AND (sideline assessment)	1970-2012	Monday, November 12, 2012	163	0	163	
ProQuest (concussion card) OR (sideline assessment)	2001-2012	Monday, November 12, 2012	22	0	22	
ProQuest (concussion card) AND (sideline assessment OR sideline testing)	1941-2012	Monday, November 12, 2012	230	0	230	
SPORTDiscus (concussion) AND (Tator)	n/a	Monday November, 5 th 2012	2	0	2	
SPORTDiscus (concussion card*) AND (parent*) OR (coach*) OR (youth*)	n/a	Monday November, 5 th 2012	40	0	40	
SPORTDiscus (heads up) AND (CDC)	n/a	Monday November, 5 th 2012	8	0	8	
SPORTDiscus (ThinkFirst)	n/a	Monday November, 5 th 2012	10	0	10	
		Totals:	475	0	475	

Grey Literature Search

Google was used to search the grey literature in order to identify concussion tools that could be administered by teachers, coaches, trainers, athletic therapists, players and parents. The initial search focused on organizations within Canada and the United States and used the following keywords: *concussion card, concussion tool, concussion protocol, sport concussion awareness card, sideline assessment card, and sideline assessment tool.*

The following organizations' websites were also searched for relevant concussion tools:

- Braintrust Canada
- Canadian Spinal Research Organization
- Centres for Disease Control and Prevention
- Coaches Association of Ontario
- Coaches of Canada
- Coaching Association of Canada
- Concussions Ontario
- GTHL
- OPHEA
- Ontario Medical Association
- Ontario Injury Prevention Resource Centre
- Ontario Minor Hockey Association
- Ontario Athletic Therapists Association
- Provincial Injury Prevention Organizations (Atlantic Canada, Alberta and B.C.)
- Public Health Agency of Canada
- Safe Communities Canada
- Safe Kids Canada
- Safe Kids U.S.
- SMARTRISK
- Sunnybrook RBC First Office for Injury Prevention
- ThinkFirst
- Tom Pashby

Although out of scope, internationally used concussion tools were identified by conducting searches of Australia, the UK, Switzerland, New Zealand and Sweden in combination with the keywords used in the Canadian and United States search.

Google was also used to identify concussion apps that can be administered by coaches, trainers, athletic therapists, players and parents. The keywords used included *concussion card apps, concussion apps and sideline apps.*

Key Informant Consultation

The stakeholders contacted for this project included:

- Dr. Shelina Babul, BC Injury Prevention
- Kathy Belton, Alberta Centre for Injury Control & Research
- Lynne Fenerty, ThinkFirst
- Theresa Harris, Ontario Catholic Supervisory Officers' Association
- Warren Hoshizaki, District School Board of Niagara
- Laura Kennedy, Peterborough Youth Sports Program
- George Kourtis, Toronto District School Board
- Rebecca Leonard, Alberta Injury Prevention Centre
- Sally Lockhart, ThinkFirst
- Chris Markham, Ontario Physical and Health Education Association (OPHEA)
- Liz Kazimowicz, Superintendent of Schools, Dufferin-Peel Catholic District School Board
- Frank Kelly, Ontario Public Supervisory Officers' Association
- Dr. Winne Meeuvisse, Leader, Brain Injury Initiative, Hotchkiss Brain Institute, University of Calgary
- Christine Provvidenza, Parachute
- Jillian Steeve, Ministry of Culture, Tourism and Sport

Focus Group

Key stakeholders were invited to a Focus Group meeting on November 22, 2012 (Appendix F) to discuss the format, content and knowledge translation of the concussion card. The questions addressed by the Focus Group included:

- Are there critical concussion tools that have been omitted?
- Is it important to have different concussion tools for target audiences (coaches, trainers, athletic therapists, teachers, parents, athletes)?
- Is it important to have different concussion tools for each sport?
- Is it important to have different concussion tools for different age groups?
- What format is best for the concussion tool (pocket card, wallet card, Fact Sheet)?
- What content should be included in the concussion tool?
- Is it feasible to include memory and balance assessments in an assessment tool for coaches?
- What would be the most appropriate method and/or approach for the tools to promote practice uptake and use by coaches, teachers, nurses, trainers, and athletic therapists?

Results

Objective 1

Objective 1: Suggest the most appropriate method and/or approach for the tools to promote practice uptake and use by school coaches, teachers, nurses, trainers, and athletic therapists in Ontario.

Dr. Charles Tator reported that “it is essential to educate a large array of individual groups in order to achieve improvement in the recognition, management and prevention of sports concussions”(Tator, Sport Concussion Education and Prevention, 2012).

The Focus Group suggested that the most appropriate method and/or approach for the tools to promote practice uptake and use by coaches, teachers, nurses, trainers, and athletic therapists included the following:

- The concussion tool should be targeted to parents for children less than 10 years of age.
- Ministries, OPHEA and Parachute can distribute the concussion tool and post it on their websites.
- There should be collaboration with government to prioritize key audiences e.g. the Ministry of Education and Ministry of Culture, Tourism and Sport works with after school providers, recreational leaders in addition to coaches, and teachers.
- Each Board of Education in Ontario will have to adopt the OPHEA guidelines once concussion legislation passes so all teachers will be aware of the guidelines. OPHEA should add the recommended concussion tool to the Safety Guidelines on their website.
- There are two central streams for educating coaches: 1) training programs and 2) sport governing bodies. The concussion tool should be distributed across sport organizations.
- Physicians should be added to the list of audiences because many of them are coaches and parents and they may not know about the management of concussions.
- There should be a press release for the concussion tool.
- The concussion tool should be supported by Focus Group participants.

Objective 2

Objective 2: Assess level of awareness and utilization of existing tools with school-based audiences including teachers, coaches, trainers, athletic therapists, players and parents. If tools are known to school audiences, identify to what extent they are utilized.

Concussion Awareness

A number of surveys have recently been conducted on coaches' and teachers' awareness of concussion. As such, it was decided that the existing survey results would be reported

rather than conducting another survey of the same stakeholders e.g. coaches, teachers. Two projects were completed by the Ontario Neurotrauma Foundation (ONF) and one by the Ontario Physical and Health Education Association.

Ontario School-Based Personnel Concussion Knowledge Project (Ontario Neurotrauma Foundation March 2012)

The Recognition and Awareness Working Group identified school-based personnel as a priority group that should be educated on concussion recognition and awareness.(Ontario Neurotrauma Foundation, 2012) There were three target audiences for this project: (1) school boards, (2) teachers and (3) coaches.

School Boards

- The goal of the survey was to identify whether schools have concussion guidelines, policies or procedures in place
- 83 school boards in Ontario were surveyed with a 53% response rate
- 68% reported that they do not have guidelines, policies or procedures
- Only 43% of respondents have guidelines, policies or procedures mentioned e.g. OPHEA guidelines
- Besides OPHEA, respondents reported they use curriculum, Health & Safety Committees, Safe School PD Day, Panno Therapeutic services, concussion program and first aid
- Waterloo high schools use Pocket SCAT2

Teachers

Despite numerous attempts to survey teachers via the Ontario Teachers' Federation and the Ontario English Catholic Teachers' Association, there were no responses to requests to participate in the project.

3. School Coaches

A survey was distributed by the Ontario Federation of School Athletic Association that included 16 questions, nine of which related to concussion knowledge questions from OPHEA guidelines.

- 67 coaches participated in the survey; the denominator is not known
- 43% of respondents had concussion guidelines in their schools; 17% did not and 31% did not know
- 40% of the coaches knew how to access concussion guidelines for athletes at their school board

- 79% knew what to do if an athlete had a loss of consciousness; 70% knew what to do if there was no loss of consciousness.

The study demonstrated that not all schools are aware of OPHEA guidelines and that school coaches were an accessible audience. The results suggested that partnership with OPSAA is necessary to ensure that school coaches are knowledgeable about concussion guidelines.

Ontario Coaches and Sports Trainers Concussion Knowledge Report (Ontario Neurotrauma Foundation August 22, 2011)

The Recognition and Awareness Working Group identified coaches and sports trainers as a priority group that should be educated on concussion recognition and awareness. The study had a three prong approach:

1. Examine the first aid training of coaches (Red Cross/St. John's Ambulance)
2. Concussion information and guidelines in coaching curricula: surveys Coaches Association of Ontario, Hockey Development Centre for Ontario, Ontario Athletic Therapist Association, Ontario Football Alliance, Sport Alliance of Ontario and ThinkFirst
3. Concussion Survey: 22 questions of which 11 were concussion knowledge questions based on Sports-Related Concussion Guidelines for the Coach/Trainer from ThinkFirst

The survey was sent to Coaches Association of Ontario, Ontario Athletic Therapist Association, and Sport Alliance of Ontario.

- There were 70 responses from coaches and trainers and major knowledge gaps were identified
- 67% received first aid training
- 71% knew that symptoms and signs of concussion include general confusion, loss of vision and not playing as well
- 76% knew that it is necessary to have only one symptom to diagnose a concussion
- 76% knew that physical rest is always recommended after a concussion
- 63% knew that mental rest is always recommended after a concussion
- 30% erroneously thought that a stepwise increase in exercise and activity should be recommended if the athlete is symptomatic.

Recommendations from the Report:

- First aid training should be standardized
- The information and guidelines about concussion available to coaches and sport trainers in Ontario through organizations such as Coaches Association of Ontario

and Sport Alliance of Ontario should be standardized and provide the most recent information.

Current Implementation of the Ontario Physical Education Safety Guidelines and Concussion-Related Resources in Ontario School Boards by OPHEA Report (March 2012)

In 2012, OPHEA approached Ontario school boards to collect data to assess current levels of implementation of the OPHEA Safety Guidelines in the 72 school boards across Ontario, with a focus on head injury prevention, as well as concussion policies and protocols. The study involved a survey and key informant interviews.

- There was a 47% response rate to the survey
- 72% of English respondents and 20% of French respondents were very familiar with OPHEA guidelines
- 93% of English respondents and 20% of French respondents stated every school within their board had access to OPHEA safety guidelines
- 86% of English respondents and 100% of French respondents stated that they accessed the Safety Guidelines through the OPHEA website
- English school boards provide a link to guidelines on their intranet; circulation of hard copies occurred in 31% of English boards and 0% of French boards.
- 31% of English school boards and 20% of French boards monitor implementation (staff meetings, in-servicing, surveys)
- 39% of English boards and 20% of French boards had policies regarding concussion management
- Key resources used to support head injury prevention included OPHEA Safety guidelines (85% for English boards and 100% for French boards, ThinkFirst (5%), school based information and public health campaigns.

Objective 3

Objective 3: Finalize and compile a list of concussion recognition and management tools in sport in the Ontario environment and provide user friendly descriptions for each. The goal is to identify tools that are practical and feasible that can be administered in a reasonable amount of time.

Concussion Tools

Appendix A outlines the concussion tools that are used in sports in Canada and the U.S. outlining the target audience and a link to each tool.

Figure 3 lists the organizations with concussion tools that were found during the grey literature search.

Figure 3: Organizations with Concussion Tools

Organizations with available concussion tools found during the literature review
1. CDC
2. ThinkFirst
3. Montreal’s Children Hospital (MCH)
4. Peterborough Youth Sports Concussion Program
5. Consensus Statement on Concussion in Sport - 3rd International Conference on Concussion in Sport Held in Zurich, November 2008
6. Alberta Schools’ Athletic Association
7. American Academy of Neurology
8. Brain Injury Association of Nova Scotia
9. Canadian Ski Patrol Ontario Division
10. CFL
11. Fort McMurray Zone Canadian Ski Patrol
12. Hockey Canada
13. Massachusetts Medical Association
14. Mt. Diablo Memory Center Sport
15. National Collegiate Athletic Association
16. NCAA/CDC
17. Ontario Athletic Therapist Association
18. Ontario Physical and Health Education Association (OPHEA)
19. SafeKids USA
20. Sanford Orthopedics Sports Medicine
21. Sport Medicine and Science Council of Manitoba
22. United States Eventing Association
23. University of Pittsburgh Medical Centre
24. Wyoming High School Activities Association

Figure 4 summarizes the list of concussion cards by organization found in search of the grey literature.

Figure 4: List of Concussion Cards by Organization

List of Concussion Cards by Organization
CDC
Heads Up Concussion In High School Sports (n=2) - Wallet Card Sports

List of Concussion Cards by Organization
- Clipboard sticker
Heads Up Concussion in Youth Sports (n=6)
- Clipboard
- A Fact Sheet for Coaches
- A Fact Sheet for Athletes
- A Fact Sheet for Parents
- Parent/Athlete Concussion Information Sheet
- Clipboard for coaches
Heads Up to Schools Know your Concussion ABCs (n=3)
- Concussion Signs and Symptoms Check List
- A Fact Sheet for School Nurses
- Concussion Fact Sheet for Teachers, Counselors and School Professionals
Concussion in Sports Palm Card
Heads Up: Concussion in Specific Sports Collegiate Sports Clipboard stickers (n=10)
ThinkFirst
Concussion Guidelines for the Coach/Trainer
Concussion Guidelines for the Parents/Caregivers
Concussion Guidelines for the Athlete
Concussion Guidelines for the Teacher
Concussion Pocket Card (incl. Pocket SCAT2)
Sport-Related Concussion: Guidelines for the Coach/Trainer Football Canada
Sport Related Concussion: Guidelines for Athletes ThinkFirst-SportSmart Concussion Education and Awareness Program
Montreal's Children Hospital (MCH)
Athlete Concussion Card 2011
Concussion Information Brochure/Flyer
Concussion Pocket Card
Peterborough Youth Sports Concussion Program
Athlete Information Sheet
Parent Information Sheet
Coaches Information Package
Clipboard Concussion Tool for Coaches
Consensus Statement on Concussion in Sport
Pocket SCAT2
Other Organizations
Concussion card
Recognizing and Managing a Sports Concussion
Concussion Awareness
Concussion Information and Management
Concussion card
So You Hit Your Head What to Watch For
ThinkFirst SportSmart Concussion Education and Awareness Program Concussion Card
Concussion A Coaches Guide to Sideline Evaluation
Sideline Concussion Evaluation
Concussion A Fact Sheet for Coaches (NCAA Coaches Sheet)
Concussion A Fact Sheet for Student Athletes
Concussion Reference Card
Physical Activity and Sport Related Concussion Physical Education Safety Guidelines
Concussion Fact Sheet for Youth and High School Coaches (CDC Heads Up Concussion in Youth Sports)

List of Concussion Cards by Organization
Sanford Sports Concussion Pocket Card for Coaches
Concussion Management
Management of Concussion in Eventing Grades of Concussion
Concussion Signs and Symptoms Evaluation
Pocket Card Wyoming Concussion Signs and Symptoms

- The search generated 47 concussion tools used in North America plus 10 sport-specific tools from CDC from 24 organizations.
- CDC was the only organization that had sport-specific concussion tools for soccer, cheerleading, lacrosse, baseball, field hockey, rugby, football, softball, volleyball and hockey.
- Each of the tools is downloadable from the link in the table.
- Coaches are the most frequent target audience of concussion tools but tools are also available for parents, teachers, trainers, athletic therapists and athletes.
- There are no age restrictions for the concussion tools presented
- ThinkFirst, Montreal Children’s Hospital and Peterborough Youth Sports Program are the concussion tools developed in Canada.
- CDC, ThinkFirst, Montreal Children’s Hospital and Peterborough Youth Sports Program have multiple concussion tools for a variety of audiences including coaches, trainers, athletic therapists, teachers, parents, athletes etc. using a variety of formats.
- CDC has the largest number of concussion tools (n=23) including clipboards, wallet cards, fact sheets, information sheets, check list, clipboard stickers and palm cards.
- ThinkFirst has seven concussion tools for coaches, athletes, teachers, trainers, parents and caregivers. In addition, ThinkFirst also has a concussion card for Football Canada and Hockey Canada.
- The size of concussion tools include wallet cards, pocket cards and 8 ½ x 11 for Fact Sheets and Information Sheets.

Appendix B outlines the content of concussion tools identified in Appendix A. Each of the 47 (100%) concussion tools reviewed for this project included signs and symptoms of concussion. Eighty seven percent of the tools identified what to do if an athlete sustains a concussion. Sixty eight percent of the tools defined or described a concussion. Thirty eight percent described the guidelines for return to play (6 steps). Thirty four percent included prevention tips and 30% indicated when to seek medical advice.

Appendix C outlines the tools found searching the international literature e.g. Sweden, UK, Australia, New Zealand.

Figure 5 outlines the percentage of concussion tools with specific content.

Figure 5: Percentage of Concussion Tools with Specific Content

Concussion Tool Content	Percentage of tools
What is a concussion?	68
Assess ABCs	2
Symptoms and Signs	100
What Causes Concussion?	28
Memory Function/Mental Status	21
Balance testing	9
What to do if an athlete gets a concussion	87
How is concussion treated?	11
How long will it take to get better?	15
Return to sport/play?/6 steps	38
Return to school/learn	6
When to see a doctor?	34
Prevention tips	30

Evaluation of Concussion Tools from the Scientific Literature

The primary concussion tools considered for this project include the Pocket SCAT2 and tools developed by Think First and CDC.

SCAT2

Consensus Statements on Concussion in Sport, developed as a result of international consensus conferences held in 2001 (Vienna), 2004 (Prague) and 2008 (Zurich), have successfully increased awareness of concussion. (Marar, McIlvain, Fields, & Comstock, 2012)(McCrory, Meeuwisse, Johnston, Aubry, Molloy, & Cantu, 2009)The Zurich consensus statement provides definitions and standard of care management guidelines for concussion (Levine, 2010). The Consensus Statement on Concussion in Sport was developed for use by physicians, athletic therapists, health professionals and coaches (McCrory, Meeuwisse, Johnston, Aubry, Molloy, & Cantu, 2009). McCrory reported that sideline assessment of cognitive function is mandatory for concussions recognition. According to McCrory, brief neuropsychological test batteries that assess memory are reported to be practical and effective. Standard orientation questions (person, place and time) are unreliable in sports compared with memory assessment (Maddocks, Dicker, & Saling, 1995). The Consensus Statement recommends that a comprehensive assessment including symptom, clinical,

neuropsychological and balance assessment be conducted to determine return to play rather than one assessment tool (McCrory, Meeuwisse, Johnston, Aubry, Molloy, & Cantu, 2009).

Although concussion tools for physicians are outside the scope of this project, Appendix D lists the physician specific tools that were found while searching tools for coaches.

ThinkFirst

In Canada, ThinkFirst, a non-profit organization dedicated to the prevention of brain and spinal cord injury, developed concussion tools for coaches, athletes, and parents. (Levine, 2010) There is nothing in the scientific literature, however, evaluating the ThinkFirst concussion tools.

CDC

In response to a lack of concussion awareness, the Centers for Disease Control and Prevention (CDC), through the Children's Health Act of 2000, implemented Heads Up: Concussion in High School Sports in 2005 to educate the public about the prevention, recognition and response to concussion in young athletes (Sarmiento, Mitchko, Klein, & Wong, 2010). CDC, in partnership with 26 health and sports organizations, provided free material including tool kits, fact sheets, magnets and posters to coaches, athletes and parents (Centers for Disease Control and Prevention, 2012) .

Evaluation of CDC's Heads Up: Concussion in High School Sports 2005

The Heads Up: Concussion in High School Sports tool kit is a comprehensive initiative aimed at helping high school coaches recognize and manage sports-related concussion. The CDC tool kit was developed using qualitative and quantitative research methods including literature reviews, focus groups, consultation and a telephone based survey of coaches. (Mitchko, Huitric, Sarmiento, Hayes, Pruzan, & Sawyer, 2007)) It is intended to be a practical, easy to use tool kit for high school coaches to reduce the number of concussions (Sarmiento, Mitchko, Klein, & Wong, 2010). The tool kit was launched at the start of the school year in 2005 (Mitchko, Huitric, Sarmiento, Hayes, Pruzan, & Sawyer, 2007). Draft materials were pretested by high school students and coaches. The coaches stated they wanted information on the signs and symptoms and management of concussion. The results of the pilot study demonstrated the kit's effectiveness with the target audience (Mitchko, Huitric, Sarmiento, Hayes, Pruzan, & Sawyer, 2007). The findings from the study are as follows:

- 94% of coaches reported the material contained the right amount of detail. Coaches preferred a tool kit over a video and thought the pocket card was the most useful component of the tool kit (Mitchko, Huitric, Sarmiento, Hayes, Pruzan, & Sawyer, 2007).

- Coaches reported it was also useful to have a fact sheet for athletes and parents.
- The pilot test confirmed that the design of the tool kit met the needs of high school coaches.
- The final tool kit included an information guide for coaches, a wallet card, a clipboard sticker, fact sheets for athletes and parents, two posters, a video and a cd-ROM of additional information.

Sarmiento et al. conducted a 1-year evaluation study to assess the tool kit's impact and sustainability as a concussion resource (Sarmiento, Mitchko, Klein, & Wong, 2010). CDC evaluated the tool kit by mailing a questionnaire to high school coaches and six focus groups of coaches.

Coaches reported that the barriers regarding managing their athletes' concussions were parents' and athletes' competitiveness, viewing injuries as weaknesses, underestimating the potential risks of concussions and a lack of health insurance (Sarmiento, Mitchko, Klein, & Wong, 2010).

- 60% of the coaches were aware of their school's or club's policy on sports-related concussion but 79% reported that the tool kit was more comprehensive than their policies (Sarmiento, Mitchko, Klein, & Wong, 2010).
- 90% of coaches who responded to the survey had used one of the tool kit materials.
- The materials that were most useful were: booklet (79%), wallet card (60%), video (59%) and athlete's fact sheet (57%) (Sarmiento, Mitchko, Klein, & Wong, 2010).
- 82% of the coaches reported the material to be very or extremely useful.
- 34% of coaches reported that they learned something new from the tool kit.
- Focus group participants reported that the tool kit helped them identify signs and symptoms of concussion, provided information about the potential length of recovery and second impact syndrome, and the need to have a suspected concussion checked by a health care professional.
- 50% of participants reported that the tool kit changed their views on the seriousness of concussions.
- 68% of coaches reported that they had educated others about concussion, particularly athletes (84%).
- 38% of coaches reported that the tool kit changed the way they managed concussions.

Heads Up: Concussion in Youth Sports (2007)

Based on results from the initial evaluation of the Heads Up: Concussion In High School Sports, CDC launched the Heads Up: Concussion in Youth Sports in 2007 for high school coaches and school administrators (Sawyer, Hamdallah, White, Pruzan, Mitchko, & Huitric,

2010). The objectives were to raise awareness and educate coaches about concussion, help coaches educate others about concussion and improve coaches' ability to prevent, recognize and manage concussion among their athletes (Sarmiento, Mitchko, Klein, & Wong, 2010). The tool kit includes a guide for coaches, a video, clipboard sticker, wallet card and fact sheets for parents and athletes.

The study assessed the perceptions of youth sport coaches who have received the CDC's Heads Up: Concussion in Youth Sports materials in preventing, recognizing and responding to concussions (Covassin, Elbin, & Sarmiento, 2012). A survey was sent to coaches as part of the evaluation. The literature reported that:

- Youth sports coaches were able to recognize and respond to sports related concussions after reviewing the materials.
- 91% said they would use the fact clipboard and fact sheet (86%).
- 70% of coaches did not have access to other concussion materials before receiving the CDC material.
- 60% of coaches viewed concussions as a more serious injury after reviewing the material.

Heads Up to Schools: Know Your Concussion ABCs (2010) Following the evaluation of the 2007 version of Heads Up, CDC developed a national concussion education initiative for school personnel who work with grades K-12 called Heads Up to Schools: Know Your Concussion ABCs (Sarmiento, Mitchko, Klein, & Wong, 2010). To date, there have been no publications describing an evaluation of this tool kit in the literature.

The CDC tool kit showed positive changes in coaches' attitudes and behaviours related to concussion prevention and management (Sarmiento, Mitchko, Klein, & Wong, 2010). The study demonstrates the key role that coaches play in establishing a safe environment for athletes.

In an evaluation of the impact of CDC's Heads Up tool kit for physicians, physicians were significantly less likely to recommend next day return to play after a concussion after using the tool kit (Chrisman, Schiff, & Rivara, 2011).

Focus Group

Of the total 47 concussion tools reviewed for this project, five tools were reviewed by the Focus Group. Three tools from CDC: the wallet card (#2 in Appendix A), fact sheet (#3 in Appendix A) and clipboard (#12 in Appendix A) and two tools from ThinkFirst: guideline for coaches and trainers (#14 in Appendix A) and concussion pocket card (#18 in Appendix A) were reviewed by Focus Group participants based on the scientific literature.

Figure 6 documents the decisions made by the Focus Group in terms of the content of the concussion tool.

Figure 6 Concussion Tool Content Recommended by the Focus Group

Concussion Tool Content Recommended by Focus Group	Yes/No
What is a concussion?	Yes
Assess ABCs	Yes
Symptoms and Signs	Yes
What Causes Concussion?	Yes
Memory Function/Mental Status	Yes
Balance testing	Yes but optional
What to do if an athlete gets a concussion	Yes
How is concussion treated?	Yes
How long will it take to get better?	No
Return to sport/play?/6 steps	Yes
Return to school/learn	Yes (before RTP)
When to see a doctor?	Yes
Prevention tips	No
Other e.g. website url	Yes

Discussion

Research on pediatric sport-related concussion is limited (Guskiewicz & Valovich McLeod, 2011). The frequency of concussion and the wide variety of activities associated with them underscore the need to prevent, recognize and respond to sports -related concussions (Centers for Disease Control and Prevention, 2011).

The guiding principle in the assessment of a concussed player is that assessment be timely, systematic and multifaceted (Khurana & Kaye, 2012). Concussion tools or symptom checklists can be quickly administered, allow athletes to identify common symptoms of concussion, and are particularly useful for coaches and teachers (Dziemianowicz, Kirschen, Pukenas, Laudano, Balcer, & Galetta, 2012). It is important to remember that, because athletes tend to underreport symptoms, checklists may not accurately reflect an athlete's true symptoms (Dziemianowicz, Kirschen, Pukenas, Laudano, Balcer, & Galetta, 2012). One study found that 26% of athletes who reported being symptom free on a checklist were found to have cognitive changes (McCrea, et al., 2005). Although symptom checklists may be suitable for sideline use, they are not adequate for return to play guidelines

(Dziemianowicz, Kirschen, Pukenas, Laudano, Balcer, & Galetta, 2012). As such, abbreviated sideline assessment cannot replace neuropsychological testing and should not be used as a standalone tool for the management of concussion (McCrorry, Meeuwisse, Johnston, Aubry, Molloy, & Cantu, 2009).

The literature demonstrates that, although many symptom scales and assessment tools are available including self-reported symptom assessment using 7 point Likert scale such as that used in the SCAT2, cognitive testing is also important (Khurana & Kaye, 2012). The Balance Error Scoring System is the most common scale used to assess postural stability (Broglia & Guskiewicz, 2009). A decreased ability to maintain balance is a hallmark sign of concussion which is demonstrated by a postural sway (Broglia & Guskiewicz, 2009). There is general consensus in the scientific literature that return to play should be based on a combination of sideline assessment, neuropsychological testing and postural stability testing (Khurana & Kaye, 2012). The SCAT2 from the International Consensus Conference on Concussion in Sport is widely available and includes these three components (signs and symptoms, mental status and balance). By consensus, the SCAT2 is the current tool of choice to be used by physicians if athletes aged 10 years and above are suspected to have a concussion (Khurana & Kaye, 2012). The effectiveness of SCAT2 for use on the sideline, however, is yet to be determined (Eckner & Kutcher, 2010).

It is important to note that many young athletes will not have access to an athletic trainer or physician on the sideline (Evans, 2011) as only 42% of high schools have an athletic trainer (Senelick, 2012). Coaches and parents involved in youth sports need to be trained to screen for concussion so they can pull athletes out of play until they can be evaluated by a health care provider. (Evans, 2011) A comprehensive neurological assessment including cognitive and balance assessment may be impractical as a sideline assessment so a concussion tool based on signs and symptoms should be used by coaches in school sports.

There is little in the literature about delivering injury prevention messages by educating coaches (Gianotti, Hume, & Tunstall, 2012). Gianotti et al. suggested that including injury prevention messages into coaches' education is a viable way to improve the recognition of concussion in sports. Coaches are in the best position to be well informed and educate athletes and their families about the signs and symptoms of concussion (Ghiselli & McAllister, 2003) and efforts have been made to educate coaches, parents and the public on the signs and symptoms of concussion (Saffary, Chin, & Cantu, 2012). Good resources are available (Ashare, 2012) and educational initiatives such as CDC's Heads Up tool kit has increased awareness of symptoms among coaches, parents and athletes (Gessel, Fields, Collins, Dick, & Comstock, 2007).

An increase in legislation and awareness programs will result in an increase in concussion assessment tools (Curaudeau, Sharma, & Rovin, 2011). Mobile phone apps, because they are popular and easy to use, offer a convenient platform to promote concussion recognition.

Phone Apps

To increase recognition of concussions for athletes and parents, a number of applications have been developed (Appendix E).

The Concussion Recognition and Response using CDC material is an iPhone application intended to identify whether a player has suffered a concussion. The app includes mechanism of injury and subsequent sign or symptom and treatment strategies and answers to FAQs (Walkinshaw, 2011). The signs and symptoms, sport and geographic location of the incident are included in a database for research purposes (Sarmiento, Mitchko, Klein, & Wong, 2010). A free app called Concussion Test based on the SCAT2 (Curaudeau, Sharma, & Rovin, 2011) is also available.

The Future of Concussion Recognition

Impact Indicators

Greenwald et al. (2012) proposes monitoring the number, severity, location and cumulative effect of impacts of head impacts in football and other sports where practical to provide objective measures regarding head impact exposure experienced by an athlete in games and practices (Greenwald, Chu, Beckwith, & Crisco, 2012). CDC and the National Operating Committee on Standards for Athletic Equipment have developed technology to monitor head impact exposure using athletic headgear to increase identification of head injury and permit early intervention.

Reebok CCM and mc10 have developed and distributed a skull cap with an embedded impact indicator (Edwards, 2012). It is designed to help determine if medical treatment or rest is needed before an individual is permitted to return to play after a potential head injury. It will initially be marketed to hockey players, since Reebok CCM is the company's hockey brand, but can fit underneath any helmet used by athletes in all sports at all levels, as it is explicitly designed for such universal usability.

The Impact Intelligence System (IIS) is the world's first system for end-to-end management of sports brain injury. It consists of an impact sensing mouth guard, a real-time wireless network, and a player assessment tool to monitor a player's head impact over an extended period of time.(BITETECH, 2012)

Recommendations

The literature supports that concussion education must be disseminated to athletes, coaches, trainers, athletic therapists, leagues, teachers, health care professionals and the media. Education should comply with the international consensus statements and convey consistent messages. Concussion tools are one avenue to promote concussion recognition and awareness. Based on research conducted by Daria Parsons, in collaboration with Dr. Charles Tator, with input from a Focus Group of experts, the final recommendations include the following:

General Recommendations

- One concussion tool should be available to standardize information for coaches, teachers, athletes and parents to ensure consistent messaging across target audiences.
- One concussion tool should be available across sports.
- SCAT2 is intended for use by physicians and is not suitable for use by coaches and teachers in schools. The components of the PocketSCAT2, however, should be included on the concussion tool to be used by teachers, coaches and athletic therapists.
- Medical professionals should be involved in decisions regarding return to play and return to school
- Return to play activities may vary by sport e.g. running in football or skating in hockey.
- The concussion tool should be translated into other languages.

Format of the Concussion Tool

- The suggested format of the concussion tool should be double sided 8 ½ x 11 inch clipboard format.
- Because schools require paper copies of forms for coaches, a hard copy of the concussion tool should be available for schools.
- The tool should be available by download for teachers, coaches, players and parents.
- The concussion tool information should be legible when printed in black and white (colour copies should not be required).
- QR codes should be included on the concussion tool so the content can be uploaded to smart phones.
- An app should be developed based on the recommended concussion tool for use by athletes, parents and coaches.

Content of the Concussion Tool

- Because the ThinkFirst concussion tool aligns with the International Consensus Conference on Concussion in Sport and was developed by a Canadian expert panel, the

ThinkFirst tool for coaches was the initial template for the concussion tool recommended for this project.

- The concussion tool must align with the content of the Consensus Statement on Concussion in Sport to increase credibility. A new Consensus Statement will be released in March 2013 and so the concussion tool should be updated at that time.
- The concussion tool should align with the content of the Ontario Safety Guidelines from OPHEA including the caveat on special needs.
- The concussion card should state that signs and symptoms may be different for students less than 10 years and also that young students may not be able to clearly communicate their symptoms.
- Signs and symptoms listed on the concussion tool should be applicable to all age groups to facilitate concussion recognition in children and youth in sports and in the playground.
- It is important to include return to activity information that includes return to school and return to play rather than exclusively focusing on return to play.
- The tool should recommend that a student suspected of having a concussion must be assessed by a medical professional.
- Memory questions should be age and sport-specific.
- The concussion tool should include a website where stakeholders can find more information e.g. sport specific information, prevention tips e.g. websites such as ThinkFirst, CDC and OPHEA.
- The concussion tool should include a date of production.

Specific content to be included as informed by the Focus Group

- Description of what is a concussion
- What to do if concussion occurs/Access ABCs
 - What to do when an athlete is unconscious/ Emergency Action Plan e.g. when to call 911 (using ACLS and First Aid training guidelines for ABC terminology)
 - Athletes do not have to lose consciousness to have a concussion.
- Signs & Symptoms
- What causes concussion?
- Memory testing
- Balance testing should be included on the concussion tool because it is recommended by the International Consensus Conference but should be labelled optional.
- Return to school and play
- When to see a doctor (in large print).
- URL link to more information

Content not required on the concussion tool (not enough space)

- How long will it take to get better
- Prevention tips

Knowledge Translation of the Concussion Tool

The most appropriate method and/or approach for the tools to promote practice uptake and use by coaches, teachers, nurses, trainers, and athletic therapists include the following:

- The Ministry of Education, Ministry of Health and Long Term Care and Ministry of Tourism, Culture and Sport, OPHEA and Parachute and other organizations can distribute the concussion tool and post it on their websites.
- Organizations can add their own logo to the concussion tool but the information provided should be maintained and ThinkFirst should be credited with the content.
- There should be collaboration with government to prioritize key audiences e.g. the Ministry of Education and Ministry of Culture, Tourism and Sport work with after school providers, recreational leaders in addition to coaches, and teachers.
- OPHEA should add the recommended concussion tool to the Safety Guidelines on their website.
- There are two central streams for educating coaches: 1) training programs and 2) sport governing bodies. The concussion tool should be distributed across all sport organizations.
- Physicians and nurses should be added to the list of audiences.
- The concussion tool should be given to parents for children less than 10 years of age who sustain a concussion.
- There should be a press release for the concussion tool.

Appendix A Concussion Tools used in North America

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
CDC						
1	<p>CDC To help ensure the health and safety of young athletes, CDC developed the <i>Heads Up: Concussion in Youth Sports</i> initiative to offer information about concussions to coaches, parents, and athletes involved in youth sports. The <i>Heads Up</i> initiative provides important information on preventing, recognizing, and responding to a concussion. http://www.cdc.gov/concussion/HeadsUp/youth.html (link to Toolkit) Size: 8 ½ x 11 Clipboard</p>	<p>Heads Up Concussion in Youth Sports Clipboard</p>	Yes	Coaches Youth Sport Administrators	U.S.	<p>Heads Up Concussion in Youth Sports Clipboard: http://www.cdc.gov/concussion/pdf/clipboard_Eng.pdf</p>
2	<p>CDC Size: wallet card</p>	<p>Heads Up Concussion In High School Sports Wallet Card</p>	Yes	Coaches	U.S.	http://www.cdc.gov/concussion/pdf/Wallet Card-a.pdf
3	<p>CDC Size: 8 ½ x 11 Fact Sheet</p>	<p>Heads Up Concussion in Youth Sports A Fact Sheet for Coaches</p>	Yes	Coaches	U.S.	http://www.cdc.gov/concussion/pdf/coaches_Engl.pdf
4	<p>CDC Size: 8 ½ x 11 Fact Sheet</p>	<p>Heads Up Concussion in Youth Sports A Fact Sheet for Athletes</p>	Yes	Athletes	U.S.	http://www.cdc.gov/concussion/pdf/athletes_Eng.pdf
5	<p>CDC Size 8 ½ x 11</p>	<p>Heads Up Concussion in Youth Sports</p>	Yes	Parents	U.S.	http://www.cdc.gov/concussion/pdf/parents_Eng.pdf

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	Fact Sheet	A Fact Sheet for Parents				
6	CDC Size: 8 ½ x 11	Heads Up Concussion in Youth Sports Parent/Athlete Concussion Information Sheet	Yes	Parents Athletes	U.S.	http://www.cdc.gov/concussion/headsup/pdf/Parent_Athlete_Info_Sheet-a.pdf
7	CDC Size: 8 ½ x 11 Check List	Heads Up to Schools Know your Concussion ABCs Concussion Signs and Symptoms Check List	Yes	School Professionals	U.S.	http://www.cdc.gov/concussion/pdf/TBI_schools_checklist_508-a.pdf
8	CDC Size: 8 ½ x 11 Fact Sheet	Heads up to Schools Know your Concussion ABCs A Fact Sheet for School Nurses	Yes	School Nurses	U.S.	http://www.cdc.gov/concussion/pdf/TBI_factsheet_NURSE-508-a.pdf
9	CDC Size: 8 ½ x 11 Fact Sheet	Heads Up to Schools Know your Concussion ABCs Concussion Fact Sheet for Teachers, Counselors and School Professionals	Yes	Teachers Counselors and School Professionals	U.S.	http://www.cdc.gov/concussion/pdf/TBI_factsheet_TEACHERS-508-a.pdf
10	CDC Clipboard sticker	Heads Up Concussion in High School Sports Clipboard sticker	Yes	Coaches	U.S.	http://www.cdc.gov/concussion/pdf/Clipboard_Sticker-a.pdf
11	CDC Palm Card	Concussion in Sports Palm Card	Yes	Medical personnel	U.S.	http://www.cdc.gov/concussion/headsup/pdf/Concussion_in_Sports_palm_card-a.pdf
12	CDC	Heads Up: Concussion	Yes	Coaches	U.S.	http://www.cdc.gov/concussion/pdf/clipb

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	Clipboard	in Youth Sports Clipboard for coaches				oard_Eng.pdf
13	CDC Sport specific Clipboard stickers Soccer Cheerleading Lacrosse Baseball Field Hockey Rugby Football Softball Volleyball Ice Hockey	Heads Up: Concussion in Specific Sports Collegiate Sports Clipboard stickers	Yes	Coaches	U.S.	http://www.cdc.gov/concussion/HeadsUp/sports_specific.html
ThinkFirst						
14	ThinkFirst ThinkFirst is a national charitable organization dedicated to the prevention of brain and spinal cord injury. The ThinkFirst Canada Concussion resources were developed based on the Zurich Guidelines outlined in the Consensus Statement on Concussion in Sport. 2012 Size: 8 ½ x 11	Concussion Guidelines for the Coach/Trainer	Yes	Coach Trainer	Canada	http://thinkfirst.ca/programs/documents/TF_Concussion_QAcoachtrainer_E_2012.pdf
15	ThinkFirst 2012 Size 8 ½ x 11	Concussion Guidelines for the Parents/Caregivers	Yes	Parent	Canada	http://thinkfirst.ca/programs/documents/TF_Concussion_QAparentscaregivers_E_2012.pdf
16	ThinkFirst 2012	Concussion Guidelines for the Athlete	Yes	Athlete	Canada	http://thinkfirst.ca/programs/documents/TF_Concussion_QAathlete_E_2012.pdf

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	Size 8 ½ x 11					
17	ThinkFirst 2012 Size: 8 ½ x 11	Concussion Guidelines for the Teacher	Yes	Teacher	Canada	http://thinkfirst.ca/programs/documents/TF_Concussion_QAteachers_E_2012.pdf
18	ThinkFirst Pocket card	Concussion Pocket Card (incl. Pocket SCAT2)	Yes	Coaches	Canada	http://www.thinkfirst.ca/programs/documents/Concussion_PocketGuide_2011.pdf
19	ThinkFirst Size 8 ½ x 11	Sport-Related Concussion: Guidelines for the Coach/Trainer Football Canada	Yes	Coaches Trainers	Canada	http://www.footballcanada.com/LinkClick.aspx?fileticket=rFEkDHoLvRU%3D&tabid=185&language=en-CA
20	ThinkFirst Football BC Governing body for amateur football in British Columbia 2012 Size: 8 ½ x 11	Sport Related Concussion: Guidelines for Athletes ThinkFirst-SportSmart Concussion Education and Awareness Program	Yes	Athletes	B.C.	http://www.playfootball.bc.ca/files/2012AthletesInfoTF.pdf
Montreal's Children Hospital (MCH)						
21	Montreal's Children Hospital (MCH) McGill University Health Centre The MCH Concussion KiT was developed through the work of the Neurotrauma and Concussion/Return to Sports Programs as an educational initiative to increase the awareness of parents, athletes, coaches and sporting associations with respect to preventing, recognizing and managing concussions in sports.	Athlete Concussion Card 2011	Yes	Athlete	Montreal	http://www.thechildren.com/trauma/_pdf/en/athlete-concussion-card.pdf

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	Concussion Kit developed in 2007. Size: 8 ½ x 11					
22	MCH Flyer/Brochure Size: 8 ½ x 11	Concussion Information Brochure/Flyer	Yes	Coaches Parents Public	Montreal	http://www.thechildren.com/trauma/_pdf/en/trauma-concussion-flyer.pdf
23	MCH Pocket Card	Concussion Pocket Card	Yes	Coaches m	Montreal	http://www.thechildren.com/trauma/_pdf/en/concussion-pocket-card.pdf
Peterborough Youth Sports Concussion Program						
24	Peterborough Youth Sports Concussion Program Administered by Primary Health Services of Peterborough which includes five family health teams. The program was created to develop and implement best practices in the assessment, treatment and prevention of concussion in youth from the ages of 10 through high school graduation Information Sheet Size: 8 ½ x 11	Athlete Information Sheet	Yes	Athletes	Peterborough	http://youthsportsconcussionprogram.com/wp-content/uploads/2012/04/YSCP-Athlete-Information-Sheet-April-2012.pdf
25	Peterborough Information Sheet Size: 8 ½ x 11	Parent Information Sheet	Yes	Parents	Peterborough	http://youthsportsconcussionprogram.com/wp-content/uploads/2012/04/YSCP-Parent-Information-Sheet-April-2012.pdf
26	Peterborough Information Package Size: 8 ½ x 11	Coaches Information Package	Yes	Coaches	Peterborough	http://youthsportsconcussionprogram.com/wp-content/uploads/2012/04/YSCP-Coaches-Information-Package-April-2012.pdf
27	Peterborough Clipboard	Clipboard Concussion Tool for Coaches	Yes	Coaches	Peterborough	http://youthsportsconcussionprogram.com/wp-content/uploads/2012/04/YSCP-

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	Size: 8 ½ x 11					Clipboard-Concussion-Tool-April-2012.pdf
Consensus Statement on Concussion in Sport						
28	Consensus Statement on Concussion in Sport 3rd International Conference on Concussion in Sport Held in Zurich, November 2008 (Versions: 2001, 2004, 2008, 2012) Used by FIFA	Pocket SCAT2	Yes	Coaches Trainers	International	http://www.fifa.com/mm/document/footballdevelopment/medical/01/42/10/50/pocketscat2card_final_printready_e.pdf (Note: add link or article related to Zurich)
Other						
29	Alberta Schools' Athletic Association The Alberta Schools' Athletic Association is a voluntary, non profit organization established to coordinate a program of worthwhile athletic activities for the young people of Alberta in an educational setting. The membership, currently 371 high schools, ultimately determines the policy of the Association through representation on the provincial Board of Governors.	Concussion card	Yes		Alberta (sent to all schools)	http://www.footballcanada.com/Players/HealthandSafety/tabid/185/language/en-CA/Default.aspx#concussion_awareness
30	American Academy of Neurology The American Academy of Neurology (AAN) is an international professional association of more than 25,000 neurologists and neuroscience professionals. Size: 8 ½ x 11	Recognizing and Managing a Sports Concussion	Yes	High School Coaches and Players	U.S.	http://www.aan.com/globals/axon/assets/8313.pdf
31	Brain Injury Association of Nova Scotia	Concussion	Yes		Atlantic	http://www.ccrsb.ednet.ns.ca/sites/default

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	The Brain Injury Association of Nova Scotia's Mission Statement is: <i>"To enhance the quality of life for survivors and their families. BIANs focuses its work on advocacy, education, prevention, support and partnering for the creation of inclusive and accessible policies, programs and services."</i>	Awareness			Canada	t/files/BIANS%20Concussion%20Card.pdf
32	Canadian Ski Patrol Ontario Division The cards and posters contain the same information, organized into two sections: Concussion Information and Concussion Management and provides the BrainTrust Canada website.	Concussion Information and Management	Yes	Coaches	Ontario	http://www.skipatrol.on.ca/FIRST_AID_concussion_information.php from website
33	CFL	Concussion card	Yes		Canada	http://www.cfl.ca/uploads/assets/CFL/PDF_Docs/Concussion_Poster_ENG_2011.pdf
34	Fort McMurray Zone Canadian Ski Patrol The CSPS, in partnership with BrainTrust Canada, and the financial assistance of the Calgary zone, have made available thousands of concussion cards to inform patients and their families with concussion information and management.	So You Hit Your Head What to Watch For	Yes	Coaches	Canada	http://www.fortmcmurrayskipatrol.com/concussion-card.html from website
35	Hockey Canada	ThinkFirst SportSmart Concussion Education and Awareness Program Concussion Card	Yes		Canada	(link to Hockey Canada website and then Concussion Card downloadable) http://www.hockeycanada.ca/index.php/ci_id/7699/la_id/1.htm

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
36	Massachusetts Medical Association Developed in cooperation with the Massachusetts Interscholastic Athletic Association and Massachusetts Medical Society Alliance	Concussion A Coaches Guide to Sideline Evaluation	Yes	Coaches	U.S. (Massachusetts)	http://www.massmed.org/AM/Template.cfm?Section=Home6&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=35418
37	Mt. Diablo Memory Center Sport Walnut Creek Concussion Program Four specialty services: older adult (70+) memory assessments; general neuropsychological services; Sport Concussion Program; Cognitive Rehabilitation Program.	Sideline Concussion Evaluation	Yes			http://www.sportconcussion.com/storage/side%20line%20card%207-10.pdf
38	National Collegiate Athletic Association CDC and the National Collegiate Athletic Association (NCAA) have teamed up to create concussion educational resources for coaches, student-athletes, team medical staff, and college sports fans. Each of these resources includes important information on concussion signs and symptoms, how to respond, and when it is safe to get back in the game. Fact Sheet Size: 8 ½ x 11	Concussion A Fact Sheet for Coaches (NCAA Coaches Sheet)	Yes	Coaches		http://www.sportconcussionlibrary.com/sites/default/files/ncaa_confactsheetcoaches.pdf
39	NCAA/CDC Fact Sheet Size: 8 ½ x 11	Concussion A Fact Sheet for Student Athletes	Yes	Athletes		http://www.sportconcussionlibrary.com/sites/default/files/ncaa_athletes_fact_sheet_confactsheetsa.pdf
40	Ontario Athletic Therapist Association	Concussion Reference	Yes	Athletic	Ontario	http://www.ontarioathletictherapists.org/

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	From Concussions Ontario Size: 8 ½ x 11	Card		Therapists		Default.aspx?pageId=1336033 then downloadable
41	Ontario Physical and Health Education Association (OPHEA) OPHEA supports schools and communities through quality program supports, partnerships and advocacy to enable children and youth to lead healthy active lives.	Physical Activity and Sport Related Concussion Physical Education Safety Guidelines	No	Coaches Teachers	Ontario	http://safety.ophea.net/sites/safety.ophea.net/files/docs/appendices/S_IS/EN_S_IS_Appendix%20C_12.pdf
42	SafeKids USA Safe Kids USA is a nationwide network of organizations working to prevent unintentional childhood injury, the leading cause of death and disability for children ages 1 to 14. We educate families, provide safety devices to families in need and advocate for better laws to help keep children safe, healthy and out of the emergency room. Coalition Network More than 600 coalitions and chapters in 49 states bring together health and safety experts, educators, corporations, foundations, governments and volunteers to educate and protect families. (from CDC)	Concussion Fact Sheet for Youth and High School Coaches (CDC Heads Up Concussion in Youth Sports)	Yes	Youth High School Coaches	U.S.	http://www.safekids.org/assets/docs/safety-basics/safety-tips-by-risk-area/Zip-PDFs/Concussion-Guide-for-Coaches-2012.pdf#_utma=1.2037115640.1348932304.1348932304.1348932304.1&_utmb=1.3.10.1348932304&_utmc=1&_utmx=-&_utmz=1.1348932304.1.1.utmcsr=google utmccn=(organic) utmcmd=organic utmctr=safekids%20USA&_utmvl=-&_utmk=5130035
43	Sanford Orthopedics Sports Medicine Sanford Orthopedics & Sports Medicine provides concussion management in eight	Sanford Sports Concussion Pocket Card for Coaches	Yes	Coaches		http://www.sdhsaa.com/LinkClick.aspx?fileticket=EGXbca993XU%3D&tabid=634

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	states for individuals who participate in activities where there is a risk for concussion.					
44	Sport Medicine and Science Council of Manitoba The Sport Medicine Council of Manitoba (SMCM) is a cooperative forum of medical, paramedical and sport science provider groups organized to meet the needs of Manitoba's sport, recreation and fitness communities. The SMCM is a collaboration of 14 professional groups who meet on a regular basis and consist of a board of directors and an executive committee.	Concussion Management	Yes	Coaches	Manitoba	http://www.sportmed.mb.ca/uploads/pdfs/concussion%20cards%2009%20SINGLE.pdf
45	United States Eventing Association The USEA is a non-profit 501 C (3), educational organization committed to providing eventing enthusiasts with a competitive level suited to their individual skills. By assisting and educating competitors, event organizers and officials; maintaining responsible safety standards; and registering qualified competitions and clinics, the USEA offers a strong and continuous training opportunity for an ever-expanding field of world-class competitors.	Management of Concussion in Eventing Grades of Concussion	Yes		U.S.	http://c.ymcdn.com/sites/www.ponyclub.org/resource/resmgr/general_administrati on/managementofconcussion.pdf
46	University of Pittsburgh Medical Centre Sports Concussion Program	Concussion Signs and Symptoms Evaluation	Yes		Pittsburgh	http://www.upmc.com/Services/sports-medicine/Documents/concussion-card.pdf

Appendix	Organization Date Size	Name of Concussion Card	Downloadable	Target Audience	Jurisdiction	Website
	The UPMC Sports Medicine Concussion Program offers a comprehensive approach to managing every aspect of concussion.					
47	Wyoming High School Activities Association Sports Medicine Advisory Committee Provided by Wyoming Medical Centre Provide services to all member schools while promoting, coordinating and controlling interscholastic activities in Wyoming	Pocket Card Wyoming Concussion Signs and Symptoms	Yes	Coaches	Wyoming	http://www.whsaa.org/whsaainformation/ConcussionSignsPocketCard2012.pdf

Appendix B Contents of Concussion Tools in Sports

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
CDC																
1	CDC	Heads Up Concussion in Youth Sports Clipboard			√				√							Hosp #s url
2	CDC	Heads Up Concussion In High School Sports Wallet Card			√		√		√							Phone #s url 1
3	CDC	Heads Up Concussion in Youth Sports A Fact Sheet for Coaches	√		√	√			√						√	url ref
4	CDC	Heads Up Concussion in Youth Sports A Fact Sheet for Athletes	√		√				√						√	url
5	CDC	Heads Up Concussion in Youth Sports A Fact Sheet for Parents	√		√				√					√	√	url
6	CDC	Heads Up Concussion in Youth sports Parent/Athlete Concussion Information Sheet	√		√				√						√	-Did You Know -Danger Signs -Why report

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
																-student/ Parent signatures Date
7	CDC	Heads Up for Schools Know Your Concussion ABCs Concussion Signs and Symptoms Check List			√ Over time											Name Grade Date/time of injury Where & how injury occurred Danger signs Comments
8	CDC	Heads up to Schools Know your Concussion ABCs A Fact Sheet for School Nurses	√		√				√				√		√	The Facts How can concussion happen in schools Danger signs url
9	CDC	Heads Up to Schools: Know Your Concussion ABCs A Fact Sheet for Teachers, Counselors and School Professionals	√		√				√				√			The Facts Danger signs How to recognize concussion What to look for after a concussion
10	CDC	Heads Up Concussion in			√				√							Phone numbers

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
		High School Sports Clipboard Sticker														
11	CDC	Concussion in Sports Palm Card			√		√		√							Signs of deterioration
12	CDC	Heads Up: Concussion in Youth Sports Clipboard for Coaches			√				√							Phone numbers url
13	CDC	Heads Up: Concussion in Specific Sports Collegiate Sports Clipboard stickers			√				√							Phone numbers
ThinkFirst																
14	ThinkFirst	Concussion Guidelines for the Coach/Trainer	√		√	√			√		√	√				url
15	ThinkFirst	Concussion Guidelines for the Parents/Caregivers	√		√	√			√	√	√	√	√	√		url
16	ThinkFirst	Concussion Guidelines for the Athlete	√		√	√			√	√	√	√		√		url
17	ThinkFirst	Concussion Guidelines for the Teacher	√		√	√			√	√	√	√				url
18	ThinkFirst 2011	Concussion Pocket Card			√		√	√	√							url

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
		(includes Pocket SCAT2)														
19	ThinkFirst	Sport-Related Concussion: Guidelines for the Coach/Trainer Football Canada	√		√	√			√	√	√	√				url
20	BC Football ThinkFirst	Sport Related Concussion: Guidelines for Athletes (ThinkFirst-SportSmart Concussion Education and Awareness Program	√		√	√										
Montreal's Children Hospital (MCH)																
21	Montreal's Children Hospital (MCH) McGill University Health Centre (2011)	Athlete Concussion Card	√		√				√						√	Facts Avail in French
22	MCH	Concussion Information Brochure/Flyer	√		√	√			√	√		√			√	Facts Considerations for teens
23	MCH	Concussion Pocket Card	√		√		√	√	√		√	√				When to call 911
Peterborough Youth Sports Concussion Program																

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
24	Peterborough Youth Sports Concussion Program	Athlete Information Sheet	√		√				√			√		√		
25	Peterborough	Parent Information Sheet	√		√				√					√		
26	Peterborough	Coaches Information Package	√		√	√			√					√	√	Did you know Check with schools re: policies Communicating about concussions
27	Peterborough	Clipboard Concussion Tool for Coaches			√		√		√							Phone numbers
Consensus Statement on Concussion in Sport																
28	Consensus Statement on Concussion in Sport	Pocket SCAT2			√		√	√	√							
Other																
29	Alberta Schools' Athletic Association	Concussion Card Be Smart!	√		√				√			√				
30	American Academy of	Recognizing and Managing a	√		√	√			√			√				url

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
	Neurology	Sports Concussion Reference Card														
31	Brain Injury Association of Nova Scotia		√		√				√			√		√	√	SIS url
32	Canadian Ski Patrol Ontario Division	Concussion Information and Management	√		√				√					√		
33	CFL	Concussion Awareness & Management	√		√				√			√				ThinkFirst url
34	Fort McMurray Canadian Ski Patrol	So You Hit Your Head What to Watch For	√		√									√		url
35	Hockey Canada	ThinkFirst Concussion	√		√	√			√			√		√	√	Response to LOC Key steps
36	Massachusetts Medical Association	Concussion Evaluation Card A Coaches Guide to Sideline Evaluation	√		√							√			√	
37	Mt. Diablo Memory Center Sport Concussion Program	Sideline Concussion Evaluation			√		√							√		url
38	NCAA	Concussion A Fact Sheet for Coaches (NCAA Coaches Sheet)	√		√	√			√					√	√	The Facts url

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
39	NCAA	Concussion A Fact Sheet for Student Athletes	√		√				√						√	url
40	Ontario Athletic Therapist Association	Concussion Reference Card			√				√			√				
41	OPHEA	Physical Activity and Sport Related Concussion Physical Education Safety Guidelines	√	√	√				√		√	√				Second Impact Syndrome Parent/Guardian Responsibilities School Responsibilities Communicate with Parents Resources
42	SafeKids USA	Concussion Fact Sheet for Youth and High School Coaches (CDC Heads Up Concussion in Youth Sports)	√		√	√			√						√	The Facts
43	Sanford Orthopedics Sports Medicine	Sanford Sports Concussion Pocket Card for Coaches			√				√					√		
44	Sport Medicine	Concussion	√		√		√	√	√			√				url

Appendix	Organization	Name of Concussion Card	What is a concussion?	Assess ABCs /Initiate ER Action Plan	Symptoms and Signs	What Causes Concussion?	Memory Function/Mental Status	Balance testing	What to do if an athlete gets a concussion?	How is concussion treated?	How long will it take to get better?	Return to sport/play? 6 steps	Return to school/learn	When to see doctor?	Prevention tips	Other
	and Science Council of Manitoba	Management														
45	United States Eventing Association	Management of Concussion in Eventing Grades of Concussion (1-3)			√		√		√					√		Grades of concussion
46	University of Pittsburgh Medical Centre Sports Concussion Program	Concussion Signs and Symptoms Evaluation			√		√							√		Phone #
47	Wyoming High School Activities Association Sports Medicine Advisory Committee Provided by Wyoming Medical Centre	Pocket Card Concussion Signs and Symptoms	√		√				√			√		√		Hotline #
	% of Total		68	2	100	28	21	9	87	11	15	38	6	34	30	

1 signs of deteriorating neurological function

Appendix C Concussion Tools used outside of North America

Appendix	Organization	Name of concussion card	Downloadable	Target Audience	Jurisdiction	Website
	International Rugby Board	Pocket Scat 2	Yes	Coaches, team managers, administrators, teachers, parents, Players, Match Officials and Healthcare Professionals	International	http://www.irbplayerwelfare.com/pdfs/Pocket_SCAT_2_EN.pdf
	International Rugby Board	International Rugby Board <i>Putting players first</i>	Yes	Physicians and other health professionals, team management, teachers, parents and Players	Australia	http://www.irbplayerwelfare.com/pdfs/IRB_Concussion_Guidelines_EN.pdf
Australia						
	Australian Rugby union	Concussion Management Factsheet	Yes	Medical practitioners and/or healthcare professionals, clubs/schools, coaches/ teachers, team management/ support	Australia	http://www.rugby.com.au/LinkClick.aspx?fileticket=r2FM8EIt3E0%3d&tabid=1951

Appendix	Organization	Name of concussion card	Downloadable	Target Audience	Jurisdiction	Website
				staff, match officials & players/parents.		
	Axon Sport	1. CDC - Concussion Fact Sheet-Spanish	Yes	Athletes	International	http://www.axonsports.com/media/resources/files/CDC-Document-Concussion-Fact-Sheet-SP.pdf
	Australian Rugby League	Head Injury Notification	Yes	Athletes	Australia	http://crlnsw.com.au/fileadmin/user_upload/National_Sports_Trainers_Scheme/Inside.pdf http://crlnsw.com.au/fileadmin/user_upload/National_Sports_Trainers_Scheme/Flyer_Outside.pdf
New Zealand						
	Brain Injury New Zealand	Sideline Concussion Checklist	No	Athletes		http://www.coachingtoolbox.co.nz/rugbysmart/concussion/ Need to contact Brain Injury New Zealand for a copy
UK						
	Rugby Football Union	Wallet-sized pitch-side concussion assistant card	No	Coaches	UK	http://www.rfu.com/ManagingRugby/FirstAid/Injuries/Concussion Need to contact RFU for a copy

Appendix D Concussion Tools for Physicians

Organization	Title of Concussion Card	Websites
Think First	Concussion in Sport Concussion Guidelines for Physicians	http://www.thinkfirst.ca/downloads/concussion/concussion-card-physicians.pdf http://www.thinkfirst.ca/programs/documents/TF_Concussion_QAphysicians_E_2012.pdf
SCAT2	Sport Concussion Assessment Tool 2	http://www.cces.ca/files/pdfs/SCAT2[1].pdf
Axon Sports Youth Sports Concussion Program Peterborough	Ahead of the Game Concussion Management Toolkit Parent Information	http://www.axonsports.ca/media/resources/files/AxonSports-Peterborough-Flyer-Parent-CA.pdf
Department of Veterans Affairs	Management of Concussion MTBI	http://www.healthquality.va.gov/management_of_concussion_mtbi.asp http://www.healthquality.va.gov/mtbi/Pocket_Card_2-11-11.pdf
Defense and Veterans Brain Injury Center	Military Acute Concussion Evaluation (MACE) Pocket Card	http://www.dvbic.org/material/military-acute-concussion-evaluation-mace-pocket-cards
Defense and Veterans Brain Injury Center The primary operational TBI component of the Defense Centers for Excellence for Psychological Health and Traumatic Brain Injury (16 sites)		http://www.dvbic.org/sites/default/files/DVBIC_S%26S_English_FINAL.pdf
CDC Acute Concussion Evaluation Physician/Clinician Office Version University of Pittsburgh Medical Center	Acute Concussion Evaluation (ACE)	http://www.cdc.gov/concussion/headsup/pdf/ACE-a.pdf
IMPACT ImPACT provides computerized neurocognitive assessment tools and services that are used by	The Best Approach to Concussion Management Impact Test Signs and Symptoms Evaluation	www.impacttest.com

<p>medical doctors, psychologists, athletic trainers, and other licensed healthcare professionals to assist them in determining an athlete's ability to return to play after suffering a concussion</p>		
<p>Ontario Neurotrauma Foundation</p>	<p>Guidelines for Mild Traumatic Brain Injuries and Persistent Symptoms</p>	<p>http://www.onf.org/documents/Guidelines%20for%20Mild%20Traumatic%20Brain%20Injury%20and%20Persistent%20Symptoms.pdf</p>
<p>NFL</p>	<p>NFL Sideline Concussion Assessment Tool</p>	<p>http://nflps.org/uploads/NFL_SIDELINE_TOOL-POST_INJURY_Final.pdf</p>

Appendix E Concussion Apps

Apps					
	Organization	Name of Concussion Card	Downloadable	Target Audience	Website
1	Concussion Health iTunes Enables hospitals, outpatient clinics and sports organization to expand their practice to successfully provide comprehensive concussion management services	Play It Safe Concussion Assessment Free	Yes	Healthcare providers coaches, parents or other individuals involved in the Athlete's care	http://itunes.apple.com/us/app/play-it-safe-concussion-assessment/id441786934?mt=8
2	Developed by the Children's National Medical Center in Washington, DC the app is based on information from the CDC's "Heads Up: Concussion in Youth Sports" program. Guiding the user through a list of possible symptoms, the app helps coaches and parents make informed decisions about next steps following a suspected concussion.	Concussion Recognition and Response \$3.00 Available for hockey, lacrosse and football	Yes	Coaches and parents	http://www.sportsconcussions.org/feature-stories-PAR-concussion-app.html
3	Inovapp Sport Concussion Assessment Tool 2 This tool has been developed by a group of international experts	SCAT 2 \$3.99 This tool represents a standardized method of evaluating injured athletes for	Yes	Developed primarily for medical and health professional use.	http://itunes.apple.com/ca/app/scat2-sport-concussion-assessment/id452857229?mt=8 http://www.scat2.org/

Apps					
	Organization	Name of Concussion Card	Downloadable	Target Audience	Website
	at the 3rd International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2008.	concussion and can be used in athletes			
4	Sports Safety Labs LLC Utilizes scientifically validated objective tests to evaluate the physiological and neurocognitive status of pre-concussion (baseline) and post-concussion (injured) athletes.	Concussion Free OR for a fee of \$4.99 an unlimited number of athletes can take pre- and post-injury tests which include a balance assessment, coordination, memory, and a concentration evaluation, all of which are tallied into a final score.	Yes	The app is for athletic trainers, coaches, and health personnel	http://www.stopconcussions.com/2011/10/download-the-concussion-app-today/
5	ImPACT	ImCAT™ (ImPACT Concussion Awareness Tool) Free Note that the ImPACT test cannot be taken on the ImCAT App.	Yes	Developed to educate athletes, parents, teachers and coaches about the common signs and symptoms of concussion	http://impacttest.com/imcat

Appendix F Focus Group Participants

Concussion Recognition and Awareness Working Group

Focus Group on

Sports: Review of concussion recognition and management tools

November 22, 2012

Participant List

Participant	Affiliation
Alun Ackery	Emergency Physician
Patrick Brown	Working Group Co-Chair
Peter Evans	Ministry of Culture, Tourism & Sport
George Kourtis	Toronto District School Board
Drew Laskoski	Working Group
Chris Markham	OPHEA
Michelle Mohan	Research Associate
Daria Parsons	Project Manager and Facilitator
Nate Peters	Ontario Soccer Association
Christine Provvidenza	Parachute
Nancy Schad	OPHEA
Ken Smith	GTHL 1 st Vice President
Bev Solomon	RNAO
Steve Soroko	Ministry of Education
Gillian Steeve	Ministry of Culture, Tourism & Sport
Dr. Charles Tator	Working Group Co-Chair

Regrets:

Chris Foerster, Working Group

Liz Kazimowicz, Working Group

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