

**CONCUSSION MANAGEMENT AND CARE STRATEGY
A PROPOSAL FOR NOVA SCOTIA
2021 White Paper**

**Prepared by the Brain Injury Association of Nova Scotia and
Concussion Nova Scotia**

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1. EXECUTIVE SUMMARY

In the last 10 years the standards of care for the diagnosis and management of concussion/mild Traumatic Brain Injury (mTBI) have evolved rapidly. Many consensus statements and clinical guidelines have been published. It has been challenging for health care professionals to keep up to date with these ever-changing guidelines. This has contributed to gaps in care for the approximately 11, 300 Nova Scotians who sustain a concussion/mTBI each year.

Although most individuals who sustain a concussion/mTBI will recover quickly, 15-30% (>1500/year in NS) will experience persistent symptoms that can result in poor outcomes including loss of time from school or work. Persistent symptoms and functional impairment can come at considerable economic cost, impacting the health care system, educational attainment, career trajectory, as well as productivity and lifestyle.

Currently, there is a therapeutic management problem in Nova Scotia. An early referral pathway for concussion would assist in preventing unnecessary complications such as poor mental health of patients waiting for specialist care and be more cost effective than the status quo. It is likely that persistent symptoms and poor outcomes could be significantly diminished if Nova Scotians were receiving the care they need by the right practitioners, at the right time, in a coordinated and efficient manner.

This document identifies the gaps and challenges in concussion care in Nova Scotia and proposes solutions to help clinicians effectively diagnose and manage concussions using a cost-effective, evidence-based approach. Epidemiological data, Canadian developments, and a synopsis of information and progress in concussion diagnosis, management and care are also provided in support of this proposal. The next steps include the importance of concussion awareness, education, prevention and research as well as improving access to care for Nova Scotians.

2. RATIONALE

Approximately 11,300 Nova Scotians will sustain a concussion each year. Concussion is a serious injury with significant effects on personal well-being, ability to go to school, and earn a living. Several groups have been working hard to improve the diagnosis and treatment of concussion in Nova Scotia and across the country. However, there are significant gaps in care that we will outline, along with suggestions for how to close those gaps and provide much better care for all Nova Scotians.

The aim of this document is to;

- 1) raise concussion awareness
- 2) highlight the gaps in current concussion care in Nova Scotia
- 3) propose a cost-effective plan to address the significant clinical shortage of medical concussion care providers in Nova Scotia
- 4) review Canadian developments in concussion management and care
- 5) improve clinical care and outcomes for the approximately 11,300 Nova Scotians who sustain a concussion each year.

3. GAPS IN CONCUSSION CARE

In Nova Scotia, there are several factors contributing to what could become a concussion crisis in our province, including:

1. There is no provincial strategy for concussion care in Nova Scotia.
2. There is insufficient surveillance and tracking of concussion incidence rates, recovery, and the economic costs of concussion in Nova Scotia. Identifying where, when, and who is sustaining concussions, can direct improvements for intervention and provision of services that will ultimately reduce the number of concussions as well as costs associated with recovery.
3. There is insufficient knowledge about concussion in the general population¹
 - 1 in 2 Canadians have **little or no knowledge** about concussion
 - 1 in 4 **do not know how concussion is treated**
 - Only 15% can correctly **identify the best ways** to treat concussion
 - Only 4 in 10 are **aware** of available concussion **tools or resources**

Recognizing the symptoms of concussion is essential for making appropriate decisions regarding diagnosis, treatment, and prevention of concussion. An accurate reporting of the history of concussion symptoms by the patient to a doctor or another person, such as a coach, will help guide recovery and return to school, return to play, and return to work decisions. Lack of concussion knowledge and poor recognition of concussion symptoms among the general population may hinder proper treatment and management.

4. Currently, we do not have the capacity in Nova Scotia for every individual with a suspected concussion to access a qualified physician or nurse practitioner for diagnosis, treatment, and management in a timely (ideally within a week after injury), appropriate manner. This is due to:
 - a. a shortage of family doctors and nurse practitioners
 - b. difficulty maintaining up-to-date knowledge regarding the detection and treatment of concussions due to a continually evolving evidence-base
 - c. limited medical practitioners with the specialized training, knowledge and experience in concussion to fully manage a patient with prolonged symptoms
 - d. poor compensation structures which do not allow physicians to allocate the time necessary to conduct appropriate assessments, manage and advise on return to learn, work and sport protocols. Existing fee-for-service remuneration models for physicians do not adequately account for the complex nature of concussion assessment and management.²
5. For those who are able to access timely care after the injury, this care is often focused on the diagnosis, and not the management of concussion. Many patients visit walk-in-clinics and emergency departments after their injury because they do not have a family physician or cannot access their family physician with a week. Some physicians in these settings may not have the education or training to conduct a proper assessment and formulate a treatment plan for concussion. Those who have the awareness often lack the time required to do a comprehensive assessment for concussion/mTBI. Additionally, an ED or walk-in clinic is not able to provide the serial assessments, monitoring, and follow-up that is often required in the management of concussion/mTBI.
6. There is a shortage of physicians in NS with specialized training in concussion. In situations where concussion recovery is not progressing as expected, the patient should be referred to a physician experienced in diagnosis and concussion management. Of the > 2300 practicing doctors in the province, approximately 20 physicians have specialized training in concussion and concussion management in Nova Scotia. Many of these practitioners are unable to accept referrals for concussion due to their volume of other work or

have at least a one year wait time. Many physicians who are accepting referrals provide care for only sport related concussions, and several are unable to oversee concussion management following diagnosis. Non-sports related concussion management is often time intensive and current provincial billing codes do not compensate for the time necessary for these patients.

7. There are several allied health care professionals and clinics who are providing concussion services to individuals in Nova Scotia. However, most of these health care professionals and concussion clinics are not connected with a physician/nurse practitioner who could assist with collaborative care. There is often limited oversight of the type of concussion care being provided to patients by allied health care professionals. Concussion care can fall short for complex patients, particularly those who are demonstrating limited improvement. Many patients with persisting concussion symptoms would benefit from case consultation with multiple providers, including a physician or nurse practitioner to ensure the optimal use of resources and to identify next steps.

Although there are allied health professionals (e.g., Occupational Therapists, Physiotherapists, Chiropractors, Osteopaths, Neuro-optometrists etc.) who are treating concussion without physician oversight, patients are often in need of care from physicians specializing in concussion when treatment becomes complex. This burden of care rests with only a few concussion care physicians with extreme caseloads to manage a large patient population with concussions. Access to this limited medical concussion care often occurs after significant time and money have been spent on privately funded services in a failed treatment process. Early access to primary care physicians or nurse practitioners with concussion expertise through an early referral pathway would be cost effective and prevent unnecessary complications such as poor mental health of concussion patients waiting for specialist care. As well some patients with concussion never receive medical care.

8. Nova Scotia has no public interdisciplinary, non-sports related concussion clinics with standardized, evidence-based management plans and access to physicians/nurse practitioners with specific training and expertise in concussion assessment and management. Patients often seek treatment at clinics which are designed for rehabilitation for many other conditions and can incur large expenses, as this care is often not covered by insurance or the patients simply do not have insurance.
9. Not all NS sports organizations have developed concussion policies or ways to disseminate information to their membership.

10. Schools in NS do not have concussion policies and protocols. Meetings have been previously held with Nova Scotia School Athletic Federation, as well as the NS Department of Education and Early Childhood Development. While there was interest in adapting existing concussion protocols for NS schools, progress stalled due to other priorities within the school system.
11. Workplaces in NS need safety laws and standards to reduce the incidence of concussion and persistent post-concussion symptoms in the work environment. Policies and protocols should be in place to ensure prompt detection and management of concussion, as well as reintegration back into work activities once medical clearance has been obtained. Concussion NS representatives have met many times with WCB, but a protocol with evidence-based concussion care has yet to be established.

12. Nova Scotia is currently not prepared for any concussion legislation similar to Rowan's Law³.

In summary, there is a therapeutic management problem in Nova Scotia. Many concussion patients in NS are not receiving the care they need by the right practitioners, at the right time, in a coordinated and efficient manner. With a medical care pathway in place for concussion patients, in partnership with allied health, true collaborative care can occur, and we know this will improve outcomes.

4. PROPOSED SOLUTION/MODEL FOR CONCUSSION CARE IN NOVA SCOTIA

In order to diagnose and manage the approximately 11, 300 concussions per year in Nova Scotia, using the current evidence and expert consensus guidelines, we must:

1. Collaborate with health, sport, education, and labour sectors within Nova Scotia through a provincial strategy for concussion. Government and professional regulatory bodies should implement public health strategies to increase awareness on prevention, diagnosis, and management of concussion. Nova Scotia should be committed to working with partners to improve pathways of care, so that appropriate care is delivered in a timely manner for people with suspected concussion and/or living with persistent symptoms of concussion.
2. Establish a provincial concussion surveillance program to properly track concussion incidence rates and recovery. This will help inform prevention by identifying root causes and risk factors for concussion and the associated economic costs of concussion.
3. Increase concussion awareness in Nova Scotia through greater dissemination of harmonized concussion tools to the general public through stakeholders across health, sport, education and labour sectors.

4. Increase concussion education, training and tools available to family doctors, nurse practitioners, walk-in clinics, and ED's in NS according to most current clinical practice recommendations. This includes, but is not limited to:
 - Educational tools - MOOC⁴ and CATT⁵ (Module for Health Practitioner)
 - Credentialing workshops
 - Academic detailing for physicians
 - Improving concussion education in medical school, medical residency, nursing school, and nurse practitioner education
 - Supporting ongoing and new concussion research
 - Interdisciplinary workshops with allied healthcare professionals
 - Annual NS Concussion Conference
 - Assessment and evaluation tools, such as CRT, SCAT, Child SCAT, Acute Concussion Evaluation Tool etc.
 - Concussion Harmonization Project

Funding is needed for a protected FTE concussion expert to craft and deliver the ongoing education and capacity building.

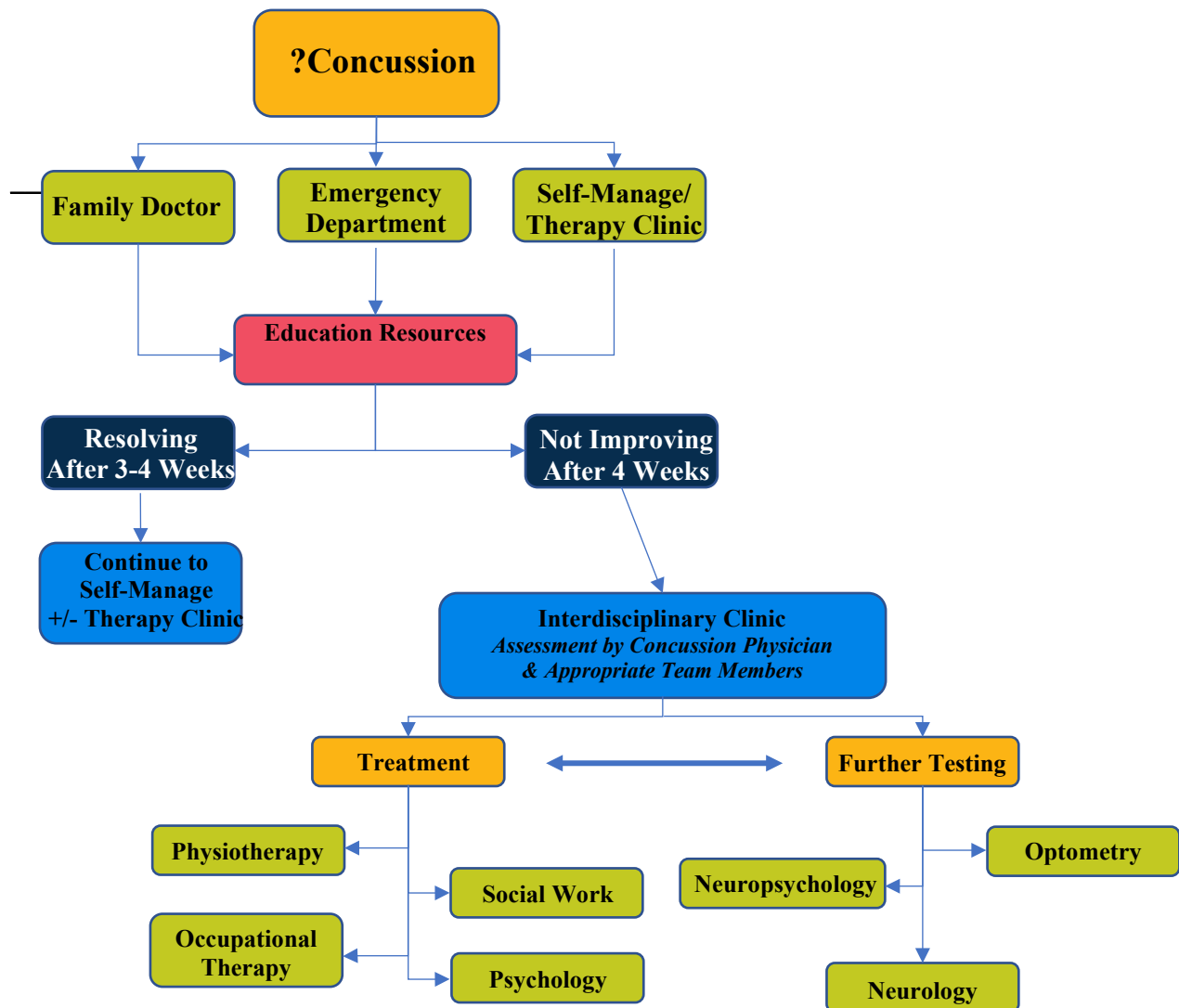
5. Provide emergency departments and walk-in-clinics with a pathway for referral to clinics and providers who can provide timely and specialized concussion care, follow up, and management.
6. Provide a special fee code for physicians to compensate for the time required to perform initial comprehensive concussion assessments and comprehensive concussion management follow-up. Special fee codes should be made available to family doctors and other specialists with specific training and expertise in concussion including, but not limited to, neurologists, physical medicine and rehabilitation specialists, and sports medicine specialists.
7. Allied health professionals should pursue continuing professional development of best practice evidence to maintain competencies related to concussion and head injuries. Appropriate scopes of practice should be defined for health professionals in the field of concussion.
8. Allied health professionals should be connected with and work collaboratively with qualified physicians to implement concussion management protocols in their own practices.

9. Create public regional interdisciplinary/multidisciplinary concussion clinics that can provide care to patients not improving after four weeks of standard treatment. Sessional fees should be provided for these clinics as complex, chronic care cannot be sustainably provided on the current MSI fee for service payment schedule. The concussion clinics should be supported by a FTE physician, and the interdisciplinary team should be comprised of publicly funded allied health brain injury practitioners including, but not limited to, OT, PT, Social Work, and Psychology professionals for ongoing treatment. These clinics should be leaders in evidence-based concussion and aid all practitioners in the province in staying up to date with evidence-based practice and supporting practice change. We would expect that the clinics would also regularly meet so that there is consistency in care, but also in meeting all of the objectives of these clinics.
10. The IWK should have its own interdisciplinary concussion clinic, as above, that can provide in person and virtual care for children across Nova Scotia, as well as act as a resource for family physicians, nurse practitioners and emergency departments.
11. NS Department of Communities, Culture and Heritage should continue work on a concussion project to ensure sport organizations have a concussion policy and a means of disseminating information to their membership, creating an education plan for relevant stakeholders, and creating a resource information page for sport stakeholders.
12. Ensure that the Department of Education and Early Childhood Development has concussion guidelines in place, including Return to Learn and Return to Play protocols, based on Canadian Guidelines⁶ in the harmonization project. Regional Centres of Education, educators, and coaches should have access to resources and training to support their implementation.
13. Employers should comply with workplace safety laws and implement safety standards to reduce the incidence of head injuries in the work environment. Employers should put into practice removal from work and post injury observation of workers suspected of possible concussion. Workers with a confirmed diagnosis of concussion who have been medically cleared should be gradually reintegrated back into activities based on return-to-work protocols. Workers' Compensation Board (WCB) needs to establish an evidence-based concussion management pathway.

WCB and Motor Vehicle Incident (MVI) cases should be managed separately from other concussion cases in the public health care system.
14. Nova Scotia needs to continue to prepare for concussion legislation by building capacity in the public health care system.

Although concussion harmonization efforts will start with sport related concussion, it is essential to have a strategy for all concussions in Nova Scotia. Nova Scotia has an opportunity to take a leadership role in moving towards a comprehensive strategy that addresses the needs of all sectors (health, sport, education, & labor).

Pathway for Concussion Care: The following Pathway to Concussion Care is an example of ideal concussion management and when to refer to an interdisciplinary clinic utilizing different allied health practitioners depending on the patient’s symptoms. The suggested pathway is not all inclusive and there may be several other allied health professions needed for optimal treatment.



The following sections include information used to identify the gaps in concussion care in Nova Scotia and the proposed solutions.

5. EPIDEMIOLOGY OF CONCUSSION IN CANADA

A study from the Ontario Concussion Cohort examining concussion cases from 2008 to 2016 found that the average annual incidence of concussion was 1153/100,000 residents, or greater than 1% of the population of Ontario per year. This is the highest rate of concussion ever reported in this population.⁷ This finding was based on OHIP billings for office and emergency department visits. This estimate is likely lower than the actual incidence, when factoring in those who did not visit a physician or nurse practitioner for their concussion and those that the billing codes were for concussion (e.g., had a concussion and muscular neck pain and the provider billed as neck pain).

The Government of Canada has released their own statistics through the National Ambulatory Care Reporting System (NACRS). In 2016-2017 alone, there were approximately 46 000 diagnosed concussions in hospital emergency departments for children and youth 5-19 years of age.¹ Again, this does not factor in children and youth who presented to a provider other than an emergency department, or who did not present to a medical professional at all.

The most common cause of concussion from the NACRS was sports and recreation activities (54% or 26,000 in males and 45% or 20,000 in females). Other causes were assaults, self-harm, and other unintentional causes.¹

6. CANADIAN DEVELOPMENTS IN CONCUSSION MANAGEMENT AND CARE.^{2,8}

While concussion is clearly an under recognized issue, both by individuals and health care providers, important steps have been taken to educate, advance research, and create policies around concussion. The following timeline reviews some of the recent advances in concussion care on a national level.

6.1 Canadian Developments from 2016-2021

2016

- Governor General's Conference on Concussion in Sport – On December 6, 2016, David Johnson, Governor General of Canada, hosted “We can do better: Governor General's Conference on Concussions in Sport” at Rideau Hall. The event was presented in partnership with Sport Canada and the Sport Information Resource Centre. The objectives of the conference were to bring together federal, provincial and territorial government representatives and key stakeholders in the sport, recreation, health and education sectors to advance collaboration in the development of a national approach to manage, detect and prevent concussions.

2017

- Canada's Ministers for Health and Sport were mandated to implement a pan-Canadian concussion strategy and raise awareness for parents, coaches, and athletes on concussion treatment.
 - The framework for this concussion strategy is the *Harmonized Approach on Concussions*, consisting of 5 key components: Awareness, Prevention, Detection, Management and Surveillance.
- Sport Canada and Parachute Canada, funded by the Public Health Agency of Canada, released two important documents:
 - 1) *Framework for Action*, a guidance document on minimal requirements for jurisdictions to follow when developing practices to address concussion; and
 - 2) *Canadian Guideline on Concussion in Sport* that covers best practices and a harmonized approach to prevention, detection and treatment of concussions.
- The Canadian Concussion Collaborative (CCC), comprised of health-related organizations and chaired by the Canadian Academy of Sport and Exercise Medicine, released a document titled "*4 Characteristics of a Good Concussion Clinic.*"⁹ Its criteria include:
 - (1) having a medical doctor with experience in treating concussions
 - (2) licensed health care professionals working to provide complementary expertise and who work with the medical doctor to design/implement a personalized treatment plan
 - (3) adherence to the most up-to-date standards of care
 - (4) adherence to the Berlin Consensus Statement with regards to tools, testing, and recommendations made to patients
- The College of Family Physicians of Canada and the Canadian Academy of Sport and Exercise Medicine released a joint position statement titled "*The Role of Family Physicians and Physicians with Added Competencies in Sport and Exercise Medicine in a Public Health Approach to Concussions.*"¹⁰ The joint statement emphasized the need to develop and implement public health strategies to address the issue of concussions.

2018

- The province of Ontario's Bill 193 - named Rowan's Law³ came into effect in memory of 17 year old Rowan Stringer who died from head injuries sustained playing rugby in 2013. This legislation is designed to prevent and manage concussions in amateur sport. It requires "sports organizations" (including post-secondary institutions) to educate and implement removal-from-play and return-to-sport protocols for amateur athletes who have sustained (or who are suspected of having sustained) a concussion. It also establishes a concussion code of conduct.
 - Since then, other provinces have taken steps to investigate the implementation of either regulation or legislation to reduce concussions in amateur sports.
- *Parachute Return-To-School & Return-To-Sport Protocols* have been developed and disseminated nationally based on Canadian guidelines for students and athletes after sustaining a concussion. The protocols aim to recognize, prevent and reduce the impacts of concussion in the sport, health, and education sectors.
 - Parachute has been working with National Sport Organizations (NSOs) to develop sport specific RTSport Protocols. Most of Sport Canada funded NSOs now have sport-specific RTSport protocols in place. As a funding condition for 2019-2020, all Sport Canada funded NSOs were required to work with Parachute to develop sport-specific RTSport protocols.
- The Ontario Neurotrauma Foundation released the 3rd Edition of the *Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms*¹¹ for adults over 18 years of age.
- The House of Commons Standing Committee on Health adopted a motion to establish the Subcommittee on Sports-Related Concussions in Canada. The subcommittee was created to develop recommendations on how to better protect athletes from concussions and make sport safer for youth in Canada.
- SCHOOLFirst¹² is a tool developed by Holland Bloorview Kids Rehabilitation Hospital to help teachers and other school personnel be a "Concussion Champion" and support youth upon their return to school after concussion.

2019

- On April 23, 2019 Public Health Agency of Canada, along with the Minister of Health and the Minister of Sport and Science, announced more than 1 million dollars in funding for Parachute's *Concussion Harmonization Phase II* project, supporting the Government of Canada's commitment to implement a national approach to improve prevention, recognition and treatment of concussions in Canada.
- The Canadian Medical Association, The College of Family Physicians of Canada and the Canadian Academy of Sport and Exercise Medicine developed an advocacy and policy document on *Concussion in Sport, Leisure and Occupational Settings*.¹³ This document aims to improve safety during activity by raising awareness of concussions and by working to improve the detection and safe management of concussions when they occur. The policy recommendations apply to target audiences across all levels of sport, leisure, and occupational activity.
- The Ontario Neurotrauma Foundation released the *Living Guideline for Diagnosing and Managing Pediatric Concussion*¹⁴
- Sport Information Resource Centre (SIRC) Canadian Concussion Prevention Workshop¹⁵ focused on changing behaviours in sport, changing rules and guidelines, and changing training techniques to make sport safer.
- The Massive Open Online Course for Concussion⁴ hosted by University of Calgary, in collaboration with the Université de Laval, offers a free, online-credited course for those interested in preventing, detecting and managing concussion.

2020

- The Canadian Concussion Network/Reseau Canadien des Commotions (CCN-RCC)¹⁶ was established with a vision to establish and guide a coordinated national research and knowledge translation agenda. This agenda aims to reduce the risk of concussions and their consequences across four broad domains: prevention, detection/diagnosis, prognosis/modifiers, and treatments.
- The James Lind Alliance Canadian Concussion Priority Setting Partnership (PSP) was established to work with patients, caregivers, healthcare providers and researchers to identify the top ten research priorities in concussion. People across Canada who have lived with and/or have clinical experience with concussion will be invited to share their thoughts and ideas, to help shape the future of concussion research.¹⁷

2021

- SIRC 2021 Canadian Concussion in Sport Virtual Symposium¹⁸ - At this symposium sport leaders who have found the evidence and have changed their programs to help prevent concussions shared their stories. National, provincial, territorial and community sports spoke about how the latest concussion data has impacted their organizations. This Symposium dove deeper into concussion data, innovative programs and critical new areas of research.
- The Federal Provincial Territorial working group as part of the harmonization project has gained momentum in ensuring that each province develops a concussion strategy.

6.2 What Nova Scotia has Done:

In 2019, the Brain Injury Association of Nova Scotia (Brain Injury NS) teamed up with Concussion Nova Scotia (CNS) to deliver a Concussion Roundtable Series (see Table below and Appendix B). Project funding for the roundtables was provided to Brain Injury NS by the Nova Scotia Department of Health and Wellness. The purpose of the series was to foster progress, consensus-building, education and capacity around concussion/mTBI care, diagnosis, and rehabilitation in NS.

- Brain Injury NS is a non-profit organization delivering a continuum of programs, services, and community support to Nova Scotians living with brain injury and their families/caregivers.
- CNS, established in 2012, is a group of healthcare professionals working to develop, adapt, and implement guidelines and resources to assist with the diagnosis, education, and management of individuals with concussion/mild Traumatic Brain Injury in Nova Scotia
 - CNS Advisory Committee Members: Dr. Kevin Gordon (Pediatric Neurologist), Dr. Simon Walling (Neurosurgeon), Dr. Brett Taylor (IWK ED Physician), Dr. David Cudmore (Sports Medicine), Dr. Linda Ferguson (Sports Medicine), Dr. Tina Atkinson (Sports Medicine), Dr. Erica Baker (Psychologist), Dr. Joan Backman (Psychologist), Patrick Thompson (Physiotherapist), Natalie Thornley (Occupational Therapist), and Lynne Fenerty (RN/Osteopath).

Stakeholders consulted during the Concussion Roundtable Series included:

Nova Scotia Health Authority Acquired Brain Injury Program
 IWK Health Centre
 Peter’s Place
 Trauma Nova Scotia
 Nova Scotia Department of Health and Wellness
 Nova Scotia Public Health
 Nova Scotia Department of Education and Early Childhood Education
 Nova Scotia Department of Communities, Culture and Heritage
 Nova Scotia School Athletic Federation
 Sport Nova Scotia
 Atlantic University Sport
 Canadian Sport Centre Atlantic
 Allied Health Professions involved in concussion management (OT, PT, AT, etc.)
 Workers’ Compensation Board of Nova Scotia
 Lawyers and Insurance Companies

Roundtable 1: Building Consensus and Capacity - Concussion Care, Rehabilitation and Diagnosis in Nova Scotia - Focus on Physicians
Roundtable 2: Building Consensus and Capacity - Concussion Awareness, Safety and Management in Nova Scotia Sports
Roundtable 3: Building Consensus and Capacity - Concussion Care, Rehabilitation & Diagnosis in Nova Scotia - Focus on Allied Health
Roundtable 4: Building Consensus and Capacity - Concussion Care, Rehabilitation & Diagnosis in Nova Scotia - Focus on Legal, EAP/WCB & Insurance Sectors
Roundtable 5: Building Consensus and Capacity - Concussion Care, Rehabilitation & Diagnosis in Nova Scotia - Focus on Nova Scotians who have sustained concussion/mTBI

Note: Summaries of each of these Roundtables are attached to this White Paper (Appendix B).

- In 2017 and 2018 meetings were held with the Nova Scotia Department of Education and Early Childhood Development (Former Minister Zach Churchill, as well as Directors of Student Services and Personal Development and Wellness), to share Parachute concussion resources and protocols, and offer to assist in adapting them for NS schools.
- As a result of Dr. Kevin Gordon, Pediatric Neurologist, relocating, in 2020 a need was identified at the IWK for a physician specializing in concussion. A series of meetings with Dr. Andrew Lynk, Chair and Chief of Pediatrics, have taken place to discuss a concussion clinic at the IWK
- In 2021, new resources to support the care of individuals who have sustained a concussion in Nova Scotia were developed. These resources have been disseminated through the ABI Provincial Network to Nova Scotia Health Practitioners, IWK Practitioners, Family Practitioners, Emergency Departments and CEC's across the province to support concussion recovery close to home.

6.3 New Nova Scotia Resources and Initiatives:

1. Concussion Awareness and Concussion Management Card

- Developed collaboratively with Brain Injury Nova Scotia, Concussion Nova Scotia, the IWK and Nova Scotia Health (September 2020). A downloadable PDF version of the concussion card can be found in the resource section of the Brain Injury NS website:
<https://braininjuryns.com/resources/>

2. Concussion Management Patient and Family Guide (January 2021)

- This guide was developed by Nova Scotia Health - Acquired Brain Injury Services. The guide is intended for individuals newly diagnosed with a concussion. It provides the reader with information about concussion, the red flag symptoms to watch for, identification of common symptoms, recommendations for managing symptoms, and returning to activities. It also provides information about the concussion education sessions available through NSH. The patient and family guide is now available online:
<https://www.nshealth.ca/sites/nshealth.ca/files/patientinformation/0395.pdf>

3. Concussion Education Session (June 2020)

- The [Concussion Education Sessions](#) were developed by Nova Scotia Health – Acquired Brain Injury Services. These weekly sessions are available for individuals across the province. This two-part education session is offered virtually through Zoom for Healthcare. These sessions are intended for individuals (16 years of age or older) who are experiencing symptoms from a concussion within the past 6 months.

In 2021 Canadian Sports Centre Atlantic established a Chief Medical Officer position that Dr. Tina Atkinson has accepted. Dr. Atkinson will work with the NS Department of Communities Culture and Heritage on a sports related concussion strategy.

7. CONCUSSION AWARENESS:

7.1 What is a Concussion?

Concussion (also sometimes called mild traumatic brain injury) is the most common form of traumatic brain injury (TBI).¹⁹ A concussion is caused by a bump, blow or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth.²⁰ Concussion will typically not show as an abnormality on routine imaging, such as CT scans and MRIs, which is why imaging is not performed for the diagnosis of concussion.²¹ However, it is important to rule out more serious injuries such as skull fracture or brain bleeds following impacts that may result in concussion. It is also important to consider other factors, such as past medical history, medications, and other conditions or complicating factors (e.g., diabetes, PTSD, drug or alcohol use) that may affect the diagnosis of concussion. Concussion signs and symptoms can appear immediately or can evolve with time. Loss of consciousness is not required for the diagnosis of concussion. However, concussion is commonly associated with changes in mentation, such as feeling dazed, confused, or stunned. A concussion may be sport related, but can also be due to falls, car and bike crashes, fights, assaults, or domestic violence.⁵

Did you know?

- Concussion can occur even without a direct hit to the head.
- Less than 10% of individuals who sustain a concussion experience loss of consciousness (or “getting knocked out”).
- Medical imaging (e.g. MRI, CT) is not necessary for a diagnosis of concussion. In fact, to be considered a concussion, there cannot be any signs of more significant brain injury on imaging.
- Symptoms of concussion can be present immediately after the injury but can also slowly emerge over the following days to week.
- Headache is the most commonly reported symptom of concussion but is not always present.
- Although most individuals with concussion will recover fully, 15-30% can have persistent post-concussion symptoms that can last months to years.

7.2 Diagnosis of Concussion:

A physician or nurse practitioner can medically diagnose concussion.¹¹ It is recommended that all individuals with a suspected concussion undergo medical assessment in order to⁶:

- Rule out more serious traumatic brain injury (e.g., skull fracture, bleeding in the brain)
- Rule out injuries to other parts of the body, especially the cervical spine (e.g., neck fracture)
- Rule out other medical and neurological conditions that can present with concussion-like symptoms
- Make the diagnosis of concussion based on findings of the clinical history and physical examination. Adjunctive testing (e.g., CT scan, MRI) should only be used if clinical assessment reveals red flag symptoms or signs that indicate higher risk of serious injuries

Conditions that can mimic or exacerbate persistent symptoms of concussion include:¹⁹

- Cervical strain
- Neurological disorders (e.g., vestibular diseases, skull base tumors, facial nerve disorders, migraine, seizure disorders, cerebral hemorrhage)
- Visual dysfunction
- Chronic bodily pain
- Deconditioning
- Analgesic medication over-use
- Post-traumatic stress disorder
- Depression and/or anxiety
- Developmental disorders (e.g., ADHD)

Proper recognition and diagnosis of concussion is necessary to ensure there is appropriate management of the condition and to provide positive health outcomes for patients.²² Firstly, it is imperative to rule out more serious brain injury. Missing serious injury can have devastating consequences, including permanent neurologic deficits and difficulties with daily functioning. Secondly, failure to identify concussion early on can result in other significant consequences. Returning to sport or activity too soon can, in rare but devastating cases, result in death (i.e., second-impact syndrome).⁴ Failure to recognize and initiate treatment can also result in the development of complex cases with prolonged symptoms. Often, these complex cases can be avoided if concussion is properly identified, and early education and current management standards are implemented.⁴ Proper diagnosis helps to ensure that patients can access appropriate care in a timely and affordable manner.

There is no gold standard or objective test for concussion.^{23,24} A clinical interview based on patient self-reported symptoms, with physical examination, remains the standard of care for diagnosis of concussion.¹⁹ Many primary care physicians and specialists are not aware of the specific diagnostic interview questions and measurement tools that are helpful for concussion recognition.

7.3 Key Components of Medical Assessment and Management:²³

- Assessing for red flags and considering alternate diagnoses
- Taking a thorough concussion history (e.g., mechanism of injury, symptoms and risk factors for persistent symptoms)
- Documenting symptoms (e.g., physical, cognitive, emotional, sleep) consider the use of a validated symptom assessment form
- Performing a physical exam including assessment for red-flag findings- that may indicate a more severe injury and require imaging and referral
- Providing appropriate guidance/educational material on concussions, symptom management and return to activity guidelines and medical documentation for school/work/sport
- Booking a timely follow-up

A concussion can be an evolving injury, with symptoms arising over the first few hours to several days after the injury. As such, no single test or clinical assessment can definitively rule out a possible concussion in the immediate period following a head injury (e.g., initial assessment in the emergency department, by the family physician, or by a first responder). Following a suspected concussion generating incident (any forceful back and forth movement of the body or head, or blow to the head), there should be immediate removal from activity/play (players should not be permitted to play on the same day or return to a risky work environment), ongoing symptom observation (as symptoms could appear several days after the injury), and a formal assessment with a nurse practitioner or physician.^{25,26}

7.4 Prognosis:

Most concussion patients recover quickly and fully. Typically, adults recover in 10-14 days and most children recover in 4 weeks.⁵ Unfortunately, not all patients experience such rapid recovery.⁴ A key aspect of the initial medical assessment is to evaluate if the patient is at risk for the development of persistent symptoms. Some of the potential risk factors for prolonged recovery include:^{23,27}

- Severity of acute and subacute symptoms
- High initial symptom burden on self-report
- Pre-injury history of depression/anxiety and post- injury psychological distress
- Previous history of migraines/headaches
- Adolescence
- Greater risk for females than males
- History of learning disabilities/ADHD

7.5 Concussion Management:

Patients and families should be provided with information about concussive symptoms, recovery expectations, strategies for symptom management, follow-up instructions, and access to resources. Timely provision of this information has been shown to decrease the incidence of persisting symptoms following concussion.²²

Two Nova Scotia resources for those affected by concussion are:

- 1) The Concussion Nova Scotia website - This website is hosted and maintained by Brain Injury Nova Scotia with assistance from members of Concussion Nova Scotia
<https://braininjuryns.com/concussionns/>
- 2) The Nova Scotia Health Concussion Recovery Family and Patient Guide
<https://www.nshealth.ca/sites/nshealth.ca/files/patientinformation/0395.pdf>

Every patient diagnosed with concussion should receive follow up care (usually from their primary care provider) within 1-2 weeks following the injury.

Many individuals can self-manage their concussion symptoms when provided with education and resources either at the time of diagnosis, or at their initial follow up with their primary care provider. The sooner this information is provided, the more helpful to the individual. However, some patients will require follow up for a longer period of time.

Adult and pediatric guidelines have been developed that include information on the management of the most common symptoms of concussion that can affect people over time. These guidelines can be accessed at:

<https://braininjuryguidelines.org/concussion/index.php?id=154>

<https://braininjuryguidelines.org/pediatricconcussion/>

Persistent Post Concussion Symptoms (PPCS) are defined as symptoms that last more than two weeks in adults or four weeks in youth.⁵ It is estimated that between 15-30% of patients develop PPCS and require interdisciplinary care, though estimates vary across studies.²³ If specialist care is needed, wait times for the specialist appointment can be significant and this delay can result in worsening symptoms for patients.

8. APPENDIX A

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Round Table 4: Dr. Tina Atkinson, Dr. Linda Ferguson, Leona Burkey

Round Table 5: Five panelists from the peer-support group, Concussion Café, were selected to present their lived experience and journey to recovery

9. APPENDIX B:**Concussion Roundtable Summaries**

9.1 Roundtable 1: Concussion Care, Rehabilitation and Diagnosis in Nova Scotia - Focus on Physicians

9.2 Roundtable 2: Concussion Awareness, Safety and Management in Nova Scotia Sports

9.3 Roundtable 3: Concussion Care, Rehabilitation and Diagnosis in Nova Scotia - Focus on Allied Health

9.4 Roundtable 4: Concussion Care, Rehabilitation and Diagnosis in Nova Scotia - Focus on Legal, EAP/WCB & Insurance Sectors

9.5 Roundtable 5: Concussion Care, Rehabilitation & Diagnosis in Nova Scotia - Focus on Nova Scotians Who Have Sustained Concussion/mTBI

10. REFERENCES

1. Sport and Recreation-related Traumatic Brain Injuries among Canadian Children and Youth [Internet]. Concussion in Sport. Government of Canada; 2018 [cited 2021Feb26]. Available from: <https://www.canada.ca/en/public-health/services/diseases/concussion-sign-symptoms/concussion-sport-infographic.html>
2. Background to Concussion in Sport, Leisure, and Occupational Settings. Ottawa: Canadian Medical Association Board of Directors; 2019. Available from: <https://policybase.cma.ca/en/viewer?file=%2fdocuments%2fPolicyPDF%2fPD19-07S.pdf#phrase=false>
3. Rowan's Law: Concussion safety: Learn how to prevent, identify and manage concussions. [Internet]. Rowan's Law: Concussion safety. Ontario Government; 2019 [cited 2021Feb26]. Available from: <https://www.ontario.ca/page/rowans-law-concussion-safety>
4. Concussion: prevention, detection and management (MOOC) [Internet]. Université Laval Massive Open Online Courses. Université Laval; 2021 [cited 2021Feb26]. Available from: <https://www.ulaval.ca/en/academics/mooc-massive-open-online-courses/concussion-prevention-detection-and-management>
5. Medical Professional Course [Internet]. Concussion Awareness Training Tool. BC Injury Research and Prevention Unit; 2020 [cited 2021Feb25]. Available from: <https://cattonline.com/medical-professional-course>
6. Parachute. Canadian Guideline on Concussion in Sport. Toronto; 2017 July. 54 p.
7. Langer L, Levy C, Bayley M. Increasing Incidence of Concussion: True Epidemic or Better Recognition? J Head Trauma Rehabil. 2020 Jan/Feb;35(1):E60-E66. doi: 10.1097/HTR.0000000000000503. PMID: 31246881.
8. CANADIAN HERITAGE - SPORT CANADA FEDERAL-PROVINCIAL/TERRITORIAL (F-P/T) COLLABORATIVE WORK ON CONCUSSIONS. Ottawa: House of Commons' Subcommittee on Sport-Related Concussions in Canada; 2019. Available from: <https://www.ourcommons.ca/Content/Committee/421/SCSC/Brief/BR10442158/br-external/FederalProvincialTerritorialSportCommitteeWorkGroupOnConcussionsInSports-e.pdf>
9. 4 Characteristics of a Good Concussion Clinic. Canadian Concussion Collaborative; 2017 [cited 2021Feb26]. Available from: <https://casem-acmse.org/wp-content/uploads/2018/06/CCES-PUB-CCC-4Qs-E-FINAL.pdf>

10. Joint Position statement - The Role of Family Physicians and physicians with Added Competencies in Sport and Exercise Medicine in a Public Health Approach to Concussions [Internet]. College of Family Physicians of Canada & Canadian Academy of Sport and Exercise Medicine; 2017 August [cited 2021Feb26]. Available from: <https://www.canada.ca/en/public-health/services/diseases/concussion-sign-symptoms/concussion-sport-infographic.html>
11. Ontario Neurotrauma Foundation. Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms: Healthcare Professional Version Adults (18+ years of age). 3rd ed. Toronto: Ontario Neurotrauma Foundation; 2018 May. 250 p.
12. SCHOOLFirst: Enabling successful return-to-school for Canadian youth following a concussion. [Internet]. SCHOOLFirst. Holland Bloorview Kids Rehabilitation Hospital; 2021 [cited 2021Feb26]. Available from: <https://hollandbloorview.ca/services/programs-services/concussion-centre/concussion-education/schoolfirst>
13. Concussion in Sport, Leisure, and Occupational Settings. Ottawa: Canadian Medical Association Board of Directors; 2019. Available from: <https://policybase.cma.ca/en/viewer?file=%2fdocuments%2fPolicypdf%2fPD19-07.pdf#phrase=false>
14. Reed, N., Zemek, R., Dawson, J., Ledoux, AA., Providenza, C., Paniccia, M., et al . Guidelines for Diagnosing and Managing Pediatric Concussion [Internet]. Toronto, ON: Ontario Neurotrauma Foundation; 2020. Available from: www.braininjuryguidelines.org
15. SIRC Hosts the Canadian Concussion Prevention Workshop [Internet]. Sport Calgary: be part of the energy. Sport Calgary; 2019 [cited 2021Feb26]. Available from: <https://www.sportcalgary.ca/this-week-in-sport-listings/2019/6/18/sirc-hosts-the-canadian-concussion-prevention-workshop>
16. The Canadian Concussion Network is promoting innovative and collaborative research across Canada to answer the concussion challenge. [Internet]. Canadian Concussion Network. Canadian Concussion Network; 2021 [cited 2021Feb26]. Available from: <https://ccn-rcc.ca/>
17. Concussion (Canada) [Internet]. James Lind Alliance Priority Setting Partnerships. James Lind Alliance ; 2020 [cited 2021Feb26]. Available from: <https://www.jla.nihr.ac.uk/priority-setting-partnerships/concussion-canada/>
18. The 2021 Canadian Concussion in Sport Virtual Symposium [Internet]. The Sport Information Resource Centre. Government of Canada; 2021 [cited 2021Feb26]. Available from: <https://sirc.ca/concussion/2021-concussion-symposium/>

19. Silverberg ND, Iaccarino MA, Panenka WJ, Iverson GL, McCulloch KL, Dams-O'Connor K, Reed N, McCrea M; American Congress of Rehabilitation Medicine Brain Injury Interdisciplinary Special Interest Group Mild TBI Task Force. Management of Concussion and Mild Traumatic Brain Injury: A Synthesis of Practice Guidelines. *Arch Phys Med Rehabil.* 2020 Feb;101(2):382-393. doi: 10.1016/j.apmr.2019.10.179. Epub 2019 Oct 23. PMID: 31654620.
20. What Is a Concussion? [Internet]. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention; 2019 [cited 2021Feb25]. Available from: https://www.cdc.gov/headsup/basics/concussion_what.html
21. McCrory P, Meeuwisse W, Dvorak J, Aubry M, Bailes J, Broglio S, et al. Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016 [Internet]. *British Journal of Sports Medicine.* BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine; 2017 [cited 2021Feb25]. Available from: <https://bjsm.bmj.com/content/51/11/838>
22. The Ontario Neurotrauma Foundation's Concussion Website [Internet]. Concussions Ontario. Ontario Neurotrauma Foundation; 2017 [cited 2021Feb26]. Available from: <http://concussionsontario.org/>
23. Concussion Update: Beyond the Sports Field. In: Practice Based Small Group Learning Program. 12th ed. Hamilton, ON: The Foundation for Medical Practice Education; 2020. p. 1-21.
24. Broglio SP, Katz BP, Zhao S, McCrea M, McAllister T; CARE Consortium Investigators. Test-Retest Reliability and Interpretation of Common Concussion Assessment Tools: Findings from the NCAA-DoD CARE Consortium. *Sports Med.* 2018 May;48(5):1255-1268. doi: 10.1007/s40279-017-0813-0. Erratum in: *Sports Med.* 2018 Mar 26;: PMID: 29138991; PMCID: PMC5889766.
25. Elbin RJ, Sufrinko A, Schatz P, French J, Henry L, Burkhart S, Collins MW, Kontos AP. Removal From Play After Concussion and Recovery Time. *PEDIATRICS.* 2016Sep29;138(3).
26. Silverberg ND, Iverson GL; ACRM Mild TBI Definition Expert Consensus Group and the ACRM Brain Injury Special Interest Group Mild TBI Task Force. Expert Panel Survey to Update the American Congress of Rehabilitation Medicine Definition of Mild Traumatic Brain Injury. *Arch Phys Med Rehabil.* 2021 Jan;102(1):76-86. doi: 10.1016/j.apmr.2020.08.022. Epub 2020 Oct 7. PMID: 33035515.
27. Iverson GL, Gardner AJ, Terry DP, Ponsford JL, Sills AK, Broshek DK, Solomon GS. Predictors of clinical recovery from concussion: a systematic review. *Br J Sports Med.* 2017 Jun;51(12):941-948. doi: 10.1136/bjsports-2017-097729. PMID: 28566342; PMCID: PMC5466929.