

QUALITY STANDARDS

# Concussion

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Care for People Age 5 Years and Older

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DRAFT



**Ontario Health**  
Quality

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## About This Quality Standard

The following quality standard addresses **care for people age 5 years and older with a concussion**, also commonly called “mild traumatic brain injury.”

It focuses on care for acute concussion and persistent or prolonged post-concussion symptoms, and it includes all settings where concussion care is provided and all causes of concussion.

## What Is a Quality Standard?

Quality standards outline what high-quality care looks like for conditions or processes where there are large variations in how care is delivered, or where there are gaps between the care provided in Ontario and the care patients should receive. They:

- Help patients, families, and caregivers know what to ask for in their care
- Help health care professionals know what care they should be offering, based on evidence and expert consensus
- Help health care organizations measure, assess, and improve their performance in caring for patients

Quality standards are developed by the Quality business unit at Ontario Health, in collaboration with health care professionals, patients, and caregivers across Ontario.

For more information, contact [qualitystandards@hgontario.ca](mailto:qualitystandards@hgontario.ca).

# Values That Are the Foundation of This Quality Standard

This quality standard was created, and should be implemented, according to the [Patient Declaration of Values for Ontario](#). This declaration “is a vision that articulates a path toward patient partnership across the health care system in Ontario. It describes a set of foundational principles that are considered from the perspective of Ontario patients, and serves as a guidance document for those involved in our health care system.”

These values are:

- Respect and dignity
- Empathy and compassion
- Accountability
- Transparency
- Equity and engagement

Health care professionals should acknowledge and work towards addressing the historical and present-day impacts of colonization in the context of the lives of Indigenous Peoples throughout Canada. This work involves being sensitive to the impacts of intergenerational and present-day traumas and the physical, mental, emotional, and social harms experienced by Indigenous people, families, and communities. This quality standard uses existing clinical practice guideline sources developed by groups that may not include culturally relevant care or acknowledge traditional Indigenous beliefs, practices, and models of care.

# Quality Statements to Improve Care

These quality statements describe what high-quality care looks like for people who experience a concussion.

## **Quality Statement 1: Diagnosis of Concussion**

People suspected to have a concussion are diagnosed in a timely manner via a comprehensive assessment. The assessment includes taking a history, examining concussion symptoms, and reviewing physical and mental health comorbidities.

## **Quality Statement 2: Education, Self-Management, and Support for Patients, Families, and Caregivers**

People with a concussion, and their families and caregivers, are provided with early education, resources, reassurance, and support for concussion care.

## **Quality Statement 3: Acute Management of Concussion**

People with a concussion are counselled to participate in symptom-guided physical and cognitive activity, rather than resting completely after the injury. They are advised to gradually become more active, as tolerated, and to monitor the number and severity of their symptoms.

## **Quality Statement 4: Follow-up and Management of Persistent or Prolonged Post-Concussion Symptoms**

People suspected to have persistent or prolonged post-concussion symptoms receive medical follow-up for reassessment, diagnosis, and management that is guided by their individual clinical presentation.

## **Quality Statement 5: Timely Access to Specialized, Interprofessional Concussion Care**

People with a concussion who have symptoms for more than 4 weeks, comorbidities, or identified risk factors, and whose symptoms are not improving, have timely access to specialized, interprofessional concussion care for coordinated management of their overall symptoms.

## **Quality Statement 6: Education and Training for Health Care Providers**

Health care providers who deliver care and services for people with a suspected concussion are educated and trained about the risk factors, symptoms, assessment, and management of acute concussion and persistent or prolonged post-concussion symptoms.

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## Scope of This Quality Standard

This quality standard addresses care for children age 5 years and older, adolescents, and adults with a concussion. Concussion is also referred to as a mild traumatic brain injury. This quality standard includes all settings in which concussion care is provided, including primary care, emergency departments, outpatient care, rehabilitation, and concussion clinics.

The scope of this quality standard includes all causes of concussion (sports and non-sports) and all clinical populations, and it applies to all health care providers. This quality standard addresses the assessment, diagnosis, and management of acute concussion and persistent or prolonged post-concussion symptoms.

This quality standard excludes the care of children under age 5 years, primary prevention of concussion, sports-specific protocols, penetrating injuries, brain damage from strokes or other cerebrovascular accidents, and moderate to severe traumatic brain injury (injury that may result in an extended period of unconsciousness or amnesia and that results in long-term effects).

## Why This Quality Standard Is Needed

A concussion is a type of traumatic brain injury caused by biomechanical forces. The cause can be a direct blow to the head, face, neck, or other part of the body when an “impulsive” force is transmitted to the brain.<sup>1</sup> Common causes include sports injuries, falls, motor vehicle accidents, work-related injuries, and assault.<sup>2</sup> The force results in a complicated pathophysiological process affecting the brain, which can lead to a range of clinical signs and symptoms that may or may not include loss of consciousness.<sup>3</sup> Common signs and symptoms include physical symptoms (e.g., headache, nausea, fatigue, dizziness), cognitive impairment (e.g., problems with memory, communication, attention, executive function), behavioural changes (e.g., irritability), sleep disturbances (e.g., insomnia), and mental health effects (e.g., depression, anxiety).<sup>4,5</sup> In most cases the changes to neurological function resolve reasonably quickly, but in some cases symptoms may be prolonged.

In North America, concussions are reported to occur at least 1.75 million times a year and to account for 70% to 90% of all traumatic brain injuries.<sup>1,4</sup> In Ontario between 2008 and 2016, an average of nearly 150,000 concussions were diagnosed each year.<sup>6,7</sup> The annual incidence is estimated to be 1.2% of the population.<sup>7</sup> Between 2003 and 2010, the annual incidence of concussion in Ontario increased, especially in the pediatric population: from 467 to 754 per 100,000 population in boys, and from 209 to 441 per 100,000 population in girls.<sup>8</sup> It is unlikely that the increasing incidence is because more people are experiencing concussions; it is more likely that increased public awareness of concussion as a health issue has led more people to seek out health care when a head injury happens, meaning that more concussions are being diagnosed.<sup>8</sup> Rates of concussion are highest among children and adolescents under age 18 years, and peak again in the elderly.<sup>9</sup> Concussion is more common in males than females; nearly 60% of concussion diagnoses occur in males.<sup>8,9</sup>

Across Ontario, there is variation in rates of emergency department (ED) visits attributable to concussion, and of time from an ED concussion diagnosis to primary care follow-up. In 2018, 36,403 ED visits were for concussion. The average rate of ED visits in 2018 was 266 ED visits per 100,000 residents

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(IntelliHealth Ontario, National Ambulatory Care Reporting System). In 2016, there was a twofold difference across regions in the average number of days from an ED concussion diagnosis to primary care follow-up (62 days in Central West Local Health Integration Network, or LHIN, vs. 120 days in the North West LHIN; Ontario Neurotrauma Foundation, provided by the Institute for Clinical Evaluative Sciences). People who experience persistent or prolonged post-concussion symptoms may be referred to specialist care for further evaluation and management. However, on average in Ontario, the overall wait time for people with a concussion to see a physician specialist is 236 days (Ontario Neurotrauma Foundation, provided by the Institute for Clinical Evaluative Sciences). In recent years, Ontario has seen an increase in the number of private concussion clinics, where people pay out-of-pocket for services. Such clinics are unregulated, and the types of services provided at such clinics vary.<sup>5,10</sup>

Rowan’s Law (Concussion Safety),<sup>11</sup> a private members’ bill passed in the Ontario legislature in 2018, has played a role in increasing awareness. It aims to implement 49 coroner recommendations to improve the prevention and management of concussions in the education system for youth. Furthermore, the Rowan’s Law Advisory Committee, which provides advice to the government on head injury prevention and treatment, published a report in September 2017 with 21 recommended actions grouped into five themes: surveillance, prevention, detection, management, and awareness.<sup>12</sup>

Concussion symptoms typically resolve on their own within 7 to 10 days, with full recovery expected within 3 months.<sup>13</sup> However, 15% to 20% of adults and 30% of children continue to exhibit symptoms for 28 days or more after the initial injury.<sup>5,14</sup> Persistent or prolonged post-concussion symptoms, concussion symptoms lasting longer than 4 weeks, can interfere with people’s health, well-being, and quality of life as a result of functional disability, stress, time away from work or school, and loss of social activities.<sup>2</sup>

Concussions are generally diagnosed in primary care and EDs and treated in a variety of settings. Successful management of concussions relies on the ability of health care professionals to make an accurate diagnosis, which can be difficult.<sup>15-18</sup> Functional disturbances, rather than structural injury, are likely to be responsible for concussion symptoms, meaning that diagnostic imaging such as a computed tomography (CT) and magnetic resonance imaging (MRI) are not useful for diagnosis.<sup>5</sup>

To optimize a person’s recovery and decrease their risk of long-term brain injury, it’s important that health care professionals have adequate knowledge about the assessment, treatment, and management of concussion symptoms.<sup>4</sup> However, the literature suggests that there is inconsistent knowledge about concussion care among health care professionals, including primary care providers,<sup>18,19</sup> ED physicians,<sup>19,20</sup> sport and exercise medicine physicians,<sup>20</sup> and pediatricians<sup>19</sup>; a gap exists between clinical practice and evidence-based concussion management guidelines.

## How to Use This Quality Standard

Quality standards inform patients, clinicians, and organizations about what high-quality care looks like for health conditions or processes deemed a priority for quality improvement in Ontario. They are based on the best evidence.

Guidance on how to use quality standards and their associated resources is included below.

## For Patients

This quality standard consists of quality statements. These describe what high-quality care looks like for people with a concussion.

Within each quality statement, we've included information on what these statements mean for you, as a patient.

In addition, you may want to download the accompanying [patient guide](#) on concussion to help you and your family have informed conversations with your health care providers. Inside, you will find questions you may want to ask as you work together to make a plan for your care.

## For Clinicians and Organizations

The quality statements within this quality standard describe what high-quality care looks like for people with a concussion.

They are based on the best evidence and designed to help you know what to do to reduce gaps and variations in care.

Many clinicians and organizations are already providing high-quality evidence-based care. However, there may be elements of your care that can be improved. This quality standard can serve as a resource to help you prioritize and measure improvement efforts.

Tools and resources to support you in your quality improvement efforts accompany each quality standard. These resources include indicators and their definitions (Appendix 2) to help you assess the quality of care you are delivering and identify gaps in care and areas for improvement. While it is not mandatory to use or collect data when using a quality standard to improve care, measurement is key to quality improvement.

There are also a number of resources online to help you, including:

- Our [patient guide](#) on concussion, which you can share with can patients and families to help them have conversations with you and their other health care providers. Please make the patient guide available where you provide care
- Our [measurement resources](#), which include our data tables to help you identify gaps in care and inform your resource planning and improvement efforts; our measurement guide of technical specifications for the indicators in this standard; and our “case for improvement” slide deck to help you to share why this standard was created and the data behind it
- Our [Getting Started Guide](#), which includes links to templates and tools to help you put quality standards into practice. This guide shows you how to plan for, implement, and sustain changes in your practice
- [Quorum](#), an online community dedicated to improving the quality of care across Ontario. This is a place where health care providers can share information, inform, and support each other, and it includes tools and resources to help you implement the quality statements within each standard
- [Quality Improvement Plans](#), which can help your organization outline how it will improve the quality of care provided to your patients, residents, or clients in the coming year



While you implement this quality standard, there may be times you find it challenging to provide the care outlined due to system-level barriers. Appendix 1 provides our recommendations to provincial partners to help remove these barriers so you can provide high-quality care. In the meantime, there are many actions you can take on your own, so please read the standard and act where you can.

## How to Measure Overall Success

The Concussion Quality Standard Advisory Committee identified some overarching goals for this quality standard. These goals were mapped to indicators that can be used to monitor the progress being made to improve concussion care in Ontario. One indicator is provincially measurable, while some can be measured using only locally sourced data.

Collecting and using data associated with this quality standard is optional. However, data will help you assess the quality of care you are delivering and the effectiveness of your quality improvement efforts.

We realize this standard includes a lengthy list of indicators. We've given you this list so you don't have to create your own quality improvement indicators. We recommend you identify areas to focus on in the quality standard and then use one or more of the associated indicators to guide and evaluate your quality improvement efforts.

See Appendix 2 for additional details on how to measure these indicators and our [measurement guide](#) for more information and support.

### Indicator That Can Be Measured Using Provincial Data

- Percentage of people with concussion symptoms in the previous year who did not receive a concussion diagnosis

### Indicators That Can Be Measured Using Only Local Data

- Percentage of people with a concussion (and their families and caregivers) who report understanding their expected course of symptoms and recovery
- Percentage of people with persistent or prolonged post-concussion symptoms that are not improving who are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation

# Quality Statements to Improve Care: The Details

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## Quality Statement 1: Diagnosis of Concussion

People suspected to have a concussion are diagnosed in a timely manner via a comprehensive assessment. This assessment includes taking a history, examining concussion symptoms, and reviewing physical and mental health comorbidities.

**Sources:** Centers for Disease Control and Prevention, 2018<sup>21</sup> | Department of Veterans Affairs, Department of Defense, 2016<sup>22</sup> | Ontario Neurotrauma Foundation, 2018<sup>13</sup> | Scottish Intercollegiate Guidelines Network, 2013<sup>23</sup>

### Definitions

**People suspected to have a concussion:** People with symptoms typical of a concussion, such as headache, confusion, nausea, vomiting, blurred or double vision, balance problems, dizziness, tinnitus, vertigo, drowsiness, fatigue, irritability, depression, sleeping changes, feeling “in a fog” or “dazed,” difficulty concentrating, or difficulty remembering.

**Concussion:** Also referred to as mild traumatic brain injury. Concussion is “the acute neurophysiological event related to blunt impact or other mechanical energy applied to the head, neck, or body (with transmitting forces to the brain), such as from sudden acceleration, deceleration, or rotational forces. Concussion can be sustained from a motor vehicle crash, sport or recreational injury, falls, workplace injury, assault, or incident in the community.”<sup>13</sup>

**Timely manner:** The Concussion Quality Standard Advisory Committee agreed that a comprehensive assessment should occur within 7 days of the injury if no red flags are present. If any red flags are present, more immediate care from a physician or other health care professional is required. Red flags are signs or symptoms of a serious underlying health condition. They include neck pain or tenderness, double vision, weakness or tingling in the arms or legs, severe or increasing headache, seizure or convulsion, loss of consciousness, vomiting, deteriorating conscious state, or increasing restlessness or agitation.

**Comprehensive assessment:** The key components of a comprehensive assessment for diagnosis include the following:

- Medical history, including the person’s current symptoms and health concerns; the setting and mechanism of injury; the severity and duration of altered consciousness and immediate symptoms; the presence of co-occurring injuries; pre-existing physical and mental health conditions; and psychosocial factors that may affect recovery

- Examination and assessment of the person’s mental status and cognition, physical status, cranial nerves, extremity tone, strength, reflexes, and gait and balance
- Assessment of the person’s cognition, including attention, communication, learning and memory, perception, insight and judgment, organization, orientation, language, processing speed, problem-solving, reasoning, executive functioning, and metacognition
- Review of the person’s physical and mental health comorbidities, including an assessment of their current emotional and cognitive status
- Assessment of the person’s clinical status, including whether their symptoms have improved or deteriorated since the injury
- Determination of the need for urgent neuroimaging or blood work to rule out other conditions such as a more severe brain injury (e.g., structural abnormality or hemorrhage), as appropriate
- Exclusion of other medical conditions
- Use of validated, age-appropriate assessment scales to assess the person’s somatic, cognitive, emotional, and behavioural symptoms

## **Rationale**

In Ontario, the majority of concussions (about 80%) are diagnosed in hospital emergency departments, and the rest are diagnosed in primary care settings.<sup>7</sup> Successful management of concussion relies on the ability of health care professionals to make an accurate diagnosis, which can be challenging.<sup>15-18</sup> The nature of concussion is complex, and concussion has a diverse array of presenting symptoms. There is a risk of missed cases or misdiagnoses, delaying appropriate treatment. Because functional disturbances, not a structural injury, are likely to be responsible for the concussion symptoms, routine diagnostic imaging, such as a computed tomography (CT) and magnetic resonance imaging (MRI), cannot be used to confirm a concussion diagnosis.<sup>5</sup> When a concussion diagnosis is uncertain, following up to monitor symptoms is recommended.

## **What This Quality Statement Means**

### **For Patients**

If you have concussion symptoms, your family doctor or nurse practitioner should do a thorough assessment before they diagnose you with a concussion. You may go to the emergency department to receive immediate care after an injury and to rule out any urgent or severe brain injury.

### **For Clinicians**

Conduct a comprehensive assessment that includes taking the person’s history, examining all possible concussion symptoms, and reviewing physical and mental health comorbidities. This assessment should be completed within 7 days of the injury. Document concussion symptoms for monitoring and follow-up.

### **For Health Services Planners**

Ensure that health care professionals in primary care, emergency departments, and community-based settings are educated and trained in how to conduct comprehensive assessments to diagnose concussion.

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### **Quality Indicators: How to Measure Improvement for This Statement**

- Percentage of people suspected to have a concussion who receive a comprehensive assessment within 7 days of the injury
- Percentage of people with concussion symptoms in the previous year who did not receive a concussion diagnosis (i.e., potentially missed concussions; a lower percentage is better)

Measurement details for these indicators, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.

## Quality Statement 2: Education, Self-Management, and Support for Patients, Families, and Caregivers

People with a concussion, and their families and caregivers, are provided with early education, resources, reassurance, and support for concussion care.

**Sources:** Centers for Disease Control and Prevention, 2018<sup>21</sup> | Department of Veterans Affairs, Department of Defense, 2016<sup>22</sup> | National Institute for Health and Care Excellence, 2014<sup>24</sup> | Ontario Neurotrauma Foundation, 2018,<sup>13</sup> 2019<sup>25</sup> | Scottish Intercollegiate Guidelines Network, 2013<sup>23</sup>

### Definitions

**Early education:** Verbal and printed or online evidence-based information about concussion should be provided to people with a concussion, as well as their families and caregivers. Education should be provided at the person's initial presentation and ongoing, as required. The information can be tailored to the person's history and symptoms, and can include the following topics:

- The nature and severity of the injury, and the expected course of the person's symptoms and recovery (normalize symptoms and the pattern of recovery)
- Warning signs of a more serious injury
- Prevention of further injury
- Management of their cognitive and physical activity or rest
- Management and coping with their symptoms (e.g., difficulty sleeping/insomnia; headaches; fatigue; problems with social interactions, communication, vision, mental health, attention and concentrating, alcohol/drug use)
- Monitoring their symptoms
- Techniques to manage stress
- Gradual return to activities (e.g., play, work, school, driving), as tolerated
- Information about the possibility of persistent, prolonged, or delayed symptoms after a head injury, and whom to contact in case of ongoing problems
- Clear clinical follow-up instructions and when to go to the emergency department (when and why to return for care if symptoms are persistent or prolonged, or if they worsen)
- Whom to contact if multiple health care services are needed
- Role of social support (e.g., emotional, informational, instrumental, and appraisal)
- How environment can exacerbate symptoms

**Resources, reassurance, and support:** Health care professionals may assess the extent and types of social support available to the person with a concussion (e.g., emotional or informational) and emphasize social support as a key element in the education of families and caregivers. It is also important to consider people who may not be working or in school (especially seniors), because they may have less support available to them. Health care professionals should reassure people with a concussion, and their families and caregivers, that a full recovery, including cognitive functioning, can be seen as early as a few days after injury but may take longer.

## **Rationale**

Informing and empowering people with education and supportive reassurance about concussion symptoms, expectations for recovery, and strategies for symptom reduction are effective ways to reduce persistent or prolonged symptoms.<sup>13</sup> Knowledge of the symptoms associated with a concussion is generally low among athletes, coaches, trainers, and the general public, in spite of the high incidence of concussions and the adverse outcomes associated with them.<sup>4</sup> It can be reassuring for people to know what types of symptoms they can expect after a concussion (i.e., what is normal), and that a positive prognosis is the most common outcome for people with a concussion.

In addition, health literacy and a person's resulting behavioural modifications are known to improve health outcomes in general.<sup>21</sup> With the correct information, people with a concussion, and their families and caregivers, can take appropriate actions to prevent reinjury, manage symptoms, and prevent worsening of symptoms. Patient and family/caregiver education and reassurance are key components of concussion care and discharge instructions.<sup>21</sup>

## **What This Quality Statement Means**

### **For Patients**

Your health care professional should explain concussion care to you, including what it is, what to expect, where to get support, what you can do to take care of yourself, and what to do if your symptoms don't get better. Your health care professional should offer you, and your family and your caregivers (if you want them involved), information verbally and in writing.

### **For Clinicians**

Give people with a concussion (and families and caregivers) education about concussion, information about how to care for themselves, reassurance about what to expect, information about available resources, and referrals to local service providers who can help them manage their symptoms (e.g., local peer support groups, allied health care professionals).

### **For Health Services Planners**

Ensure that training, systems, processes, and resources are in place in primary care, emergency departments, and community-based settings so that health care professionals can provide education, resources, reassurance, and support related to concussions. Ensure that people with a concussion, and their families and caregivers, have access to health care professionals who are trained in providing evidence-based and consistent concussion education.

## **Quality Indicators: How to Measure Improvement for This Statement**

- Percentage of people with a concussion (and their families and caregivers) who report understanding their expected course of symptoms and recovery
- Local availability of educational material about concussion upon discharge from the emergency department

Measurement details for these indicators, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.

## Quality Statement 3: Acute Management of Concussion

People with a concussion are counselled to participate in symptom-guided physical and cognitive activity, rather than resting completely after their injury. They are advised to gradually become more active, as tolerated, and to monitor the number and severity of their symptoms.

**Sources:** Centers for Disease Control and Prevention, 2018<sup>21</sup> | Ontario Neurotrauma Foundation, 2018,<sup>13</sup> 2019<sup>25</sup>

### Definitions

**Symptom-guided physical and cognitive activity:** In the acute symptomatic period after the injury, an initial period of modified activity may be considered to reduce the risk of sustaining another concussion, but complete rest and prolonged inactivity are not recommended because they can worsen symptoms and slow overall recovery.<sup>21</sup> Modified activity may include taking time off work or staying home from school and related activities (e.g., sports, extracurricular activities, practicums) for a limited period, based on an assessment of the person’s symptoms.

**Gradually become more active, as tolerated:** After a concussion, people gradually and progressively return to activity (e.g., school, work, social activities, physical activities, driving, computer use) as tolerated in a way that does not result their symptoms getting worse or in new symptoms. The ability to determine one’s activity limits and tolerance may not always be immediate; for example, worsening symptoms may be felt the next day.

During the recovery period, people with a concussion should avoid activities that come with a risk of contact, fall, or collision, such as high-speed or contact activities and full-contact sports. These may increase the risk of sustaining another concussion.<sup>25</sup>

Students do not need to be symptom free before returning to school, but academic accommodations are likely to be needed at first.

A return to sports should be guided through specific steps, monitored by a health care professional, and not initiated until medical clearance has been provided.

### Rationale

Historically, the foundation of concussion management has been physical and cognitive rest until acute symptoms have resolved.<sup>5,21</sup> However, there is limited evidence to support the timing, duration, and efficacy of this approach. Evidence suggests that modified activity, based on symptoms, may help accelerate recovery by easing discomfort, minimizing brain energy demands, and preventing another concussion.<sup>5,13,21</sup> Once acute symptoms have resolved, it is recommended that the person take a gradual stepwise return to usual activity.<sup>5</sup> Returning to usual activity before symptoms have subsided could result in symptoms getting worse and lead to longer recovery times.<sup>5</sup>

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Health care professionals' knowledge and use of evidence-based resources for concussion vary.<sup>18-20</sup> In Ontario, studies show that the majority of health care professionals (including primary care providers, emergency department practitioners, and pediatricians) incorrectly follow guidelines for the acute management of concussion.<sup>19,20</sup> It's important that health care professionals provide accurate education and information to patients, families, and caregivers.

## **What This Quality Statement Means**

### **For Patients**

After a concussion, gradually return to physical and mental activities based on your symptoms. These activities could include running, reading, driving, social activities, using a computer, watching television, or going to school or work. Complete rest and inactivity are not necessary. Instead, adjust your activity level based on what you can tolerate, in a way that does not make your symptoms worse and that does not lead to new symptoms.

### **For Clinicians**

Counsel people with a concussion to participate in symptom-guided physical and cognitive activity. Advise people with a concussion, and their families and caregivers, to monitor symptoms, including their type, number, and severity. Do not advise people with a concussion to engage in complete rest. Implementing this strategy for long periods can lead to worsening symptoms.

### **For Health Services Planners**

Ensure that training, systems, and processes are in place in primary care, emergency department, and community-based settings so that health care professionals can provide consistent guidance about the acute management of concussion.

## **Quality Indicator: How to Measure Improvement for This Statement**

- Percentage of people with a concussion who are counselled to participate in symptom-guided physical and cognitive activity after their injury

Measurement details for this indicator, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.



# Quality Statement 4: Follow-Up and Management of Persistent or Prolonged Post-concussion Symptoms

People suspected to have persistent or prolonged post-concussion symptoms receive medical follow-up for reassessment, diagnosis, and management that is guided by their individual clinical presentation.

**Sources:** Centers for Disease Control and Prevention, 2018<sup>21</sup> | Ontario Neurotrauma Foundation, 2018<sup>13</sup>

## Definitions

**Persistent or prolonged post-concussion symptoms:** Concussion symptoms that do not resolve as expected with standard care within 4 weeks after the person’s injury.<sup>21</sup>

### Reassessment and diagnosis:

- Diagnoses other than concussion should be considered because some conditions have symptoms that are similar to concussion symptoms
- Assessment should be comprehensive and include a review of currently prescribed medications, over-the-counter medications and supplements, and substance use (see quality statement 1 for a definition of comprehensive assessment)
- All relevant factors (medical, cognitive, communication, psychological, and psychosocial) should be examined for how they may be contributing to the person’s symptom presentation and considered in the management strategies
- Validated and standardized assessment tools may be used to assess and monitor post-concussion symptoms (e.g., Rivermead Post-Concussion Symptoms Questionnaire,<sup>26</sup> Post-Concussion Symptom Scale<sup>27</sup>)
- Consider obtaining collateral information from family, caregivers, and the person’s environment (e.g., school, work) to obtain a full picture of the persistent or prolonged post-concussion symptoms

### Management:

- Concussion symptoms lasting beyond 4 weeks with little improvement after injury should lead primary care providers and other health care professionals to consider factors that may be contributing to the symptoms
- Management should be guided by the person’s specific symptoms and individual clinical presentation
- Health care professionals should ensure regular monitoring and identify treatable symptoms
- Management may require referral to specific health care professionals, based on the symptoms identified
- Consider referral to specialized, interprofessional concussion services, including a physician with expertise in concussion, where available, or an interprofessional network of health care professionals capable of managing post-concussion symptoms (see quality statement 5)

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- An identified member of the health care team (typically the primary care provider) facilitates the coordination of the person’s health care needs related to concussion care

## **Rationale**

Although for most people a full recovery is expected in a timely manner after a concussion, about 15% to 20% of adults and 30% of children do not experience rapid recovery and may experience persistent or prolonged concussion symptoms.<sup>13</sup> Many factors influence the rate of recovery and whether symptoms are persistent or prolonged, including the mechanism of injury, the setting of the initial injury, and the “interplay of symptoms, social circumstances, and subsequent development of complications, [which can] complicate and negatively influence recovery.”<sup>13</sup> People who do not follow the more common pattern of recovery require careful monitoring of their symptoms and identification of potentially treatable symptoms.

Seeing a health care professional for follow-up provides a key opportunity for the prolonged concussion symptoms to be reassessed and appropriately managed. In Ontario, there is variation in the time to see a primary care provider for follow-up after getting a diagnosis of concussion in an emergency department. In 2016 in Ontario, the average number of days from an emergency department diagnosis of a concussion to primary care follow-up was 84 days (Ontario Neurotrauma Foundation; provided by the Institute for Clinical Evaluative Sciences).

## **What This Quality Statement Means**

### **For Patients**

When your concussion symptoms last longer than 4 weeks, follow-up with your health care professional. They should reassess your condition to determine whether you have persistent or prolonged post-concussion symptoms that require additional treatment. Treatments should be based on your specific symptoms and your presentation.

### **For Clinicians**

Ensure that people with a concussion who continue to experience symptoms at 4 weeks receive medical follow-up. They should be reassessed to determine whether they have persistent or prolonged post-concussion symptoms, and they should be managed based on their individual clinical presentation.

### **For Health Services Planners**

Ensure that systems and processes are in place in primary care, emergency departments, and community-based settings for people with a concussion to receive timely medical follow-up if they experience concussion symptoms beyond 4 weeks after their injury. Ensure that health care professionals are educated and trained to recognize, assess, diagnose, and manage persistent or prolonged post-concussion symptoms.

## **Quality Indicator: How to Measure Improvement for This Statement**

- Percentage of people with post-concussion symptoms that last more than 4 weeks who receive medical follow-up

Measurement details for this indicator, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.

## Quality Statement 5: Timely Access to Specialized, Interprofessional Concussion Care

People with a concussion who have symptoms for more than 4 weeks, comorbidities, or identified risk factors, and whose symptoms are not improving, have timely access to specialized, interprofessional concussion care for coordinated management of their overall symptoms.

**Sources:** Department of Veterans Affairs, Department of Defense, 2016<sup>22</sup> | Ontario Neurotrauma Foundation, 2018,<sup>13</sup> 2019<sup>25</sup> | Scottish Intercollegiate Guidelines Network, 2013<sup>23</sup>

### Definitions

**Comorbidities:** Symptoms of other diagnoses that overlap with the diagnosis of persistent or prolonged post-concussion symptoms (e.g., headaches and migraines, depression, generalized anxiety disorder, or post-traumatic stress disorder).<sup>13</sup>

**Identified risk factors:** Pre-existing medical or health risk factors or current medical conditions or symptoms that are associated with poor outcomes. Such risk factors include the following:<sup>13</sup>

- History of previous traumatic brain injury
- History of previous physical limitations
- History of previous neurological or psychiatric problems
- Skull fracture
- Early onset of pain (particularly headache) within 24 hours after the person's injury
- Confounding effects of other health-related issues (e.g., pain medications, disabling effects of associated injuries, emotional distress)
- Anxiety
- High number of symptoms reported early after the person's injury

Other contextual risk factors, including personal, psychosocial, or environmental factors, can also influence a person's recovery after a concussion. For example, these contextual factors may include an injury sustained in a motor vehicle accident; not returning to work, or significant delays in returning to work following the person's injury; being a student; the presence of other life stressors; older age; a lack of social supports; or returning to a contact sport.<sup>13</sup>

**Timely access:** The Concussion Quality Standard Advisory Committee agreed that appropriate referrals should be made within 4 to 6 weeks when there is a diagnosis of persistent or prolonged post-concussion symptoms. The referral process could occur earlier when there are complex comorbidities or identified risk factors, and symptoms are not improving.

**Specialized, interprofessional concussion care:** Health care professionals who are qualified to provide concussion care (educated and trained in concussion care; see quality statement 6) within their scope of practice, working in collaboration to provide comprehensive concussion care. Based on the diverse

symptom effects of concussion, many different health disciplines may be engaged in the care of a person with a concussion. The interprofessional care team should include a physician with education and training in concussion care.

**Coordinated management:** An identified member of the health care team (typically the primary care provider) should facilitate the coordination of the person's health care needs related to concussion care.

## **Rationale**

People experiencing persistent or prolonged post-concussion symptoms may be referred to a specialist or another health care professional for further evaluation and management based on their symptoms. Many health disciplines may be involved in care because concussion symptoms can present differently for each person, and many types of symptoms are possible.

In Ontario, wait times for specialists are often long. Recent estimates for specialist appointments for concussion were 7 months for adult care and 9 months for pediatric care.<sup>28</sup> In 2016, on average in Ontario, the overall wait time for people with a concussion for their first visit with a physician specialist was 236 days (Ontario Neurotrauma Foundation, provided by the Institute for Clinical Evaluative Sciences). In recent years, Ontario has also seen an increase in the number of concussion clinics, where people pay out of pocket for services. People with a concussion and their families may face challenges in navigating care services because of long wait times, the involvement of many different health care providers, and potential out-of-pocket costs.

## **What This Quality Statement Means**

### **For Patients**

If your concussion symptoms are not improving, you should be referred to a specialist doctor or other allied health professional. This person will further assess and manage your symptoms. Referrals will be based on your symptoms.

### **For Clinicians**

In a timely manner, refer people with persistent or prolonged post-concussion symptoms to specialized, interprofessional concussion care for further assessment and appropriate treatment based on their individual clinical presentation and symptoms. Identify health care providers in your area who have experience with managing concussion. Support patients in using the funding options available to them, including publicly funded services, health insurance and benefits, and other programs.

### **For Health Services Planners**

Ensure that systems, processes, and resources are in place so that timely specialized, interprofessional concussion care is available for those who need it.

## **Quality Indicators: How to Measure Improvement for This Statement**

- Percentage of people with persistent or prolonged post-concussion symptoms who are not improving and are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation
- Median wait time between referral of people with post-concussion symptoms to specialized, interprofessional concussion care, and their first visit

*Draft—do not cite. Report is a work in progress and could change following public consultation.*

Measurement details for these indicators, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.

## Quality Statement 6: Education and Training for Health Care Providers

Health care providers who deliver care and services for people with a suspected concussion are educated and trained about the risk factors, symptoms, assessment, and management of acute concussion and persistent or prolonged post-concussion symptoms.

**Sources:** National Institute for Health and Care Excellence, 2014<sup>24</sup> | Ontario Neurotrauma Foundation, 2018,<sup>13</sup> 2019<sup>25</sup>

### Definitions

**Health care providers:** Refers to all health care providers who deliver care to people with a concussion or suspected concussion. This applies to first response teams and those working in primary care, emergency departments, and outpatient clinics and systems. Although it is beyond the scope of this quality standard, educators (teachers, schools), staff at seniors' facilities and recreational facilities, family members, coaches, police, and athletes should also know about concussion.

**Educated and trained:** Health care providers should receive basic education and training in concussion, and some health care providers should also receive specialized education and training in concussion. Basic education and training includes the ability to rule out other comorbid and confounding factors in assessment and diagnosis; concussion risk factors; recognizing the symptoms of concussion; acute management (see quality statement 3); management of persistent or prolonged post-concussion symptoms (see quality statement 4); knowledge of their scope of practice and that of other professionals to ensure optimal interprofessional collaboration; standards of care; and appropriate referral opportunities.

### Rationale

Variation exists in health care professionals' knowledge and use of evidence-based resources to assess and manage concussions.<sup>18-20</sup> A survey of primary care physicians' knowledge about pediatric concussion in Ontario found that only 37% of physicians correctly applied guidelines about a graduated return to play, 53% did not recommend school absence, and 40% did not recommend schoolwork accommodations. Similarly, in a study of clinicians in Toronto, only half of general practitioners, emergency department practitioners, and pediatricians recommended acute management aligned with clinical practice guidelines to people diagnosed with a concussion.<sup>19</sup>

Successful management of concussion relies on the ability of health care professionals to make an accurate diagnosis, which can be challenging.<sup>15-18</sup> The nature of concussion is complex, with a diverse array of presenting symptoms. There is a risk of missed cases or misdiagnosis, which delays treatment.

Although this education and training applies to all health care professionals who provide care to people with a concussion or a suspected concussion, it is especially important for health care professionals working in primary care, emergency departments, and concussion clinics.

## **What This Quality Statement Means**

### **For Patients**

You should receive care from health care providers who have been educated and trained in how to care for people with a concussion. This includes how to assess, diagnose, and manage your concussion immediately after your injury, and over the long term if your concussion symptoms persist.

### **For Clinicians**

Ensure that you have training and education to provide effective care (including assessment and management) for people with acute concussion and persistent or prolonged post-concussion symptoms.

### **For Health Services Planners**

Ensure that health care providers who care for people with a concussion have training and education in how to carry out comprehensive assessments, and the appropriate management and treatment of acute concussion and persistent or prolonged post-concussion symptoms. This includes education and support for people with a concussion, families, and caregivers; symptom-guided cognitive and physical activity after injury; coordinated management of overall symptoms; and referral to specialized, interprofessional concussion care.

## **Quality Indicators: How to Measure Improvement for This Statement**

- Local availability of continuing professional education for health care providers on risk factors, symptoms, assessment, and management of acute concussion
- Percentage of health care providers who have completed training in managing care for people with a suspected concussion

Measurement details for these indicators, as well as indicators to measure overarching goals for the entire quality standard, are presented in Appendix 2.

# Appendices

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## Appendix 1. Recommendations for Adoption: How the Health Care System Can Support Implementation

*To come*



## Appendix 2. Measurement to Support Improvement

The Concussion Standard Advisory Committee identified some overarching goals for this quality standard. These goals were mapped to indicators that can be used to monitor the progress being made to improve concussion care in Ontario. One indicator is provincially measurable, while others can be measured using only locally sourced data.

Collecting and using data associated with this quality standard is optional. However, data will help you assess the quality of care you are delivering and the effectiveness of your quality improvement efforts.

We realize this standard includes a lengthy list of indicators. We've given you this list so you don't have to create your own quality improvement indicators. We recommend you identify areas to focus on in the quality standard and then use one or more of the associated indicators to guide and evaluate your quality improvement efforts.

To assess equitable delivery of care, you can stratify locally measured indicators by patient socioeconomic and demographic characteristics, such as age, education, gender, income, language, and sex.

Our [measurement guide](#) for concussion provides more information and concrete steps on how to incorporate measurement into your planning and quality improvement work.

### How to Measure Overall Success

#### *Indicator That Can Be Measured Using Provincial Data*

**Percentage of people with concussion symptoms in the previous year who did not receive a concussion diagnosis (i.e., potentially missed concussions; a lower percentage is better)**

- Denominator: number of people with a diagnosis of polytrauma (patients with more than one serious injury) to the head or upper body in the emergency department who had a specialist visit for concussion symptoms (headaches, double vision, dizziness, mental health issues) in the previous year
- Numerator: number of people in the denominator who did not receive a concussion diagnosis
- Data sources: Ontario Health Insurance Plan Billing Database, National Ambulatory Care Reporting System
- Source: Langer et al, 2019<sup>7</sup>
- Note: see quality statement 1 for more details

#### *Indicators That Can Be Measured Using Only Local Data*

**Percentage of people with a concussion (and their families and caregivers) who report understanding their expected course of symptoms and recovery**

- Denominator: number of people with a concussion (and their families and caregivers)
- Numerator: number of people in the denominator who report understanding their expected course of symptoms and recovery

*Draft—do not cite. Report is a work in progress and could change following public consultation.*

- Data source: local data collection via patient survey
- Note: see quality statement 2 for more details

**Percentage of people with persistent or prolonged post-concussion symptoms that are not improving who are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation**

- Denominator: number of people with persistent or prolonged post-concussion symptoms that are not improving
- Numerator: number of people in the denominator who are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation
- Data source: local data collection
- Note: see quality statement 5 for more details

## **How to Measure Improvement for Specific Statements**

### *Quality Statement 1: Diagnosis of Concussion*

**Percentage of people suspected to have a concussion who receive a comprehensive assessment within 7 days of the injury**

- Denominator: number of people suspected to have a concussion
- Numerator: number of people in the denominator who receive a comprehensive assessment within 7 days of the injury
- Data source: local data collection

**Percentage of people with concussion symptoms in the previous year who did not receive a concussion diagnosis (i.e., potentially missed concussions; a lower percentage is better)**

- Denominator: number of people with a diagnosis of polytrauma (patients with more than one serious injury) to the head or upper body in the emergency department who had a specialist visit for concussion symptoms (headaches, double vision, dizziness, mental health issues) in the previous year
- Numerator: number of people in the denominator who did not receive a concussion diagnosis
- Data sources: Ontario Health Insurance Plan Billing Database, National Ambulatory Care Reporting System
- Source: Langer et al, 20197
- Note: this indicator is also included in the section “How to Measure Overall Success”

### *Quality Statement 2: Education, Self-Management, and Support for Patients, Family, and Caregivers*

**Percentage of people with a concussion (and their families and caregivers) who report understanding their expected course of symptoms and recovery**

- Denominator: number of people with a concussion (and their families and caregivers)
- Numerator: number of people in the denominator who report understanding their expected course of symptoms and recovery
- Data source: local data collection via patient survey
- Note: this indicator is also included in the section “How to Measure Overall Success”

**Local availability of educational material about concussion upon discharge from the emergency department**

- Data source: local data collection

*Quality Statement 3: Acute Management of Concussion*

**Percentage of people with a concussion who are counselled to participate in symptom-guided physical and cognitive activity after their injury**

- Denominator: number of people with a concussion
- Numerator: number of people in the denominator who are counselled to participate in symptom-guided physical and cognitive activity after their injury
- Data source: local data collection

*Quality Statement 4: Follow-up and Management of Persistent or Prolonged Post-Concussion Symptoms*

**Percentage of people with post-concussion symptoms that last more than 4 weeks who receive medical follow-up**

- Denominator: number of people with post-concussion symptoms that last more than 4 weeks
- Numerator: number of people in the denominator who receive medical follow-up
- Data source: local data collection

*Quality Statement 5: Timely Access to Specialized, Interprofessional Concussion Care*

**Percentage of people with persistent or prolonged post-concussion symptoms that are not improving who are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation**

- Denominator: number of people with persistent or prolonged post-concussion symptoms that are not improving
- Numerator: number of people in the denominator who are referred to specialized, interprofessional concussion care within 6 weeks of their initial presentation
- Data source: local data collection
- Note: this indicator is also included in the section “How to Measure Overall Success”

**Median wait time between referral of people with post-concussion symptoms to specialized, interprofessional concussion care, and their first visit**

- Calculation: median number of days between referral of people with post-concussion symptoms to specialized, interprofessional concussion care, and their first visit for
- Data source: local data collection

*Quality Statement 6: Education and Training for Health Care Providers*

**Local availability of continuing professional education for health care providers on risk factors, symptoms, assessment, and management of acute concussion**

- Data source: local data collection

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**Percentage of health care providers who have completed training in managing care for people with a suspected concussion**

- Denominator: number of health care providers who care for people with a suspected concussion
- Numerator: number of people in the denominator who have completed training in managing care for people with a suspected concussion
- Data source: local data collection



## Appendix 3. Glossary

**Concussion:** Also referred to as mild traumatic brain injury. Concussion is “the acute neurophysiological event related to blunt impact or other mechanical energy applied to the head, neck, or body (with transmitting forces to the brain), such as from sudden acceleration, deceleration or rotational forces. Concussion can be sustained from a motor vehicle crash, sport or recreational injury, falls, workplace injury, assault or incident in the community.”<sup>13</sup>

**Health care professionals:** Regulated professionals, such as audiologists, chiropractors, kinesiologists, massage therapists, nurses, nurse practitioners, pharmacists, physiotherapists, physicians, psychologists, occupational therapists, social workers, and speech–language pathologists.

**Health care providers:** The health care professionals listed above, as well as people in unregulated professions, such as administrative staff, athletic therapists, osteopaths, and peer support workers.

**Prolonged post-concussion symptoms:** Physical, cognitive, emotional, or behavioural symptoms of concussion that do not resolve as expected with standard care within 4 weeks after injury.<sup>21</sup> Other terms used to describe these symptoms include “persistent post-concussion symptoms” or “post-concussion syndrome.”

# Acknowledgements

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## References

- (1) Mollayeva T, Colantonio A. Gender, sex and traumatic brain injury: transformative science to optimize patient outcomes. *Healthc Q*. 2017;20(1):6-9.
- (2) Marshall S, Bayley M, McCullagh S, Velikonja D, Berrigan L. Clinical practice guidelines for mild traumatic brain injury and persistent symptoms. *Can Fam Physician*. 2012;58(3):257-67, e128-40.
- (3) 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. *Br J Sports Med*. 2017;51(11):838.
- (4) Topolovec-Vranic J, Zhang S, Wong H, Lam E, Jing R, Russell K, et al. Recognizing the symptoms of mental illness following concussions in the sports community: a need for improvement. *PLOS ONE*. 2015;10(11):e0141699.
- (5) McCrory P, Meeuwisse WH, Aubry M, Cantu RC, Dvorak J, Echemendia RJ, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport, Zurich, November 2012. *J Athl Train*. 2013;48(4):554-75.
- (6) Concussions Ontario [Internet]. Toronto (ON): Ontario Neurotrauma Foundation; 2015 [updated 2017; cited 2019 Oct 25]. Available from: <http://concussionsontario.org/>
- (7) Langer L, Levy CB, Mark. Increasing incidence of concussion: true epidemic or better recognition? *J Head Trauma Rehabil*. Forthcoming 2019.
- (8) Macpherson A, Fridman L, Scolnik M, Corallo A, Guttman A. A population-based study of paediatric emergency department and office visits for concussions from 2003 to 2010. *Paediatr Child Health*. 2014;19(10):543-6.
- (9) Bayley M, Kagan C, Langer L. Characterizing concussion in the province of Ontario. Toronto (ON): Ontario Neurotrauma Foundation; 2016.
- (10) Ellis MJ, Ritchie L, Selci E, Chu S, McDonald P, Russell K. Googling concussion care: a critical appraisal of online concussion healthcare providers and practices in Canada. *Clin J Sport Med*. 2017;27(2):179-82.
- (11) Bill 149, Rowan's Law Advisory Committee Act, Legislative Assembly of Ontario (2016).
- (12) Rowan's Law Advisory Committee. Creating Rowan's Law [Internet]. Toronto (ON): Ontario Ministry of Tourism, Culture and Sport; 2017 [cited 2019 Oct 31]. Available from: [http://www.mtc.gov.on.ca/en/publications/rowan\\_report.pdf](http://www.mtc.gov.on.ca/en/publications/rowan_report.pdf)
- (13) Ontario Neurotrauma Foundation. Guideline for concussion/mild traumatic brain injury and persistent symptoms: healthcare professional version [Internet]. Toronto (ON): The Foundation; 2018 [cited 2019 Oct 25]. Available from: <https://braininjuryguidelines.org/concussion/fileadmin/media/adult-concussion-guidelines-3rd-edition.pdf>
- (14) Zemek R, Barrowman N, Freedman SB, Gravel J, Gagnon I, McGahern C, et al. Clinical risk score for persistent postconcussion symptoms among children with acute concussion in the ED. *J Am Med Assoc*. 2016;315(10):1014-25.
- (15) Guskiewicz KM, Register-Mihalik J, McCrory P, McCrea M, Johnston K, Makdissi M, et al. Evidence-based approach to revising the SCAT2: introducing the SCAT3. *Br J Sports Med*. 2013;47(5):289-93.
- (16) McCrea M, Iverson GL, Echemendia RJ, Makdissi M, Raftery M. Day of injury assessment of sport-related concussion. *Br J Sports Med*. 2013;47(5):272-84.
- (17) McCrory P, Meeuwisse WH, Echemendia RJ, Iverson GL, Dvorak J, Kutcher JS. What is the lowest threshold to make a diagnosis of concussion? *Br J Sports Med*. 2013;47(5):268-71.



*Draft—do not cite. Report is a work in progress and could change following public consultation.*

- (18) Zemek R, Eady K, Moreau K, Farion KJ, Solomon B, Weiser M, et al. Knowledge of paediatric concussion among front-line primary care providers. *Paediatr Child Health*. 2014;19(9):475-80.
- (19) Stoller J, Carson JD, Garell A, Libfeld P, Snow CL, Law M, et al. Do family physicians, emergency department physicians, and pediatricians give consistent sport-related concussion management advice? *Can Fam Physician*. 2014;60(6):548-52.
- (20) Carson JD, Rendely A, Garell A, Meaney C, Stoller J, Kaicker J, et al. Are Canadian clinicians providing consistent sport-related concussion management advice? *Can Fam Physician*. 2016;62(6):494-500.
- (21) Lumba-Brown A, Yeates KO, Sarmiento K, Breiding MJ, Haegerich TM, Gioia GA, et al. Centers for Disease Control and Prevention guideline on the diagnosis and management of mild traumatic brain injury among children. *JAMA Pediatrics*. 2018;172(11):e182853-e.
- (22) Department of Veterans Affairs, Department of Defense. VA/DoD clinical practice guideline for the management of concussion--mild traumatic brain injury [Internet]: Department of Veterans Affairs, Department of Defense; 2016 [cited 2019 Oct 25]. Available from: <https://www.healthquality.va.gov/guidelines/Rehab/mtbi/mTBICPGFullCPG50821816.pdf>
- (23) Scottish Intercollegiate Guidelines Network. Brain injury rehabilitation in adults [Internet]. Edinburgh (UK): The Network; 2013 [cited 2019 Oct 25]. Available from: <https://www.sign.ac.uk/assets/sign130.pdf>
- (24) National Institute for Care and Health Excellence. Head injury: assessment and early management [Internet]. London (UK): The Institute; 2014 [cited 2019 Oct 25]. Available from: <https://www.nice.org.uk/guidance/cg176>
- (25) Reed N, Zemek R, Dawson J, Ledoux A, al. e. Living guideline for diagnosing and managing pediatric concussion [Internet]. Toronto (ON): Ontario Neurotrauma Foundation; 2019 [cited 2019 Oct 25]. Available from: <https://braininjuryguidelines.org/pediatricconcussion/>
- (26) King NS, Crawford S, Wenden FJ, Moss NE, Wade DT. The Rivermead Post Concussion Symptoms Questionnaire: a measure of symptoms commonly experienced after head injury and its reliability. *J Neurol*. 1995;242(9):587-92.
- (27) Kontos AP, Elbin RJ, Schatz P, Covassin T, Henry L, Pardini J, et al. A revised factor structure for the Post-Concussion Symptom Scale: baseline and postconcussion factors. *Am J Sports Med*. 2012;40(10):2375-84.
- (28) Levy C, Langer L, Bayley M. Evaluating access to appropriate concussion care in Ontario. Poster presented at: American Congress of Rehabilitation Medicine; 2013; Orlando, FL.

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