

LIVING GUIDELINE FOR DIAGNOSING AND MANAGING PEDIATRIC CONCUSSION

Family Version



Ontario Neurotrauma Foundation
Fondation ontarienne de neurotraumatologie





Living Guideline for Diagnosing and Managing Pediatric Concussion

In 2019, the Ontario Neurotrauma Foundation worked with concussion experts and researchers to create a living clinical practice guideline for pediatric concussion. The guideline is living because it is continually updated as new research becomes available. Using the most up-to-date evidence, we developed recommendations, tools and resources to support healthcare professionals to diagnose and manage concussion in children and adolescents aged 5-18 years. We reviewed the clinical guideline recommendations and created a summary of the most important information that you need to know as a family member, parent or caregiver of a child/adolescent with concussion. Like the guideline, this document is divided into three sections:

- A. Concussion Recognition, Assessment & Management**
- B. Managing Concussion Symptoms**
- C. Biomarkers**

In each section you will find information from the guideline written in question and answer format. For many of the questions, the clinical recommendations they align with are listed in a teal coloured box.

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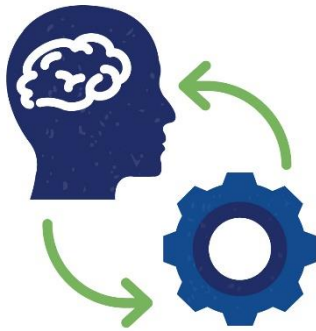
Clinical Recommendations: 1.1

At the end of this document you will see links to concussion resources and the full list of clinical recommendations to help your child manage concussion.

This document was reviewed by persons and families with lived experience in concussion. If you have questions or would like to give feedback on this resource, please contact **coordinator@onf.org**.

SECTION A: Concussion Recognition, Initial Medical Assessment & Management

Concussion Recognition and Directing to Care



What is a concussion?

A concussion is a type of brain injury that affects how the brain works and body feels.

What causes a concussion?

Any blow or hit to the head, face, neck or body that causes sudden shaking of the head can cause a concussion. Concussions can happen in many ways such as from falling or colliding in sports or while playing, motor vehicle collisions or being hit by an object.

What are the symptoms of a concussion?

Symptoms of concussion describe how someone feels after their injury. A child/adolescent does not have to be knocked out or unconscious to have a concussion. Some symptoms may not appear until the next day. Common symptoms of a concussion are:

- Headache or head pressure
- Dizziness
- Nausea or vomiting
- Blurred or fuzzy vision
- Sensitivity to light or sound
- Balance problems
- Feeling slow, tired or having no energy
- Not thinking clearly

When should I suspect a concussion?

A concussion should be suspected in any child/adolescent who takes a blow to the head, face, neck or body and shows ANY of the signs or symptoms of a concussion. Use the **Concussion Recognition Tool 5**© to help you identify a concussion in children, adolescents and adults.

Clinical Recommendation: 1.4

For information about concussion in adults, see the **Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms 3rd Edition for Adults Over 18 Years of Age**.

What should I do if a child/adolescent may have a concussion?

If you think a child/adolescent has had a concussion:

1. Remove them from the activity right away and look for **red-flag symptoms** (see below). This will avoid another injury and give you a chance to monitor them for concussion symptoms.
2. Bring the child/adolescent to a doctor or nurse practitioner to confirm the diagnosis of concussion as soon as possible. Don't leave them alone or let them return-to-sport (practice or gameplay) or other activities.

Clinical Recommendations: 1.2, 1.3, 1.4

What should I do if I'm not sure if a child/adolescent has a concussion?

If you are unsure if a child/adolescent has a concussion, follow the "*If in doubt, sit them out*" rule. Bring the child/adolescent to a doctor or nurse practitioner to confirm the diagnosis of concussion as soon as possible.

Clinical Recommendation: 1.4, 2.1

What should I do if a child/adolescent shows **red flag symptoms**?

Red flag symptoms are danger signs that indicate a more serious injury. Symptoms may appear right away or several hours up to a couple of days after the injury.

Red flag symptoms:

- Severe or worsening headache
- Neck pain or tenderness
- Double vision
- Weakness or numbness in arms/legs
- Seizure or convulsions
- Loss of consciousness
- Increase in confusion
- Repeated vomiting
- Increase in restless, agitated or aggressive behaviour
- Slurred speech

If the child/adolescent shows any red flags symptoms, they need an emergency medical assessment right away. Call an ambulance or bring them to the hospital as soon as possible. If you call an ambulance, describe the specific red flag symptoms over the phone. Severe brain swelling (cerebral edema) after a concussion is very rare but can be fatal.

Clinical Recommendations: 1.2, 1.3

Initial Medical Assessment and Management of Concussion



A thorough medical assessment by a doctor or nurse practitioner should be performed on all children/adolescents with a suspected concussion.

What will happen during a medical assessment for concussion?

1. The doctor or nurse practitioner will make sure that the child/adolescent does not have any life-threatening injuries to the brain or spine.
2. They will take a medical history and do a physical exam on the child/adolescent. This will help them confirm if the child/adolescent has a concussion and determine if they have any other injuries or a high risk for a prolonged recovery.

Clinical Recommendation: 2.1

Here are some questions the doctor or nurse practitioner may ask your child/adolescent:



- *How did you hit your head?*
- *What are your concussion symptoms?*
- *Do you have any past and present mental health conditions?*
- *Are you using any substances or medications?*
- *Do you have any other medical conditions that were present before the concussion?*

What information should I ask for before leaving the doctor's office or Emergency Department?



- Discharge note with the results of the medical assessment
- Overview of what to expect during recovery
- Warning signs to bring child/adolescent to hospital for emergency medical exam
- Information on how and when to make a gradual return-to-school and low-risk physical activities
- Strategies for modifying activity and managing symptoms
- Information on when your child/adolescent gets medical clearance to participate in full-contact sports or high-risk activities
- Information on making a follow-up medical appointment

Clinical Recommendations: 2.7, 2.10

When should a child/adolescent return for a follow-up medical exam?

A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if symptoms get worse.

Clinical Recommendation: 2.8

Will the child/adolescent need an x-ray, CT scan or MRI?

Most children/adolescents with a concussion do not need an x-ray, CT scan or MRI. If a doctor or nurse practitioner thinks there might be an injury to the structure of the brain, then they will make an urgent referral to an Emergency Department.

Clinical Recommendation: 2.1

How long does it take to recover from a concussion?

Most children/adolescents will recover within 4 weeks after a concussion, but it can take longer for some. Some children/adolescents have prolonged or persistent symptoms after concussion (post-concussion syndrome). These are new or ongoing symptoms after the concussion that last longer than 4 weeks.

The child/adolescent's initial and follow up medical assessments can help the doctor or nurse practitioner figure out if the child/adolescent has a high risk of experiencing a prolonged recovery from a concussion.

Clinical Recommendation: 2.2

How much rest do children/adolescents need after a concussion?

Resting for the first 24-48 hours is important. Complete rest (no physical or thinking activity) longer than the first 24-48 hours after a concussion is not recommended and may cause more harm than good. After 24-48 hours of rest, the child/adolescent should start activities (physical and thinking) that do not make symptoms worse or bring on new symptoms.

Clinical Recommendation: 2.3

When can children/adolescents return-to-activity after a concussion?

Children/adolescents should make a step-by-step return-to-activity and school after a concussion.

- After 24-48 hours of rest, the child/adolescent should start activities (physical and thinking) that do not make symptoms worse or bring on new symptoms. Avoid activities with risk of contact, collision or falling. This can start even if they still have symptoms.
- Easing into gentle activities is encouraged. Spreading activities out over the day to allow for periods of rest may help children/adolescents achieve more and feel better.
- Use the steps below to guide this gradual process. Each step should take about one day. If symptoms get worse, go back to the last step. Try it again until the child/adolescent can do it without bringing on new symptoms or making symptoms worse. It is important to get a doctor's note before returning to full contact.

Return-to-activity/sport steps:

Steps	Activity	Example
1	Physical and cognitive activities that do not make the child/adolescent feel worse	Walking at home or in school
2	Light physical activity	Jogging or stationary cycling at slow to medium speed. No weight training.
3	Sport-specific exercise	Running or skating drills. No drills with risk of head injury.
4	Non-contact activities	Practice without body contact. Gym class activities without risk of head injury.
5	Full-contact activities	Full activities/sports practices after doing full-time school and getting a doctor's note
6	Return to all activities and sports	Normal full-contact game play

Return-to-school steps:

Steps	Activity	Example
1	Activities at home that do not make the child/adolescent feel worse	Reading, texting, screen time and other activities that do not worsen symptoms. Start at 5-15 minutes at a time.
2	School activities	Homework, reading or other activities outside of the classroom
3	Return-to-school part-time	Getting back to school for a few hours or half days
4	Return-to-school full-time	Gradual return to full days at school

Clinical Recommendation: 2.3, 3.3



Note. If children/adolescents go back to sports too early after a concussion, they may have another brain injury. Having another injury make symptoms worse, slow down recovery and may cause a more severe injury. In rare cases, another injury can be fatal.

Is sleep important for concussion recovery?

Sleep is important for concussion recovery. It can help improve concussion symptoms such as mood issues, anxiety, pain and fatigue if they are present. Encourage children/adolescents to keep a consistent sleep schedule following a concussion.

Clinical Recommendation: 2.4

When can children/adolescents see their social networks after a concussion?

Keeping strong social networks can be good for recovery. These connections lower the risk of social isolation and mental health issues. After resting for the first 24-48 hours after a concussion, children/adolescents can start to see their peers, classmates and teammates. These visits can be in person or online.

Avoid social activities that worsen symptoms, bring on new symptoms or risk re-injury. Some social activities might need to be modified so that children/adolescents with a concussion can participate safely.

Clinical Recommendation: 2.4

How much screen time is OK for children/adolescents after a concussion?

Computers, phones and other devices with screens may make concussion symptoms worse, especially in the first few days after concussion. After resting for the first 24-48 hours after injury, children and adolescents can gradually start using devices with screens again. Avoid using screens if it makes symptoms worse or brings on new symptoms. Limit screen time during the hour before bedtime.

Clinical Recommendation: 2.4

How do alcohol and recreational drugs affect concussion recovery?

Alcohol and recreational drugs may have a negative effect on concussion recovery. Using recreational drugs and alcohol can make it hard to tell if symptoms are getting worse. Impairment due to alcohol or recreational drugs may increase the risk of falling or hitting your head after a concussion. Alcohol or recreational drugs should not be used to relieve symptoms.

Clinical Recommendation: 2.4

When can an adolescent drive after a concussion?

Driving should be avoided during the first 48 hours after concussion, even if no concussion symptoms are present. This may prevent motor vehicle accidents and further injury to the adolescent or to others. Adolescents can begin driving again when they can concentrate enough to feel safe behind the wheel and if does not cause symptoms to worsen or bring on new symptoms.

Driving is a complex coordinated process. It requires vision, balance, reaction time, judgment, cognition and attention to be done safely. A concussion can affect some or all of these skills. Driving impairments can exist even in people who do not have concussion symptoms 48 hours after a concussion.

Clinical Recommendation: 2.4

Medical Follow-up and Management of Prolonged Symptoms



When should a child or adolescent have a follow-up medical assessment for post-concussion symptoms?

Children/adolescents need a medical follow-up when:

1. They have post-concussion symptoms 1-2 weeks after injury.
2. They start to feel worse.
3. Their symptoms have not gone away after 4 weeks.

Depending on their symptoms, children/adolescents might be referred to a qualified specialty clinic (interdisciplinary team) with experience in concussion. The specialty clinics should practice consistently with established **Standards for Post Concussion Care**, including direct access to a physician with experience in concussion management.

Clinical Recommendations: 3.1, 3.4



What is an interdisciplinary team?

Health care/services provided by a grouping of different types of practitioners, often multiple disciplines. Interdisciplinary care requires collaboration and communication around the needs of the patient, respecting practice scopes and the qualifications brought by the different providers. It may also be known as inter-professional practice.

Medical Clearance for Full-Contact Sport or High-Risk Activity



When can children/adolescents return to full-contact sports, gameplay and higher-risk activities?

Children/adolescents need medical clearance from a doctor or nurse practitioner to return to full-contact sports or high-risk activities. These decisions are based on the child/adolescent and the results of the medical follow-up assessment.

- There is no test that we can use to find out if a child/adolescent has made a full recovery from their concussion.
- The child/adolescent should return to all school activities, including writing exams without accommodations for their concussion symptoms, before getting medical clearance to return to full-contact sports or high-risk activities.
- Children and adolescents with complex medical histories may need to see a qualified specialist with experience in concussion to help with return-to-play decisions.

Clinical Recommendations: 4.1, 4.2

What if a child or adolescent shows new concussion symptoms after they have medical clearance to return to all activities?

Children/adolescents with medical clearance should seek medical attention right away if they develop new concussion symptoms or think they have a new concussion. Use the **Concussion Recognition Tool 5**© to help you identify a concussion in children, adolescents and adults.



Sport Concussion Considerations

Should children/adolescents have baseline concussion testing?

Mandatory pre-season baseline testing is not recommended for children/adolescents. The current evidence does not support an added benefit of baseline testing.

Clinical Recommendations: 5.1, 5.2, 5.3

Parachute Canada (2018) Statement on Concussion Baseline Testing in Canada:

“Baseline testing refers to the practice of having an athlete complete certain concussion assessment tools/tests prior to sports participation to provide baseline measurements that can be compared to post-injury values in the event of a suspected concussion....In general, current evidence does not support a significant added benefit of baseline testing athletes.... However, there may be unique athlete populations and sports environments where baseline testing may be considered. These situations should be considered the exception and not the rule.”

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Parachute Statement on Baseline Testing

Return-to-School and Work



A gradual return-to-school, activity and work is the best way to make sure that the children/adolescents remain symptom-free when they fully engage in school and related activities. Children/adolescents can miss some school after concussion, but it is important that they do not get in the habit of it. At school, children and adolescents can connect with their friends and classmates. This type of social support is good for their recovery.

When can my child go back to school after a concussion?

After resting for the first 24-48 hours after a concussion, children/adolescents can begin a step-by-step return-to-school, activities and sport as their symptoms get better. Medical clearance is not needed to return-to-school, but it is required for return to full-contact sport or gameplay.

The child/adolescent should return-to-school full-time **before** returning to full-contact sport or high-risk activities. This means that they have a full academic load and can write exams without accommodations related to their concussion or post-concussion symptoms.

The return-to-school process should involve many different people:

- Child/adolescent
- Parents/caregivers
- Healthcare professionals
- School-based professionals

The school’s concussion management team and/or contact person (e.g., guidance counsellor, principal/vice principal, teacher, etc.) should be responsible for coordinating this process and communicating with everyone involved.

Clinical Recommendations: 12.1, 12.5

If a child/adolescent is having difficulties at school, what are strategies that may help?

If a child/adolescent has difficulties at school after their concussion, they should have another medical assessment. They may also need a referral to an interdisciplinary team (i.e., health care/services provided by a grouping of different types of practitioners respecting practice scopes and the qualifications brought by the different providers).

- Make changes to school workload and schedule to help the child/adolescent get back to their regular school routine.
- Modify accommodations as symptoms get better.
- Continue to encourage children/adolescents with school difficulties to participate in thinking and physical activities once they feel well enough.

Even if children/adolescents have symptoms, it is important that they start a step-by-step return to these activities. Avoid activities that make their symptoms worse or bring on new symptoms.

Clinical Recommendation: 12.4

When can my adolescent return-to-work following a concussion?

For adolescents who work, encourage them to return-to-school before returning to work.

For more information, please read the **Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms 3rd Edition for Adults Over 18 Years of Age** for recommendations on how to work with their employer to return-to-work safely. After a concussion, adolescents might need accommodations so that they can gradually return-to-work while promoting their recovery.

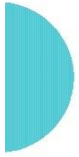
Clinical Recommendation: 12.6

What role do school boards, sports organizations, and community centres play in concussion?

Before the start of the season, school boards, sports organizations and community centres should review their concussion policies and make sure they are up-to-date. There should be policies in place to recognize concussions when they happen and make accommodations for children/adolescents with concussion.

School boards, sports organizations and community should also offer concussion education to make sure their staff know the policies. Be sure to speak with your child/adolescent's school and sport organization so that you know their concussion policy and protocol.

Clinical Recommendation: 1.1



SECTION B: MANAGING CONCUSSION SYMPTOMS

Headache

Is it common for children/adolescents to experience headache after concussion?

Headache is one of the most common symptoms reported by children/adolescents with concussion. In most cases, headache caused by concussion gets better within 4 weeks of injury along with other concussion symptoms.

Children/adolescents experiencing headache after concussion require regular medical checkups. A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if headache symptoms get worse.



What I can do to help a child/adolescent who has headache caused by concussion?

Encourage the child/adolescent to sleep well and be active daily to help manage headache after a concussion.

Children/adolescents can get back to activities (no risk of contact, collision or falling) whenever the headache improves enough to allow it. Participating in activities is encouraged, even if they still have symptoms.

Avoid activities that make them feel worse or bring on new symptoms. If possible, modify activities so that children/adolescents can participate without feeling worse.

Clinical Recommendation: 6.2

What medications can children/adolescents take to treat headache?

Medications such as acetaminophen (i.e., Tylenol) and ibuprofen (i.e., Advil) may be recommended to treat headache. Avoid “around-the-clock” (continuous) use of medications and limit using these medications to less than 15 days per month.

Regular, long-term use of pain relievers can cause rebound or overuse headache. This means that children and adolescents should not take over-the-counter medication at regularly scheduled times during the day.

Clinical Recommendation: 6.2

Sleep



Sleep is important for concussion recovery. It can help improve concussion symptoms like mood issues, anxiety, pain and fatigue.

Symptoms depend on the person and can be different from day-to-day. Some children/adolescents can have trouble sleeping after a concussion. Some might have a hard time falling asleep or staying asleep at night, while others struggle with oversleeping during the day.

Medication use and mental health issues may also affect sleep. A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if sleep issues get worse.

How can my child/adolescent improve their sleep?

Encourage children/adolescents to keep a consistent sleep schedule following a concussion. Participating in physical and thinking activities (no risk for contact, collision or falling) can improve sleep. Children/adolescents who have night-time sleep issues should avoid naps (unless it is part of the younger child's typical routine). This will promote night-time sleep and gradual return-to-activity.

Clinical Recommendation: 7.2



To promote good sleep and alertness, make sure the child/adolescent:

- ✓ Keeps the same sleep and wake times during the week and on weekends throughout the year
- ✓ Has a fixed bedtime routine
- ✓ Turns off the computer and electronic devices including cell phones, at least 30 minutes before bedtime
- ✓ Limit naps to 30 minutes once a day and avoid napping after 3pm
- ✓ Encourage napping in bed and not in another room or in front of the TV

From **Strategies to Promote Good Sleep and Alertness** (ONF, 2019)

Mental Health



How does a concussion affect children/adolescent's mental health?

Concussions can affect mood and emotions. Children/adolescents who had mental health conditions before having a concussion are at a high risk for mental health issues after a concussion.

Noticing mental health symptoms and disorders early can help keep pre-existing problems from getting worse. It can also prevent or lower the impact of other issues such as learning or behaviour problems and avoiding school.

Staying connected with peers, friends and teammates is encouraged for children/adolescents with concussion.

Clinical Recommendation: 8.1, 8.2

When should my child/adolescent see a healthcare professional about their mood and emotions?

Mental health symptoms or conditions should be treated as early as possible to prevent them from becoming a long-term problem.

- A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if symptoms get worse.
- If a child/adolescent has long lasting or urgent mental health symptoms, their doctor might refer them to local healthcare professional, specialized pediatric concussion program, or to a specialist with experience in pediatric mental health.

Clinical Recommendation: 8.3

Cognition



Children/adolescents may have trouble with speech, learning, attention, memory and information processing after a concussion. A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if cognitive symptoms get worse.

What information is helpful to share with healthcare professionals treating a child/adolescent with post-concussion cognition problems?

- Recent vision or hearing assessments
- Previous school records including teacher observations
- Information about mood/emotions and pre-existing mental health conditions
- Update on the return-to-school, activity and sports progress
- How much school the child or adolescent has missed

Clinical Recommendations: 9.1, 9.2

Vision, Vestibular and Oculomotor Function



After a concussion, children and adolescents may experience symptoms such as:

- Dizziness
- Blurred/double vision
- Vertigo
- Balance issues
- Difficulty focusing
- Motion sensitivity
- Headache while reading

Depending on their symptoms, the child/adolescent may be screened for visual, vestibular and oculomotor problems. A follow-up medical exam is suggested 1-2 weeks after concussion and if symptoms last longer than 4 weeks. An immediate medical exam is required if symptoms get worse.

What can children/adolescents with vision, vestibular and/or oculomotor symptoms do to improve with vision, vestibular and/or oculomotor symptoms?

Children/adolescents with post-concussion vestibular, vision, or oculomotor symptoms should participate in cognitive activity and low-risk physical activity as soon as they feel well enough.

Start activities at a level that does not make symptoms worse or bring on new symptoms. It's OK to start activities (no risk of contact, collision, or falling) even if they still have mild symptoms. The child/adolescent might need accommodations to help them get back to school or other activities.

Clinical Recommendation: 10.8

Fatigue



Physical and/or mental fatigue is common following a concussion. Fatigue is defined as feeling tired or weary after physical and/or mental effort. Sometimes mood and stress can make fatigue feel worse. A follow-up medical exam is suggested 1-2 weeks after concussion and if fatigue last longer than 4 weeks. An immediate medical exam is required if fatigue symptoms get worse.

What can children/adolescents do to improve fatigue?

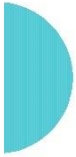
Encourage children/adolescents to participate in low risk physical and mental activities that do not bring on symptoms or make symptoms worse.

Clinical Recommendations: 11.2, 11.3



Tips for helping children/adolescents cope with fatigue:

- ✓ Spreading activities throughout the day to avoid doing too much at once
- ✓ Encouraging good diet and hydration
- ✓ Encouraging good sleep hygiene (See "Sleep" above)
- ✓ Avoiding daytime napping
- ✓ Identifying the triggers of fatigue
- ✓ Using a notebook/diary to plan meaningful goals, record activity achievement and identify patterns of fatigue

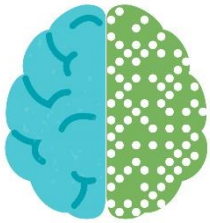


SECTION C: Biomarkers

What are biomarkers?

Biomarkers are substances found naturally in the tissues, cells and fluid of the body. Biomarkers can be measured and used as a sign of a condition or disease.

Neuroimaging Biomarkers



What is neuroimaging?

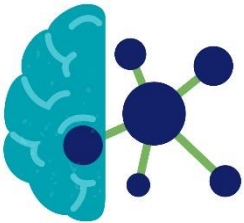
Neuroimaging is the process of taking pictures of the brain.

Can neuroimaging help identify and treat concussions?

At this stage, brain imaging biomarkers are not ready to be used for identifying and treating concussions.

Clinical Recommendation: 13.1

Serologic (Blood) Biomarkers



Is there a concussion blood test?

There is no concussion blood test that can detect concussion in children/adolescents. Using serologic (blood) biomarkers is not recommended for diagnosing concussion.

Clinical Recommendation: 14.1

Tools for Recognizing Concussions

- Concussion Recognition Tool 5 ©
- Concussion Recognition & Response™

Concussion Information and Education

- Concussion Do's and Don'ts (Ontario Neurotrauma Foundation)
- Post-Concussion Information Sheet (Ontario Neurotrauma Foundation)
- Concussion Care and Recovery Pathway (Ontario Neurotrauma Foundation)
- Concussion Ed App (Parachute)
- Information for Families, Coaches and Teachers (Ontario Neurotrauma Foundation)
- Concussion and You – A Handbook for Parents and Kids (Holland Bloorview)
- Concussion Kit: Understanding and Managing Concussion in Youth (Montreal Children's Hospital)
- Hospital Discharge Instructions following a Concussion (Montreal Children's Hospital)
- Interview Guide: Questions to Ask Healthcare Providers (Ontario Neurotrauma Foundation)
- Strategies to Promote Good Sleep and Alertness (Ontario Neurotrauma Foundation)
- Sleep for Children and Youth (Children's Hospital of Eastern Ontario)
- Headache and Medication Diary (Boston Children's Hospital)
- "Four P's" – Prioritize, Plan, Pace and Position (Holland Bloorview)
- Heads UP Discharge Instructions (Centers for Disease Control and Prevention)

Return-to-School and Sport

- Return-to-School Strategy (Concussion Awareness Training Tool)
- Return-to-Sport Strategy (Concussion Awareness Training Tool)
- Return-to-Activity: Work Considerations (Ontario Neurotrauma Foundation)
- Advice for gradually resuming intellectual, physical and sports activities (INESSS-Quebec)
- Baseline Testing Fact Sheet (Parachute)

Websites

- [ConcussionsOntario.org](https://www.concussionsontario.org)
- [Parachute.ca](https://www.parachute.ca)
- [CDC.gov/headsup](https://www.cdc.gov/headsup)



Clinical Guideline Recommendations for Healthcare Professionals

The information above is based on the Living Guideline for Diagnosing Pediatric and Managing Pediatric Concussion. Learn more at braininjuryguidelines.org/pediatricconcussion.

SECTION A

Concussion Recognition and Directing to Care

- 1.1a** School boards, sports organizations, and community centres should provide pre-season concussion education and conduct a review of all concussion policies in effect within the school or sport setting.
- 1.1b** School boards, sports organizations, and community centres should ensure updated policies are in place to recognize and accommodate a child/adolescent who has sustained a concussion.
- 1.2** Remove the child/adolescent from the activity immediately if a concussion is suspected for immediate assessment and to avoid another injury.
- 1.3** Recommend an emergency medical assessment for a child/adolescent with any of the “red flag” symptoms.
- 1.4** Concussion should be suspected and diagnosed as soon as possible to maintain health and improve outcomes. Concussion can be suspected in the community by healthcare professionals, parents, teachers, coaches, and peers. Those with a suspected concussion should be referred to a physician or nurse practitioner to perform a comprehensive medical assessment to exclude more severe injuries, consider a full differential diagnosis, and confirm the diagnosis of concussion.

Initial Medical Assessment and Management

- 2.1** Physicians or nurse practitioners should perform a comprehensive medical assessment on all children/adolescents with a suspected concussion or with acute head or spine trauma.
 - 2.1a** Take a comprehensive clinical history.
 - 2.1b** Note common modifiers that may delay recovery and use a clinical risk score to predict risk of prolonged symptoms.
 - 2.1c** Perform a comprehensive physical examination.
 - 2.1d** Consider CT of the brain or cervical spine only in patients with acute head trauma in whom, after a medical assessment, a structural intracranial or cervical spine injury is suspected; do not conduct routine neuroimaging for the purpose of diagnosing concussion.
- 2.2** Provide verbal information and written (electronic) handouts regarding the course of recovery and when the child/adolescent can return-to-school/activity/sport/work.
- 2.3** Recommend graduated return to cognitive and physical activity to promote recovery.
 - 2.3a** Recommend an initial 24-48 hour period of rest with limited physical and cognitive activity.
 - 2.3b** Recommend that low to moderate level physical and cognitive activity be gradually started 24-48 hours after a concussion at a level that does not result in recurrence or exacerbation of symptoms. Activities that pose no/low risk of sustaining a concussion should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.
 - 2.3c** Recommend that patients avoid activities associated with a risk of contact, fall, or collisions such as high speed and/or contact activities and full-contact sport that may increase the risk of sustaining another concussion during the recovery period.
- 2.4** Provide education and guidance regarding strategies to promote recovery.
 - 2.4a** Advise on the importance of sleep and discuss sleep hygiene.
 - 2.4b** Advise on maintaining social networks and interactions as tolerated beyond a brief initial period of cognitive and physical rest (24-48 hours after injury).
 - 2.4c** Advise on the use of computers, phones, and other and other devices with screens. Beyond an initial period of cognitive and physical rest (24-48 hours after injury), use of devices with screens may be gradually resumed at a level that does not result in recurrence or exacerbation of symptoms.
 - 2.4d** Advise on avoiding alcohol and other recreational drugs after a concussion.
 - 2.4e** Advise to avoid driving during the first 24-48 hours after a concussion. Advise patients to begin driving when they are feeling improved, can concentrate sufficiently to feel safe behind the wheel, and when the act of driving does not provoke significant concussion symptoms.
- 2.5** Over-the-counter medications such as acetaminophen and ibuprofen may be recommended to treat acute headache. Advise on limiting the use of these medications to less than 15 days a month and avoiding “around-the-clock” dosing to prevent overuse or rebound headaches (i.e., advise that children/adolescents avoid using over the counter medications at regular scheduled times throughout the day).
- 2.6** At present, there is limited evidence to support the administration of intravenous medication to treat acute headaches in pediatric concussion patients in the Emergency Department setting.

- 2.7 After assessment, nearly all children/adolescents with concussion may be safely discharged from clinics and Emergency Departments for observation at home.
- 2.8 Recommend a medical follow-up in 1-2 weeks to re-assess and monitor clinical status. Recommend an immediate medical follow-up in the presence of any deterioration.
- 2.9 Consider referral to an interdisciplinary concussion team in the presence of modifiers that may delay recovery.
- 2.10 Provide post-concussion information and a written medical assessment to the child/adolescent and the parent/caregiver prior to sending the child/adolescent home.

Medical Follow-up and Management of Prolonged Symptoms

- 3.1 Perform a repeat medical assessment on all patients presenting with post-concussion symptoms 1-2 weeks following acute injury.
- 3.1a Take a focused clinical history based on symptoms described.
- 3.1b Examine the child/adolescent and perform a focused physical examination.
- 3.1c Recommendation 2.1d: Consider diagnostic brain or cervical spine MRI imaging for those with focal or worrisome symptoms.
- 3.2 Provide patients with general education and guidance that outlines mental health considerations, non-pharmacological strategies to minimize symptoms including sleep hygiene, activity modifications, limiting triggers, information on screen time, the importance of social interaction, and how to work with the school team to facilitate school success.
- 3.3 Encourage patients with post-concussion symptoms to engage in cognitive activity and low-risk physical activity as soon as tolerated while staying below their symptom-exacerbation thresholds. Activities that pose no/low risk of sustaining a concussion (no risk of contact, collision, or falling) should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.
- 3.4 Refer to specialized care with an interdisciplinary concussion team if post-concussion symptoms do not gradually resolve by 4 weeks.
- 3.5 Consider early referral (prior to 4-week post-injury) to an interdisciplinary concussion team in the presence of modifiers that may delay recovery.
- 3.6 Consider initiating treatment for specific symptoms or concerns while waiting for a referral to an interdisciplinary concussion team or sub-specialist.
- 3.7 Recommend regular medical follow-up if a child/adolescent is still experiencing post-concussion symptoms or has not completed the return-to-school or return-to-sport/activity stages. Recommend an immediate medical follow-up in the presence of any deterioration.

Medical Clearance for Full-Contact Sport or High-Risk Activity

- 4.1 Consider patients for medical clearance to return to full-contact activities and sport/game play if clinical criteria have been met.
- 4.2 Provide patients with a letter indicating medical clearance to return to all activities when medically cleared.
- 4.3 Advise medically cleared patients to seek immediate medical attention if he or she develops new concussion-like symptoms or sustains a new suspected concussion.

Sport Concussion Considerations

- 5.1 Refer a child/adolescent with multiple concussions or baseline conditions associated with concussion-like symptoms to an interdisciplinary concussion team to help with return to full-contact sports or high-risk activities, or retirement decisions from full-contact sports, or high-risk activities.
- 5.2 Baseline testing on children/adolescents using concussion assessment tools or tests (or any combination of tests/tools) is not recommended or required for concussion diagnosis or management following an injury.
- 5.3 Special considerations regarding baseline testing.

Return-to-School and Work

- 12.1 Recommend a stepwise return-to-school plan and monitor once the student is ready to start a graduated return-to-school. Include temporary accommodations based on symptoms and recommendations from the healthcare professional. Modify the return-to-school plan based on ongoing assessment of symptoms.
- 12.2 Assess for school difficulties using clinical judgment.
- 12.3 Manage school difficulties.
- 12.4 Encourage patients with school difficulties to engage in cognitive activity and low-risk physical activity as soon as tolerated while staying below their symptom-exacerbation thresholds. Activities that pose no/low risk of sustaining a concussion (no risk of contact,

collision, or falling) should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.

Mental Health

- 8.1 Assess existing and new mental health symptoms and disorders.
 - 8.2 Assess the child/adolescent's broader environment, including family and caregiver function, mental health, and social connections.
 - 8.3 Treat mental health symptoms or refer to a specialist in pediatric mental health.
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SECTION B

Headache

- 6.1 Perform a repeat medical assessment on all patients presenting with post-concussion headaches 1-2 weeks following acute injury.
 - 6.1a Take a focused clinical history.
 - 6.1b Perform a focused physical examination.
 - 6.1c Consider diagnostic brain or cervical spine MRI imaging for those with focal or worrisome symptoms.
 - 6.1d Classify and characterize the headache subtype based on the clinical history and physical examination findings.
 - 6.2 Provide general post-concussion education and guidance on headache management.
 - 6.2a Advise on non-pharmacological strategies to minimize headaches including sleep hygiene, activity modifications, limiting triggers, and information on screen time.
 - 6.2b Encourage patients with headaches to engage in cognitive activity and low-risk physical activity as soon as tolerated while staying below their symptom-exacerbation thresholds. Activities that pose no/low risk of sustaining a concussion (no risk of contact, collision, or falling) should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.
 - 6.2c Consider suggesting the use of a headache and medication diary in order to monitor symptoms and medications taken. Use clinical judgment and an individualized approach on use or duration of this strategy.
 - 6.2d Over-the-counter medications such as acetaminophen and ibuprofen may be recommended to treat acute headache. Advise on limiting the use of these medications to less than 15 days a month and avoiding "around-the-clock" dosing to prevent overuse or rebound headaches. I.e., advise that children/adolescents avoid using over the counter medications at regular scheduled times throughout the day.
 - 6.3 Refer patients who have prolonged post-concussion headaches for more than 4 weeks to an interdisciplinary concussion team or to a sub-specialist for further evaluation and management.
 - 6.4 Consider initiating pharmacological therapy to treat and manage prolonged headaches while waiting for the interdisciplinary concussion team or sub-specialist referral.
 - 6.5 Recommend a medical follow-up to reassess clinical status if headaches persist. Recommend an immediate medical follow-up in the presence of any deterioration. Consider early referral (prior to 4-weeks after the acute injury) to an interdisciplinary concussion team in the presence of modifiers that may delay recovery.
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Sleep

- 7.1 Perform a repeat medical assessment on all patients presenting with post-concussion sleep disturbances 1-2 weeks following acute injury.
 - 7.2 Provide general education and guidance on sleep hygiene that outlines non-pharmacological strategies to improve sleep.
 - 7.2a Continue to encourage patients with sleep disturbances to engage in sub-symptom threshold cognitive activities and physical activities that pose no/low risk of sustaining a concussion (no risk of contact, collision, or falling) as soon as tolerated.
 - 7.3 Consider managing patients who experience sleep-wake disturbances for more than 4 weeks with cognitive behavioural therapy, treat with daily supplements, and/or refer to an interdisciplinary concussion team.
 - 7.4 Refer patients with prolonged post-concussion sleep disturbances (more than 6 weeks) to a sleep specialist or an interdisciplinary concussion team if the interventions introduced at 4 weeks have been unsuccessful and sleep issues persist.
 - 7.5 Consider prescribing medication on a short-term basis if sleep has not improved after 6 weeks following the acute injury.
 - 7.6 Recommend a medical follow-up to reassess clinical status if sleep disturbances persist. Recommend an immediate medical follow-up in the presence of any deterioration. Consider early referral (before 4 weeks) to an interdisciplinary concussion team in the presence of modifiers that may delay recovery.
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Cognition

- 9.1 Evaluate a child/adolescent for cognitive symptoms that interfere with daily functioning following the acute injury.
- 9.2 Manage cognitive symptoms that interfere with daily functioning for more than 4 weeks following acute injury.

Vision, Vestibular, and Oculomotor Function

- 10.1 Perform a repeat medical assessment on all patients presenting with dizziness, blurred or double vision, vertigo, difficulty reading, postural imbalance, or headaches elicited by prolonged visual or vestibular stimulation 1-2 weeks following acute injury.
- 10.2 Screen for oculomotor or vision deficits.
- 10.3 Screen for benign paroxysmal positional vertigo (BPPV) if the patient reports vertigo or dizziness that occurs for seconds following position changes and consider targeted particle re-positioning manoeuvres.
- 10.4 Screen for vestibulo-ocular deficits.
- 10.5 Screen for balance deficits.
- 10.6 Screen for and consider underlying psychosocial contributors of vestibular, vision, and oculomotor dysfunction.
- 10.7 Provide general post-concussion education that outlines symptoms of concussion, provides suggestions regarding activity modification and includes academic accommodations to manage visual, vestibular and oculomotor symptoms.
- 10.8 Encourage patients with post-concussion vestibular, vision, or oculomotor symptoms to engage in cognitive activity and low-risk physical activity as soon as tolerated while staying below their symptom-exacerbation thresholds. Activities that pose no/low risk of sustaining a concussion (no risk of contact, collision, or falling) should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.
- 10.9 Refer patients with prolonged post-concussion vestibular functioning, balance or visual dysfunction (more than 4 weeks following the acute injury) to an interdisciplinary concussion team with appropriate experience. Consider early referral (before 4 weeks) to an interdisciplinary concussion team in the presence of modifiers that may delay recovery.
- 10.10 Recommend a medical follow-up to reassess clinical status if vestibular functioning, balance or visual dysfunction symptoms persist. Recommend an immediate medical follow-up in the presence of any deterioration.

Fatigue

- 11.1 Perform a repeat medical assessment on all patients presenting with post-concussion fatigue 1-2 weeks following acute injury.
- 11.2 Provide patients with post-concussion fatigue with general education and guidance that outlines non-pharmacological strategies to help cope with fatigue symptoms and set expectations.
- 11.3 Encourage patients with post-concussion fatigue to engage in cognitive activity and low-risk physical activity as soon as tolerated while staying below their symptom-exacerbation thresholds. Activities that pose no/low risk of sustaining a concussion (no risk of contact, collision, or falling) should be resumed even if mild residual symptoms are present or whenever acute symptoms improve sufficiently to permit activity.
- 11.4 Consider referral to an interdisciplinary concussion team for patients with prolonged post-concussion fatigue (more than 4 weeks following the acute injury) to learn pacing techniques.
- 11.5 Recommend a medical follow-up to reassess clinical status if fatigue symptoms persist. Recommend an immediate medical follow-up in the presence of any deterioration. Consider early referral (before 4 weeks) to an interdisciplinary concussion team in the presence of that may delay recovery.

SECTION C

Biomarkers: Neuroimaging

- 13.1 At this stage, advanced neuroimaging biomarkers are not yet ready for clinical implementation/management.
- 13.2 When conventional MRI is performed in the clinical management of concussion patients, the inclusion of susceptibility-weighted images (SWI) sequences could be considered as it may be useful for detecting small hemorrhages. The clinical significance of small hemorrhages on SWI is not clear at present.

Biomarkers: Serologic

- 14.1 The use of serologic biomarkers is not clinically indicated. Presently there is no validated "concussion blood test" that can be used to accurately detect concussion in children/adolescents.