Living Guideline for Pediatric Concussion Care

The Living Guideline was created in 2019 and is a collaborative project that involves concussion experts and researchers. 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.

Example:

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 pedsconcussion@gmail.com
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.

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.

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. These red flag symptoms may appear immediately or within a few hours or days after injury. 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. Delayed red flag symptoms also require urgent medical assessment as they may indicate a more severe injury.
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 or high risk activities.
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.

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.
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.
- The child/adolescent should be able to tolerate physical activities and non-contact activities without experiencing any 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. Missing more than one week of school is not suggested.

**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 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.

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
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 Information and Education**
- Post-Concussion Information Sheet ([www.pedsconcussion.com](http://www.pedsconcussion.com))
- Information for Families, Coaches and Teachers ([www.pedsconcussion.com](http://www.pedsconcussion.com))
- 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)
- Strategies to Promote Good Sleep and Alertness ([www.pedsconcussion.com](http://www.pedsconcussion.com))
- 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 ([www.pedsconcussion.com](http://www.pedsconcussion.com))
- Heads UP Discharge Instructions (Centers for Disease Control and Prevention)
- Parachute’s Post Concussion Information Sheet for First Nations Youth
- Parachute’s Post Concussion Information Sheet for Nunavut Youth – French
- Parachute’s Post Concussion Information Sheet for Nunavut Youth – English
- Parachute’s Post Concussion Information Sheet for Nunavut Youth – Inuktitut
- Parachute’s Post Concussion Information Sheet for Nunavut Youth – Inuinnaqtun

**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**
- [pedsconcussion.com](http://pedsconcussion.com)
- Parachute.ca
- [CDC.gov/headsup](http://CDC.gov/headsup)
- Concussion awareness training tool (CATT)