

The Office of Lifelong Learning

Concussion Diagnosis and Management: Utilizing the Concussion Awareness Training Tool (CATT) Pearls for practice

Dr. Shelina Babul, UBC

Background Epidemiology:

Traumatic brain injury accounts for 55 million globally (0.7% world's population living with medically treated brain injury) with global economic burden related to concussion/TBI of ~\$400 billion annually
In Canada, concussion is among the top 5 reasons for workplace time-loss.

Prognosis

- 70-85% of individuals will have symptoms that can last up to 4 weeks in youth, and 2 weeks in adults
- 15-30% of individuals will experience symptoms that persist beyond this time frame

What are Concussions?

Clinically: Acute neurophysiological event related to blunt impact or other mechanical energy applied to head, neck or body; with immediate to transient altered brain function (can appear subtly over days); and an absence of gross structural abnormalities, although the exact mechanism is not fully understood

Metaphorically: Disruption or "earthquake" in the brain's "information highway." As a result, it needs time to heal and repair: Immediate cognitive and physiological rest.

Physiologically: It is likely that concussions are due to rotational acceleration of the brain that can produce:

- Disordered metabolic cascade (e.g., altered metabolism of glucose that leads to increased lactate levels)
- Biochemical influx (e.g., derangement of adenine nucleotides)
- Changes in cerebral blood flow
- Still uncertain where in the brain concussion occurs or the exact origin of symptoms of acute concussion

Patient Concussion Presentation

No definite diagnostic criteria for concussion, it is a precarious injury with lots of gray area:

- It is considered a traumatic brain injury (Window of vulnerability)
- It is complex (Head or other part of the body)
- Can present with or without loss of consciousness
- Typical neuroimaging will be unremarkable unless there's a fracture or bleed
- Symptoms can present with subtle onset (immediate or after several days)
- Variable length, can last days-weeks-months (number of symptoms correlated to length of recovery)
- No "magic bottle of pills" for treatment of concussions



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Misconceptions vs Facts: Past to Present

Patient must be woken up every 2 hrs. in the night	Increased sleep need is normal and necessary in acute stages
Patient must be put in a dark room and avoid all activity	Physical and mental rest in the first 48 hr. (sleep at night, rest during day), then can start light and cautious activity
You must hit your head to get a concussion	Can be a force applied to the neck or body (with transmitting forces to the brain), such as sudden acceleration, deceleration or rotational forces
You need to lose consciousness	Only in <10% of diagnosed cases
Helmets can prevent concussions	No such thing as concussion-proof helmet, but can reduce severity of injury impact (or death)

Possible Symptoms of Concussion:

Physical symptoms	Headache, nausea, dizziness, poor muscle coordination, light sensitivity, blurred vision, ringing in the ears, slurred speech, loss of consciousness
Mental/emotional symptoms	Disorientation, confusion, memory loss, inability to focus and concentrate, irritability, depression

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Diagnosis: Performing a Thorough Physical Examination

How a concussion is handled in the minutes/hours/days after the injury can significantly influence the extent of damage and recovery

- Watch for Red Flags
- Record vital signs (resting heart rate and blood pressure)
- Assess level of consciousness (Glasgow Coma Scale)
- Evaluate mental status.
- Screen for signs of orbital trauma or cervical or basilar skull fracture signs (e.g., raccoon eyes)
- Perform a complete neurological examination (cranial nerve, fundoscopy, motor, sensory, reflex, cerebellar, gait and balance testing)
- Perform a cervical spine examination (palpation, range of motion, provocative cervical spine tests)
- Perform an examination of the visual and vestibular systems.

Glasgow Coma Scale

Eye Opening Response	<ul style="list-style-type: none">• Spontaneous – open with blinking at baseline [4 points]• To verbal stimuli, command, speech [3 points]• To pain only (not applied to face) [2 points]• No response [1 point]
Verbal Response	<ul style="list-style-type: none">• Oriented [5 points]• Confused conversation, but able to answer questions [4 points]• Inappropriate words [3 points]• Incomprehensible speech [2 points]• No response [1 point]
Verbal Response	<ul style="list-style-type: none">• Obeys commands for movement [6 points]• Purposeful movement to painful stimulus [5 points]• Withdraws in response to pain [4 points]• Flexion in response to pain (decorticate posturing) [3 points]• Extension response to pain (decerebrate posturing) [2 points]• No response [1 point]



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Differential diagnoses:

Assessment must rule out: Major depression disorder, generalized anxiety disorder, posttraumatic stress disorder (PTSD), chronic pain syndrome, cervical strain/whiplash associated disorder, substance abuse or polypharmacy, somatic symptom disorder, factitious disorder, malingering, post-traumatic headache, post-traumatic dizziness, fibromyalgia syndrome (secondary), primary sleep disorder (OSA)

Concussion Modifiers

Identify patients with common modifiers early to allow for targeted therapy and supportive care as well as consideration for early referral (before 4 weeks post-injury)

Factor

Modifier

Symptoms	Number Duration (>10 days) Severity
Signs	Prolonged LOC (>1 min), amnesia
Sequelae	Concussive convulsions
Temporal	Frequency (i.e., Repeated concussions over time) Timing (i.e., Injuries close together in time) Recency (i.e., Recent concussion/TBI)
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Co- and Pre-morbidities	Migraine, depression or other mental health disorders, ADHD, learning disabilities, sleep disorders
Medication	Psychoactive drugs, anticoagulants
Behavior	Dangerous style of play
Sport	High-risk activity, contact and collision sport, high sporting level

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General lifestyle recommendations:

- Sleep hygiene: Consistent sleep schedules and duration of sleep may contribute to general recovery from a concussion and alleviate symptoms.
- Social networks: Maintain social networks/interactions as tolerated beyond a period of 24-48 hrs. post-injury. Staying below symptom-exacerbation thresholds and avoiding risk for re-injury will reduce risk of social isolation and mental health issues that may also promote late recovery.
- Screen time: Computers, phones and other devices with screens may exacerbate symptoms, especially in the first days after injury. Beyond an initial period of cognitive and physical rest (24-48 hrs. after injury), use of devices with screens may be gradually resumed at a level that does not result in recurrence or exacerbation of symptoms.
- Over the counter (OTC) medications: Acetaminophen and ibuprofen may be recommended to treat acute headache. Advice on limiting their use to less than 15 days/month and avoiding “around-the-clock” dosing to prevent overuse or rebound headaches.

When to stop playing sports: Consideration for return or never return to play:

- No two concussions are alike, so each event needs to be treated individually and case by case.

Criteria	CAN Return to Play	NEVER Return to Play
1. Neurological Examination	No neurological deficits	Presence of any neurological deficits or significant symptoms
2. Number, pattern and severity of previous concussion	Small number, dispersed in time, low severity and complete recovery	Multiple over a short period of time, high severity
3. Length of time to achieve recovery	Short duration (days)	Long duration (several months or years)
4. Neuropsychological evaluation-detailed	No cognitive deficits	Presence of cognitive deficits
5. MR/CT findings	No abnormalities	Presence of lesions



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Concussion Awareness Training Tool (CATT) <https://www.cattonline.com>

- Educational tool with relevant resources for a variety of audiences (medical professionals, athletes, coaches, parents, caregivers, schools, women's support workers, workers and workplaces, youth)
- Searchable and filterable website
- Learner-centered model
- Evidence-based, not reinventing the wheel
- Reviewed and updated monthly
- Available 24/7, free
- Free resources for download including:
 - Concussion recognition pathway for gyms, schools, etc.
 - Printable stepwise return to activity cards, packages, amongst many more

For Medical Professionals: <https://www.cattonline.com/medical-professional-course/>

- Earn MOC/CME credits, with certification, ~2 hrs. to complete.
- Effectively conduct an initial medical assessment for concussion
- Optimally manage concussion care during the first 204 weeks post-injury
- Identify when referral to specialty care is necessary
 - Module A: Concussion definition and epidemiology
 - Module B: Medical assessment for concussion
 - Module C: Concussion management and medical clearance
 - Module D: Prolonged concussion symptoms and management
 - Module E: Role of physiotherapy and occupational therapy



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Links and Resources:

- Concussion Awareness Training Tool (CATT) <https://www.cattonline.com>
- Sport Concussion Assessment Tool (SCAT5) <https://scat5.cattonline.com/>
- Child Sport Concussion Assessment Tool (SCAT5) <https://childscat5.cattonline.com/>
- Concussion Recognition Pathway: <https://cattonline.com/catt-concussion-pathway/>
- Concussion Resources for Medical Professionals
<https://www.cattonline.com/wp-content/uploads/2021/04/Concussion-Resources-for-Medical-Professionals-CATT-V6-2022.pdf>
- Post-Concussion Care Pathway: <https://concussionsontario.org/concussion/resources/tools-resources/post-concussion-care-pathway>
- Rivermead Post-Concussion Symptoms Questionnaire: http://www.tbi-impact.org/cde/mod_templates/12_F_06_Rivermead.pdf

Papers and References for Further Reading:

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- <https://www.tribuneindia.com/news/health/human-brain-did-not-shrink-3-000-years-ago-as-thought-earlier-say-researchers-419769>
- Teasdale, G. et al. Assessment of coma and impaired consciousness. *Lancet* 1974; 81-84 <https://pubmed.ncbi.nlm.nih.gov/4136544/>
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