Update on concussion management in primary care

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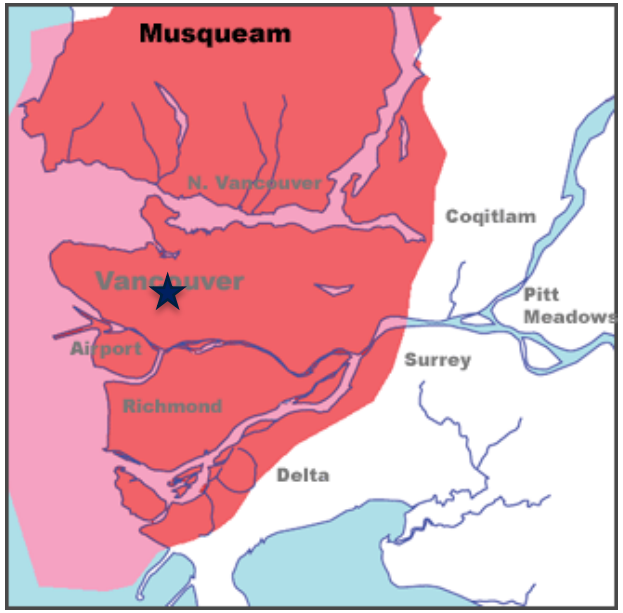
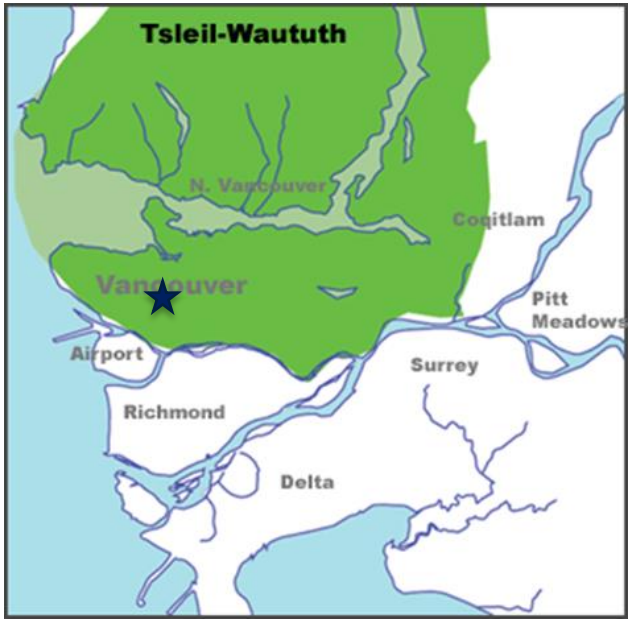
Family Practice Rounds November 16, 2021

We would like to acknowledge that we are gathered today on the traditional territories of the Musqueam, Squamish and Tsleil-Waututh peoples.

Source: www.johomaps.net/na/canada/bc/vancouver/firstnations/firstnations.html





★ = GF Strong Rehab Centre

Learning objectives:

1. Apply diagnostic criteria for concussion/mild traumatic brain injury.
2. Provide return-to-activity advice.
3. Prioritize symptoms and associated clinical management strategies in a primary care setting.
4. List evidence-based treatment options for persistent symptoms following concussion.

Presenter disclosures

Grants/research support:

- Canadian Institutes of Health Research
- Michael Smith Foundation for Health Research
- VGH+UBC Hospital Foundation

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Consulting fees: WorkSafeBC, National Hockey League (NHL), medical-legal

Key references

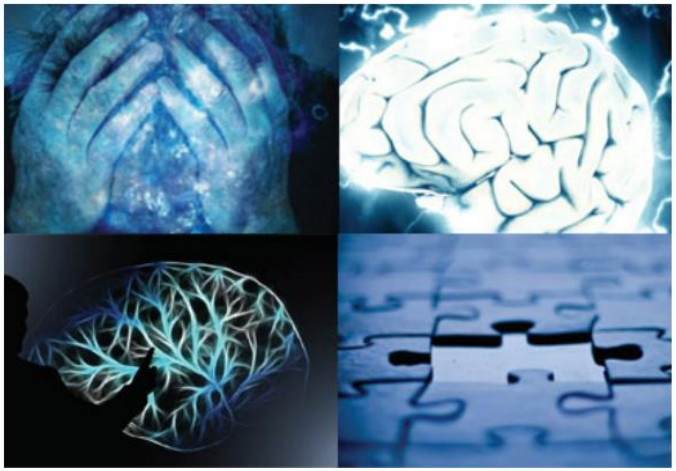
1. Silverberg ND et al. Management of Concussion and Mild Traumatic Brain Injury: A Synthesis of Practice Guidelines. *Arch Phys Med Rehabil*. 2020. 101(2):382-393.

2. Silverberg ND, Duhaime AC, Iaccarino MA. Mild Traumatic Brain Injury in 2019-2020. *JAMA*. 2020. 14;323(2):177-178.

3. Ontario Neurotrauma Foundation. (2018). Guideline for Concussion/Mild Traumatic Brain Injury & Persistent Symptoms (3rd Edition).

https://braininjuryguidelines.org/concussion/

GUIDELINE COMPONENTS | COMMITTEES & STAKEHOLDERS | METHODS | PATIENT VERSION | RESOURCES | CONTACT US | PEDIATRIC GUIDELINE



GUIDELINE FOR CONCUSSION/MILD TRAUMATIC BRAIN INJURY & PROLONGED SYMPTOMS

3RD EDITION, FOR ADULTS OVER 18 YEARS OF AGE

Ontario Neurotrauma Foundation
Fondation ontarienne de neurotraumatologie

WHAT'S NEW

- Updated patient version
- Information added on influence of sex & gender in concussion symptoms and treatment
- Use of the term "prolonged" instead of previously used "persistent" when speaking about symptoms. In some materials you may see the two terms

TOOLS & RESOURCES

FOR PATIENTS

SEARCH BY KEYWORD:

search here

AND / OR SEARCH BY TAG:

Assessment Diagnosis

Diagnosis

Concussion identification on the sideline vs in the clinic

https://www.thescore.com/nhl/news/2176385

Tips for diagnosis

1. Signs and symptoms *at the time of injury*
2. PTA ≠ LOC
3. Differential diagnosis
    - Alcohol/drug intoxication
    - Cervical strain/whiplash
    - Acute pain
    - Neurotological disorders
    - Psychological trauma

Which diagnostic criteria?

Table 2 Comparison of threshold criteria for mild TBI diagnosis across organization and expert group case definitions

	ACRM 1993	CDC 2003	WHO 2005	CDE 2010	VA/DoD 2016	CISG 2017	ONF 2018
Trauma-related intracranial lesion on conventional CT or MRI can be present	Yes*	Yes	Yes	Yes	No†	No†	Yes‡
Focal neurologic deficit	Yes	Yes*	Yes§	Yes§	Yes	Yes*,§	Yes‡
Loss of consciousness	Yes	Yes	Yes§	Yes	Yes	Yes*,§	Yes
Decreased consciousness	Yes*	Yes	Yes*,§	Yes	Yes	Yes*,§	Yes
Retrograde amnesia	Yes	Yes	No	Yes	Yes	?	Yes
Post-traumatic amnesia	Yes	Yes	Yes§	Yes§	Yes	Yes*,§	Yes
Confusion/disorientation (objectively assessed, including GCS<15)	Yes‡	Yes	Yes§	Yes§	Yes	Yes‡,§	Yes
Confusion/disorientation (subjective)	Yes	Yes	?	Yes*,§	Yes*	Yes*,§	?
Dazed (subjective)	Yes	No	No	?	Yes	Yes*,§	?
Difficulty thinking/slowed thinking (subjective)	?	No	No	Yes‖	Yes‖	Yes§	Yes‖
Physical symptoms	No	No	No	No	No	Yes§	Yes
Cognitive or emotional symptoms	No	No	No	No	No	Yes§	No

Silverberg et al (2021). Archives of Phys Med Rehab, 102(1), P76-86

Important differences in minimum threshold

Table 2 Comparison of threshold criteria for mild TBI diagnosis across organization and expert group case definitions

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Focal neurologic deficit	Yes	Yes*	Yes§	Yes§	Yes	Yes*,§	Yes‡
Loss of consciousness	Yes	Yes	Yes§	Yes	Yes	Yes*,§	Yes
Decreased consciousness	Yes*	Yes	Yes*,§	Yes	Yes	Yes*,§	Yes
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Post-traumatic amnesia	Yes	Yes	Yes§	Yes§	Yes	Yes*,§	Yes
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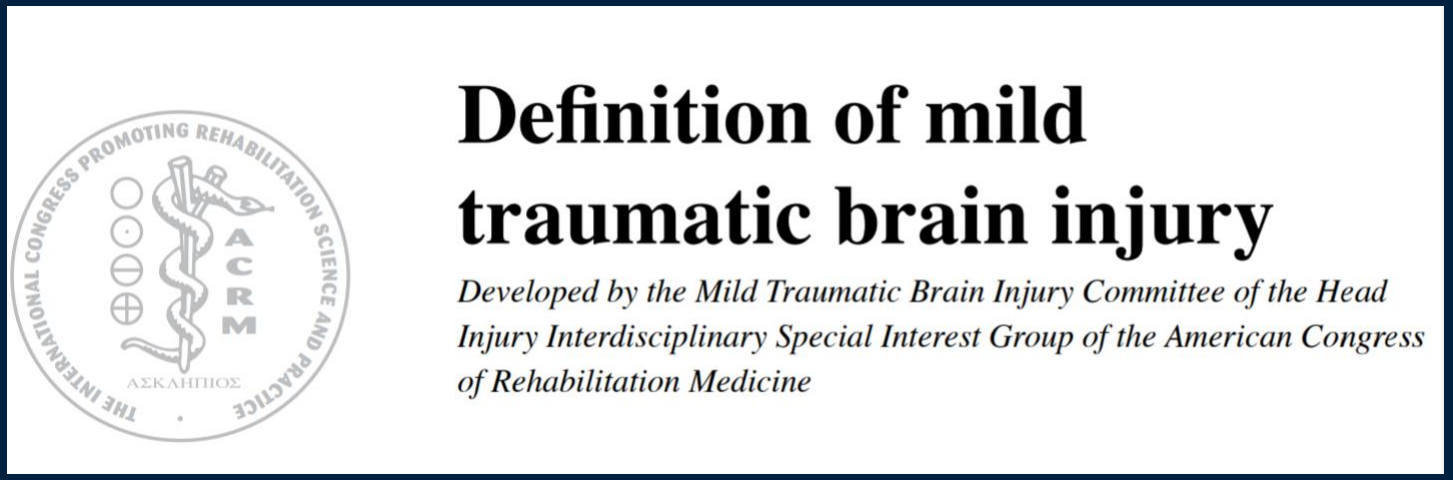
Silverberg et al (2021). Archives of Phys Med Rehab, 102(1), P76-86

1993

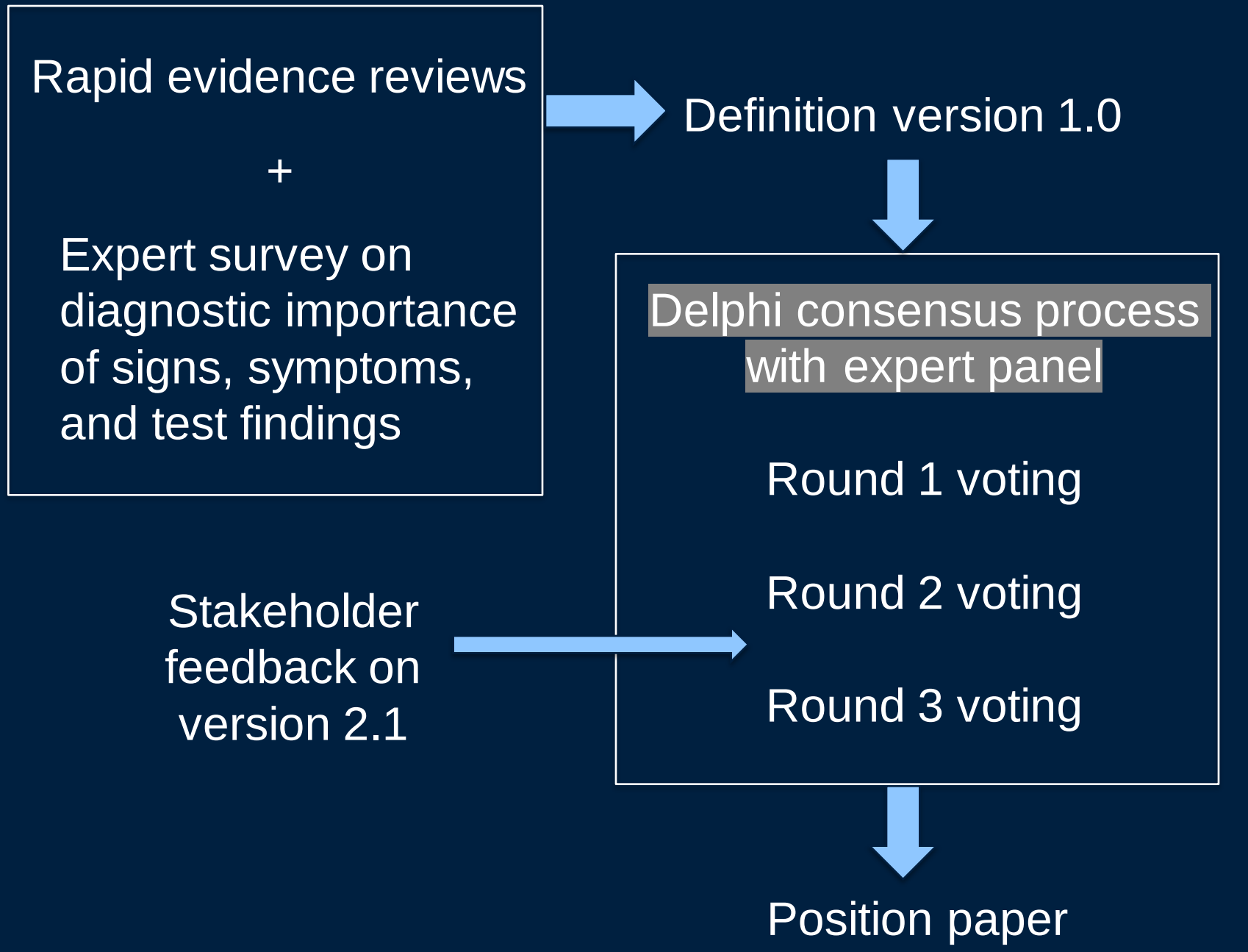


Definition of mild traumatic brain injury

Developed by the Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine

2022

Definition of mild traumatic brain injury


Rapid evidence reviews
+
Expert survey on diagnostic importance of signs, symptoms, and test findings
Definition version 1.0
Delphi consensus process with expert panel
Round 1 voting
Round 2 voting
Round 3 voting
Stakeholder feedback on version 2.1
Position paper

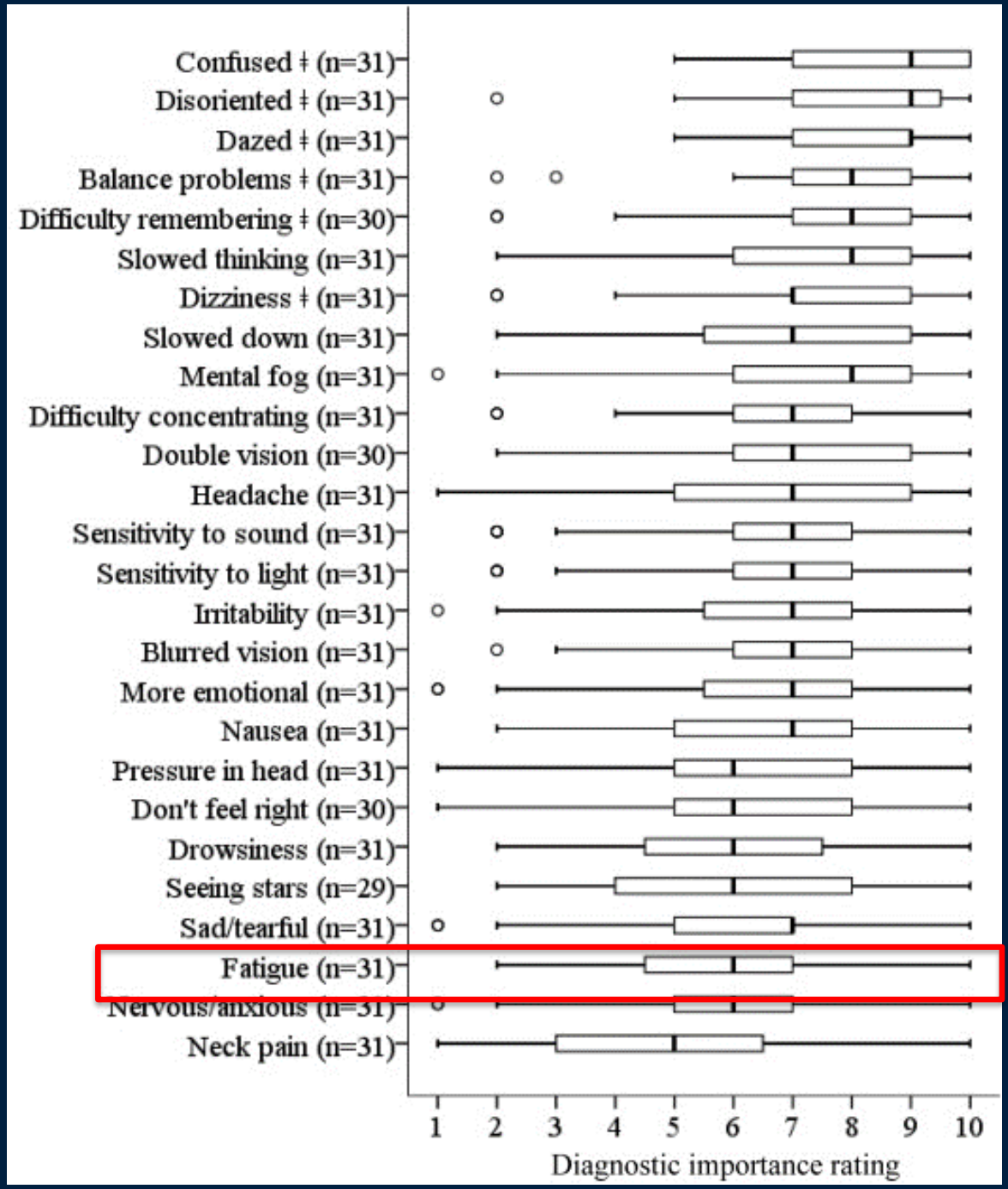
What's new?

- Clearer operational definitions
- Probabilistic framework
- Signs weighted more heavily than symptoms
- Symptoms with known poor specificity excluded
- Integration of balance, cognition, and oculomotor testing, and blood-based biomarkers
- Confounding factors must be explicitly ruled out

Healthy people experience post-concussion-like “symptoms”

Symptom	Mild Endorsement (%)	Moderate–Severe Endorsement (%)
Headaches	52.4	2.9
Dizziness/light-headed	41.7	5.8
Nausea/feeling sick	37.9	3.8
Fatigue	75.7	13.6
Extra sensitive to noises	39.8	2.9
Irritable	71.8	11.7
Sad/down in the dumps	61.2	9.7
Nervous or tense	63.1	8.7
Temper problems	53.4	11.7
Poor concentration	61.2	15.5
Memory problems	50.5	13.6
Difficulty in reading	35.9	8.7
Poor sleep	62.1	12.6

Applied Neuropsychology
2003, Vol. 10, No. 3, 137–144



Silverberg et al (2020), Archives of Phys Med & Rehab, 102(1) P76-86.

Draft Definition of Mild TBI (version 2.1)

Mild TBI Task Force, Brain Injury Special Interest Group
American Congress of Rehabilitation Medicine
September 28, 2021

Criterion 1: Mechanism of injury

Traumatic brain injury (TBI) results from a transfer of mechanical energy to the brain from external forces resulting from the (i) head being struck with an object, (ii) head striking a hard object or surface, (iii) brain undergoing an acceleration/deceleration movement without direct contact between the head and an object or surface, and/or (iv) forces generated from a blast or explosion.

Criterion 1 can be met by direct observation (in person or video review) or collateral (witness) report of the injury event, review of acute care records, or the person's recount of the injury event during an interview.

Criterion 2: Clinical signs

The injury event causes an acute physiological disruption of brain function, as manifested by one or more of the clinical signs listed below.

i. Loss of consciousness immediately following injury (e.g., no protective action taken on falling after impact or lying motionless and unresponsive).

ii. Alteration of mental status immediately following the injury (or upon regaining consciousness), evidenced by reduced responsiveness or inappropriate responses to external stimuli; slowness to respond to questions or instructions; agitated behavior; inability to follow two-part commands; or disorientation to time, place, or situation.

iii. Complete or partial amnesia for events immediately following the injury (or after regaining consciousness). If post-traumatic amnesia cannot be reliably assessed (e.g., due to polytrauma or sedating analgesics), retrograde amnesia (i.e., a gap in memory for events immediately preceding the injury) can be used as a replacement for this criterion.

iv. Focal neurological sign(s) (e.g., observed motor incoordination upon standing or ataxia).

v. Seizure or tonic posturing immediately following injury.

Criterion 3: Acute symptoms

The physiological disruption of brain function is manifested by two or more new or worsened symptoms from the list below.

i. Acute subjective alteration in mental status: feeling confused, feeling disoriented, and/or feeling dazed.

ii. Physical symptoms: headache, nausea, dizziness, balance problems, vision problems, sensitivity to light, and/or sensitivity to noise.

iii. Cognitive symptoms: feeling slowed down, "mental fog," difficulty concentrating, and/or memory problems.

iv. Emotional symptoms: uncharacteristic emotional lability and/or irritability.

The symptoms may be from one or more categories (i.e., experiencing two symptoms within a single category is sufficient). Other symptoms may be present, but they should not be counted towards Criterion 3. The onset of acute subjective alteration in mental status occurs immediately following the impact or after regaining consciousness. The onset of other symptoms (physical, cognitive, and emotional) may be delayed by a few hours, but they nearly always appear in less than 72 hours from injury.

Criterion 4: Associated clinical and laboratory findings

The assessment findings listed below can also provide supportive evidence of brain injury.

i. Cognitive impairment on acute clinical examination.

ii. Balance impairment on acute clinical examination.

iii. Oculomotor impairment or symptom provocation in response to vestibular-oculomotor challenge on acute clinical examination.

iv. Elevated blood biomarker(s) indicative of intracranial injury.

Criterion 5: Neuroimaging

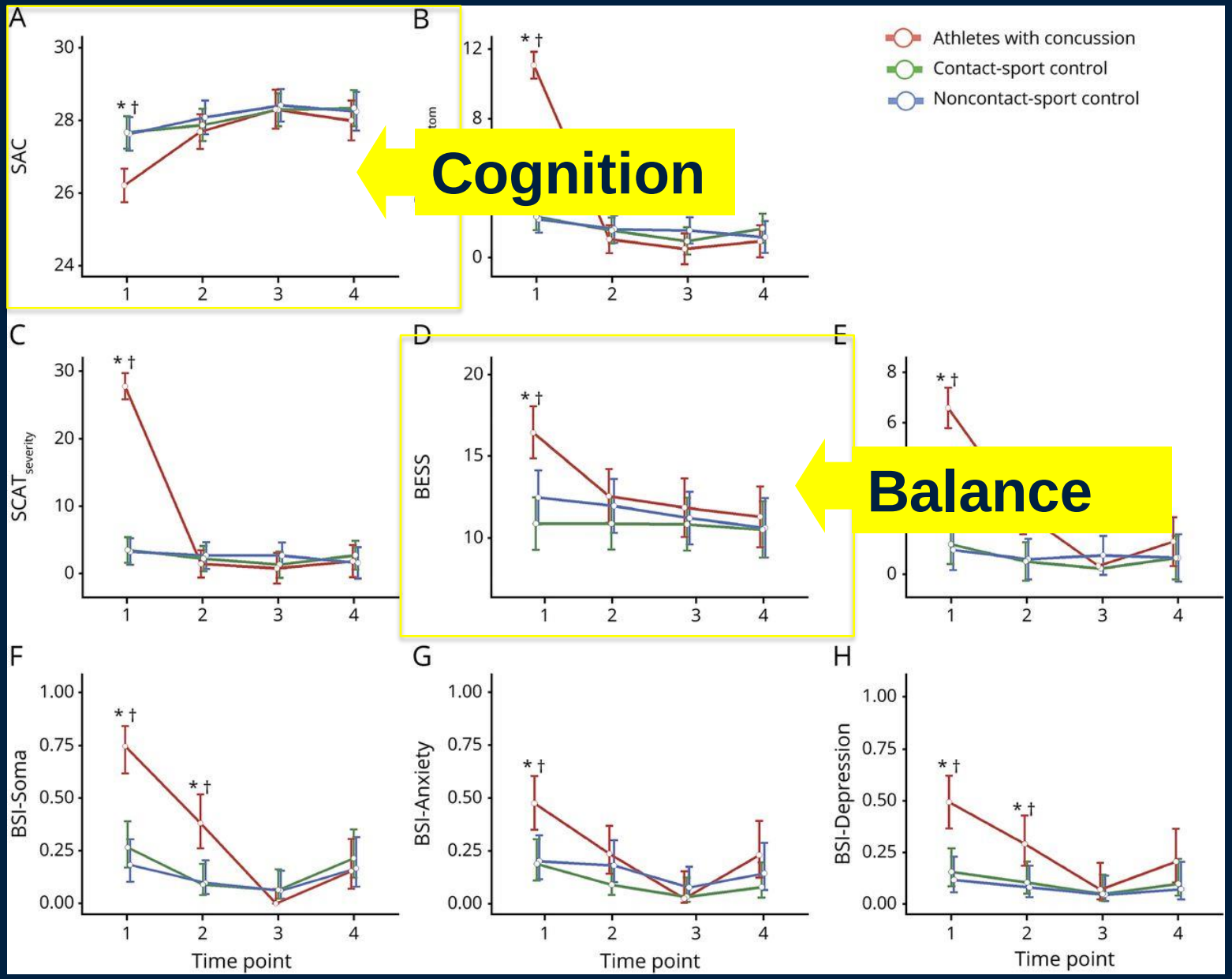
Trauma-related intracranial abnormalities on computed tomography or structural magnetic resonance imaging.

Neuroimaging is not necessary to diagnose mild TBI. Its primary clinical role is to rule out head and brain injuries that might require neurosurgical or other medical intervention in an acute care setting. When obtained, neuroimaging may reveal intracranial abnormalities indicative of TBI such as contusion(s), subdural hematoma, or subarachnoid hemorrhage.

Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

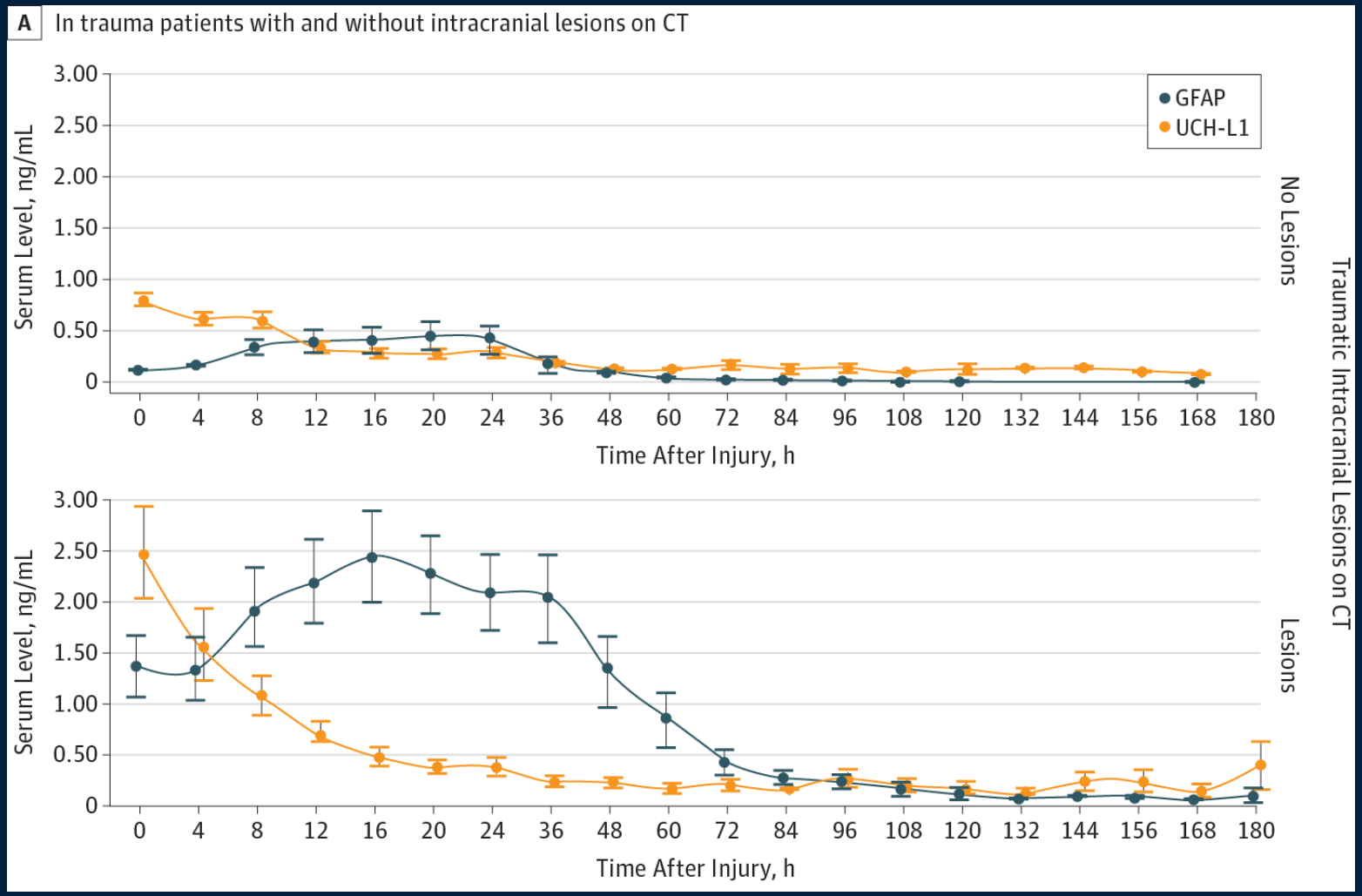
McCrory P, *et al*. *Br J Sports Med* 2017;**0**:1–10.

in the evaluation of SRC. The SCAT is useful immediately after injury in differentiating concussed from non-concussed athletes, but its utility appears to decrease significantly 3–5 days after injury. The symptom checklist, however, does demonstrate clin-



Yu-Chien et al. (2020). Neurology, 95 (7) e781-e792

Current blood-based biomarkers loose diagnostic validity by 72 hours of injury



Papa L et al. *JAMA Neurol.* 2016;73(5):551–560.

Diagnosing a Mild Traumatic Brain Injury

Mild TBI is diagnosed when, following a biomechanically plausible mechanism of injury (Criterion 1), one or more of the three operational definitions listed below are met.

i. One or more clinical signs attributable to brain injury (Criterion 2).
ii. At least two symptoms (Criterion 3) and at least one associated clinical or laboratory finding (Criterion 4).
iii. Neuroimaging evidence of TBI, such as unambiguous trauma-related intracranial abnormalities on computed tomography or structural magnetic resonance imaging (Criterion 5).

The "mild" qualifier is not used if any of the injury severity criteria listed below are present. Instead, traumatic brain injury (TBI) is diagnosed (without the "mild" qualifier).

i. Loss of consciousness duration greater than 30 minutes.
ii. After 30 minutes, a Glasgow Coma Scale (GCS) of less than 13.
iii. Post-traumatic amnesia greater than 24 hours.

A mild TBI is suspected when, following a biomechanically plausible mechanism of injury (Criterion 1), one or more of the three operational definitions listed below are met.

i. At least two symptoms (Criterion 3) but the person does not meet other criteria sufficient for diagnosing mild TBI.
ii. At least two associated clinical or laboratory findings (Criterion 4) but the person does not meet other criteria sufficient for diagnosing mild TBI.
iii. It is unclear whether signs (Criterion 2), symptoms (Criterion 3), and clinical or laboratory findings (Criterion 4) that are present are accounted for by confounding factors, including pre-existing and co-occurring health conditions.

"Suspected" means that a mild TBI is possible or probable but the injury was too mild to produce clinical signs or there is insufficient information or confounding factors that prevent a higher level of diagnostic certainty. It is reasonable to place people with suspected mild TBI on the same precautions and clinical pathway as a person who clearly meets diagnostic criteria for mild TBI.

Case study

- 38 yo female, previously healthy
- Rear-ended in MVA at ~30 km
- Does not recall if head impact
- Momentarily felt “dazed”
- Declined ambulance
- Acute headache
- Poor sleep, photophobia, difficulty concentrating next morning
- Presents to family physician

Diagnostic process

Step 1. Establish Plausible Injury Mechanism.

- Ask the patient to describe the sequence of events surrounding the injury.
- Listen carefully and query as necessary for a concussive force (eg, Did your head jolt back and forth?) and its intensity (eg, From what height did you fall?).
- Distinguish the patient's personal memories from facts he or she inferred or learned from other people afterward.

Step 2. Query Signs and Symptoms.

Determine whether the patient's mental status was altered immediately after the impact. Example questions:

- Do you remember the impact and moments just after?
- Did anyone see you lay still and unresponsive right after the accident?
- Were you confused or unsure about where you were and what was happening?
- Were you able to think clearly about what to do after the accident?
- Were you able to answer questions appropriately and follow instructions from people at the scene?
- Did anyone tell you that your speech was incoherent or not making sense?

Step 3. Rule Out Confounding Factors

Check whether factors other than brain injury can account for the acute alteration in mental status. Example questions:

- Were you drinking alcohol or using drugs just before the accident?
- Did you see the impact coming? Did you think that you or others would be seriously injured or killed? Did you feel panicked or scared?
- Did you injure other parts of your body? Were you in severe pain?

Silverberg et al (2020). Archives of Phys Med & Rehab, 101(2), P382-393.

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- Did you injure other parts of your body? Were you in severe pain?

+ cognition and balance testing if < 72 post-injury

Silverberg et al (2020). Archives of Phys Med & Rehab, 101(2), P382-393.

Early clinical management (first week post-injury)

Sidebar 1: Indicators for Immediate Referral

1. Progressively declining level of consciousness
2. Progressively declining neurological exam (Appendix 3.4)
3. Pupillary asymmetry
4. Seizures
5. Repeated vomiting
6. Neuroloigical deficit: motor or sensory
7. Double vision
8. Worsening headache
9. Connot recognize people or disoriented to place
10. Slurred speech
11. Unusual behavior

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Archives of Physical Medicine and Rehabilitation 2020;101:382-93

SPECIAL COMMUNICATION

Management of Concussion and Mild Traumatic Brain Injury: A Synthesis of Practice Guidelines

Noah D. Silverberg, PhD,[a,b] Mary Alexis Iaccarino, MD,[c,d,e] William J. Panenka, MD,[f,g,h] Grant L. Iverson, PhD,[i,j,k] Karen L. McCulloch, PT, PhD,[l] Kristen Dams-O'Connor, PhD,[m] Nick Reed, PhD,[n,o] Michael McCrea, PhD,[p] for the American Congress of Rehabilitation Medicine Brain Injury Interdisciplinary Special Interest Group Mild TBI Task Force

Table 1 Recommendation number/location and strength

Variable	ONF	CDC	VA/DoD	CISG
Prompt diagnostic evaluation	1.1 (A)	C	2 (Strong)	Pg. 3-4
No routine neuroimaging	1.3 (A)	1A/1B, 2 (B)	3 (Weak)	C
No clinical use of serum biomarkers	C	6 (R)	3 (Weak)	Pg. 5
Advice to rest for 1-3 d post injury	3.4 (A)*	13A (B)	C†	Pg. 5
Guidance on gradual stepwise return to preinjury activities	3.4 (A), 12.3 (A)	13B, 13D (B)	C†	Pg. 5, 7

Canadian CT Head Rule

CT head is only required for minor head injury patients with any one of these findings:

High Risk (for Neurological Intervention)

1. GCS score < 15 at 2 hrs after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture*
4. Vomiting ≥ 2 episodes
5. Age ≥ 65 years

Medium Risk (for Brain Injury on CT)

6. Amnesia before impact ≥ 30 min
7. Dangerous mechanism ** *(pedestrian, occupant ejected, fall from elevation)*

*Signs of Basal Skull Fracture

- hemotympanum, 'racoon' eyes, CSF otorrhea/ rhinorrhea, Battle's sign

** Dangerous Mechanism

- pedestrian struck by vehicle
- occupant ejected from motor vehicle
- fall from elevation ≥ 3 feet or 5 stairs

Rule Not Applicable If:

- Non-trauma cases
- GCS < 13
- Age < 16 years
- Coumadin or bleeding disorder
- Obvious open skull fracture

Stiell IG, et al. The Canadian CT Head Rule for Patients with Minor Head Injury. Lancet 2001;357:1391-96.

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Variable	ONF	CDC	VA/DoD	CISG
Early education for patient/family	2.3 (A), 2.6 (A)	7A/7B (B), 12 (A)	11, 15, 22 (Weak)	C

Early education about what?

2.6

On presentation to healthcare professionals, patients and their support persons should be provided with education that includes verbal and printed information (see Appendices 1.3 and 1.4). This information should be provided at the initial assessment and ongoing as required. Education should be tailored based on the patient's history and symptoms and include information on:

a. Symptoms and expected outcomes (A)

b. Normalizing symptoms (education that current symptoms are expected and common after injury event) (A)

c. Reassurance about expected full recovery in the majority of patients within a few days, weeks or months (A)

https://braininjuryguidelines.org/concussion/

Patient education resource

Get started with

MyGuide | Concussion

MyGuide: Concussion is a customizable guide for adults with concussion, or those wanting to learn about adult concussion. It should not be used to self-diagnose, replace medical advice, or for concussion in people under 18 years old.

MyGuide: Concussion has three goals:

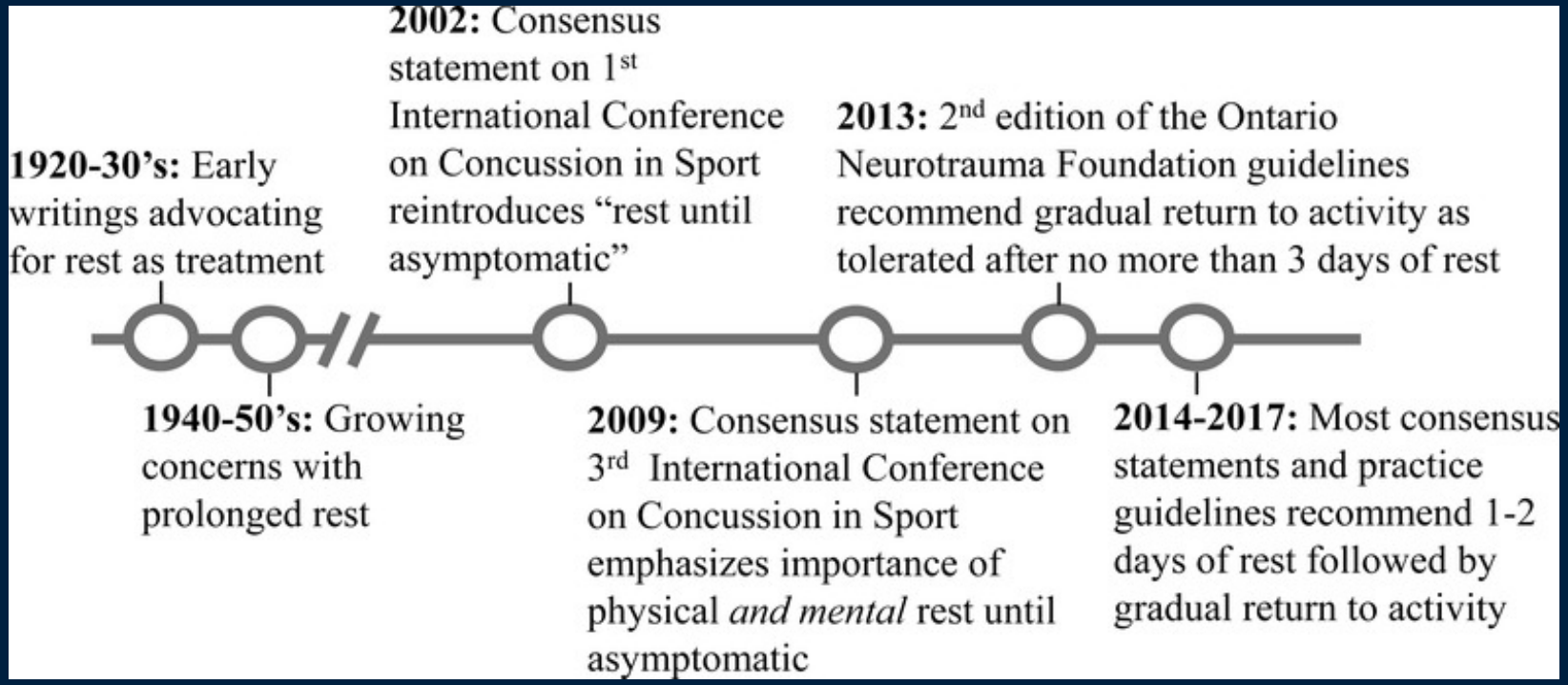
1. To **inform** you about concussion & recovery
2. To **equip** you with tools & skills
3. To **empower** you with confidence to take action

Launch

Or go to Catalogue to see all the articles.

https://concussion.vch.ca/

The role of rest in concussion management: A timeline



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No clinical use of serum biomarkers	C	6 (R)	3 (Weak)	Pg. 5
Advice to rest for 1-3 d post injury	3.4 (A)*	13A (B)	C†	Pg. 5
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Outline of gradual return to sport

Return to Sport

This tool is a guideline for managing an individual's return to sport following a concussion and does not replace medical advice. Timelines and activities may vary by direction of a health care professional.

STAGE 1:	STAGE 2:	STAGE 3:	STAGE 4:	STAGE 5:	STAGE 6:
No sporting activity Physical and cognitive rest until symptoms start to improve OR after resting for 2 days max.	**Light aerobic exercise** Walking, swimming, stationary cycling. No resistance training. The pace of these activities should be at the point where you are still able to have a conversation.	**Sport-specific exercise** Skating drills (ice hockey), running drills (soccer). No head-impact activities.	**Non-contact drills** Progress to complex training drills (e.g. passing drills). May start resistance training.	**Full-contact practice** Following medical clearance participate in normal training activities.	**Back in the game** Normal game play
Recovery	**Increase heart rate**	**Add movement**	**Exercise, coordination, cognitive load**	**Restore confidence; assess functional skills**	
Symptoms improve or 2 days rest max? **Yes:** Move to stage 2 **No:** Continue resting Time & Date completed:	**No new or worsening symptoms for 24 hours?** **Yes:** Move to stage 3 **No:** Return to stage 1 Time & Date completed:	**No new or worsening symptoms for 24 hours?** **Yes:** Move to stage 4 **No:** Return to stage 2 Time & Date completed:	**Symptom-free for 24 hours?** **Yes:** Move to stage 5 **No:** Return to stage 3 Time & Date completed:	**Symptom-free for 24 hours?** **Yes:** Move to stage 6 **No:** Return to stage 4 Time & Date completed:	**Note: Premature return to contact sports (full practice and game play) may cause a significant setback in recovery.**

https://cattonline.com/wp-content/uploads/2017/10/CATT-Return-to-Sport-V11.pdf

Outline of gradual return to school

Return to School

This tool is a guideline for managing a student's return to school following a concussion and does not replace medical advice. Timelines and activities may vary by direction of a health care professional.

AT HOME

STAGE 1:

Physical & cognitive rest

- Basic board games, crafts, talk on phone
- Activities that do not increase your heart rate or cause you to break a sweat

Limit/Avoid:

- Computer, TV, texting, video games, reading

No:

- School work
- Sports
- Work
- Driving until cleared by a health care professional

Rest

When symptoms start to improve OR after resting for 2 days max, **BEGIN STAGE 2**

STAGE 2:

Start with light cognitive activity:

Gradually increase cognitive activity up to 30 min. Take frequent breaks.

Prior activities plus:

- Reading, TV, drawing
- Limited peer contact and social networking

Contact school to create *Return to School* plan.

When light cognitive activity is tolerated:

Introduce school work.

Prior activities plus:

- School work as per *Return to School* plan

Communicate with school on student's progression.

No:

- School attendance
- Sports
- Work

Gradually add cognitive activity including school work at home

Tolerates 30 min. of cognitive activity, **introduce school work at home**

Tolerates 60 min. of school work in two 30 min. intervals, **BEGIN STAGE 3**

AT SCHOOL

STAGE 3:

Back to school part-time

Part-time school with maximum accommodations.

Prior activities plus:

- School work at school as per *Return to School* plan

No:

- P.E., physical activity at lunch/recess, homework, testing, sports, assemblies, field trips

Communicate with school on student's progression.

School work only at school

Tolerates 120 min. of cognitive activity in 30-45 min. intervals, **BEGIN STAGE 4**

STAGE 4:

Part-time school

Increase school time with moderate accommodations.

Prior activities plus:

- Increase time at school
- Decrease accommodations
- Homework – up to 30 min./day
- Classroom testing with adaptations

No:

- P.E., physical activity at lunch/recess, sports, standardized testing

Communicate with school on student's progression.

Increase school work, introduce homework, decrease learning accommodations

Tolerates 240 min. of cognitive activity in 45-60 min. intervals, **BEGIN STAGE 5**

STAGE 5:

Full-time school

Full days at school, minimal accommodations.

Prior activities plus:

- Start to eliminate accommodations
- Increase homework to 60 min./day
- Limit routine testing to one test per day with adaptations

No:

- P.E., physical activity at lunch/recess, sports, standardized testing

Work up to full days at school, minimal learning accommodations

Tolerates school full-time with no learning accommodations **BEGIN STAGE 6**

STAGE 6:

Full-time school

Full days at school, no learning accommodations.

- Attend all classes
- All homework
- Full extracurricular involvement
- All testing

No:

- full participation in P.E. or sports until *Return to Sport* protocol completed and written medical clearance provided

Full academic load

Return to School protocol completed; focus on ***RETURN TO SPORT***

Outline of gradual return to work

Return to Work

This tool is a guideline for managing an individual's return to work following a concussion and does not replace medical advice. The goal for each stage is to find the 'sweet spot' between doing too much and doing too little. Timelines and activities may vary by direction of a health care professional.

AT HOME

STAGE 1:

Initial physical and cognitive rest

- Rest in a quiet and calm environment.
- Try activities that do not aggravate symptoms (e.g., listening to quiet music or colouring).
- Sleep as much as your body needs while trying to maintain a regular night sleeping schedule.

Limit:

- Lengthy social visits.
- Screen time (smartphone, computer, television) and reading.

Avoid:

- Sports or physical activities that increase your heart rate or cause you to break a sweat.

NOTE: It is recommended to discuss driving with a licensed medical professional for safety considerations.

Rest

When symptoms start to improve OR after resting for 2 days max,
BEGIN STAGE 2

STAGE 2:

Light activity

- Gradually increase cognitive activity by trying simple, familiar tasks (e.g., reading, watching TV, using the computer or drawing).
- Go for walks or try other light physical activity (e.g., swimming, stationary bike, light housework), without becoming short of breath.
- Take frequent rest periods; keep napping to a minimum.
- Begin with brief periods of activity, up to 30 minutes.
- Start thinking about returning to work: communicating with the workplace, a return to work plan, and your commute.

Gradually increase activity

When 30 minutes of activity is tolerated,
BEGIN STAGE 3

STAGE 3:

Prepare to return to work—at home

- Continue to increase cognitive activity.
- Continue to return to pre-injury physical activities (e.g., grocery shopping, gardening, jogging, light weight training).
- Contact workplace to discuss a tailored Return to Work plan.
- Attempt to commute to work to assess if it aggravates symptoms or drains energy.
- A regular sleeping schedule supports a successful return to work.
- Work your way up to 2 hours of activity, with breaks as needed.

Prepare to return to work

When 4 hours of activity is tolerated, with breaks as needed,
BEGIN STAGE 4

AT WORK

Prepare to return to work—at work

- Work accommodations can include: flexible hours, reduced workload, extra time for tasks, access to a quiet, distraction-free work environment.
- Arrange to return to work on a graduated basis. Consider number of hours per day and appropriate accommodations.
- Work your way up to an additional 2 hours of activity, with breaks as needed.
- Have a plan to leave work and return to Stage 2 if symptoms worsen.

STAGE 4:

Begin graduated return to work

- Return to work according to your graduated return to work plan, with the agreed upon number of hours per day and accommodations.
- At work, start with less demanding activities before more difficult ones.
- Gradually increase working hours week-to-week, or sooner, as appropriate.

Return to work with accommodations and a personalized *Return to Work* plan

When ready for regular work hours with accommodations,
BEGIN STAGE 5

STAGE 5:

Regular work hours with modifications, as needed

- Decrease accommodations as energy and capacity increases.
- Accommodations can be phased out in "trial" periods, to ensure that they are no longer needed.
- Monitor energy levels for completing household tasks and participating in social or recreational activities after the work day.

Adjust workplace accommodations, as needed

When regular work hours are tolerated with min. accommodations,
BEGIN STAGE 6

STAGE 6:

Full return to work

- Full regular work schedule with usual expectations for productivity, without accommodations.

NOTE: Only return to job duties that may have safety implications for you or others when cleared by a licensed medical professional (e.g., operating heavy equipment, working from heights, driving).

Full return to work

Once you have **COMPLETED STAGE 6,** *Return to Work* strategy completed

What about screen time?

JAMA Pediatrics

RCT: Effect of Screen Time on Recovery From Concussion

POPULATION

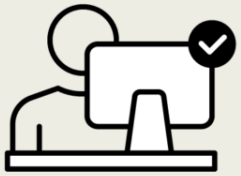
64 Males, 61 Females

Adolescents and young adults (12-24 y) with concussion sustained in previous 24 h

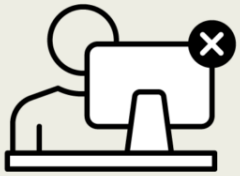
Mean age 17 y (range 12-24 y)

INTERVENTION

125 Participants randomized



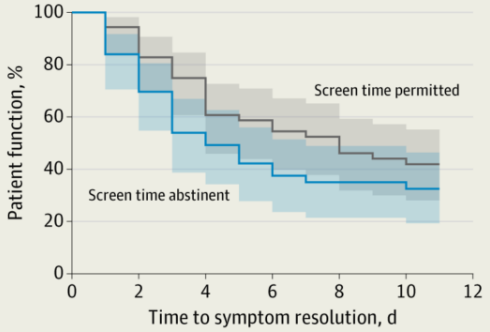
66 Screen time permitted
Permission given for use of any electronic screen as tolerated for the first 48 h post-concussion



59 Screen time abstinent
Instruction to abstain from use of any form of electronic screen for the first 48 h post-concussion

FINDINGS

Participants randomized to abstain from screen time for the first 48 h post-concussion had significantly shorter duration of concussive symptoms compared to those permitted to use screens



Median (IQR) time to recovery among participants with baseline PCSS >3 and complete follow-up data:

Screen time permitted: 8.0 (3.0 to >10.0) d among 47 participants
Screen time abstinent: 3.5 (2.0 to >10.0) d among 44 participants

Hazard ratio, adjusted for sex: 0.51 (95% CI, 0.29-0.90)

SETTINGS / LOCATIONS

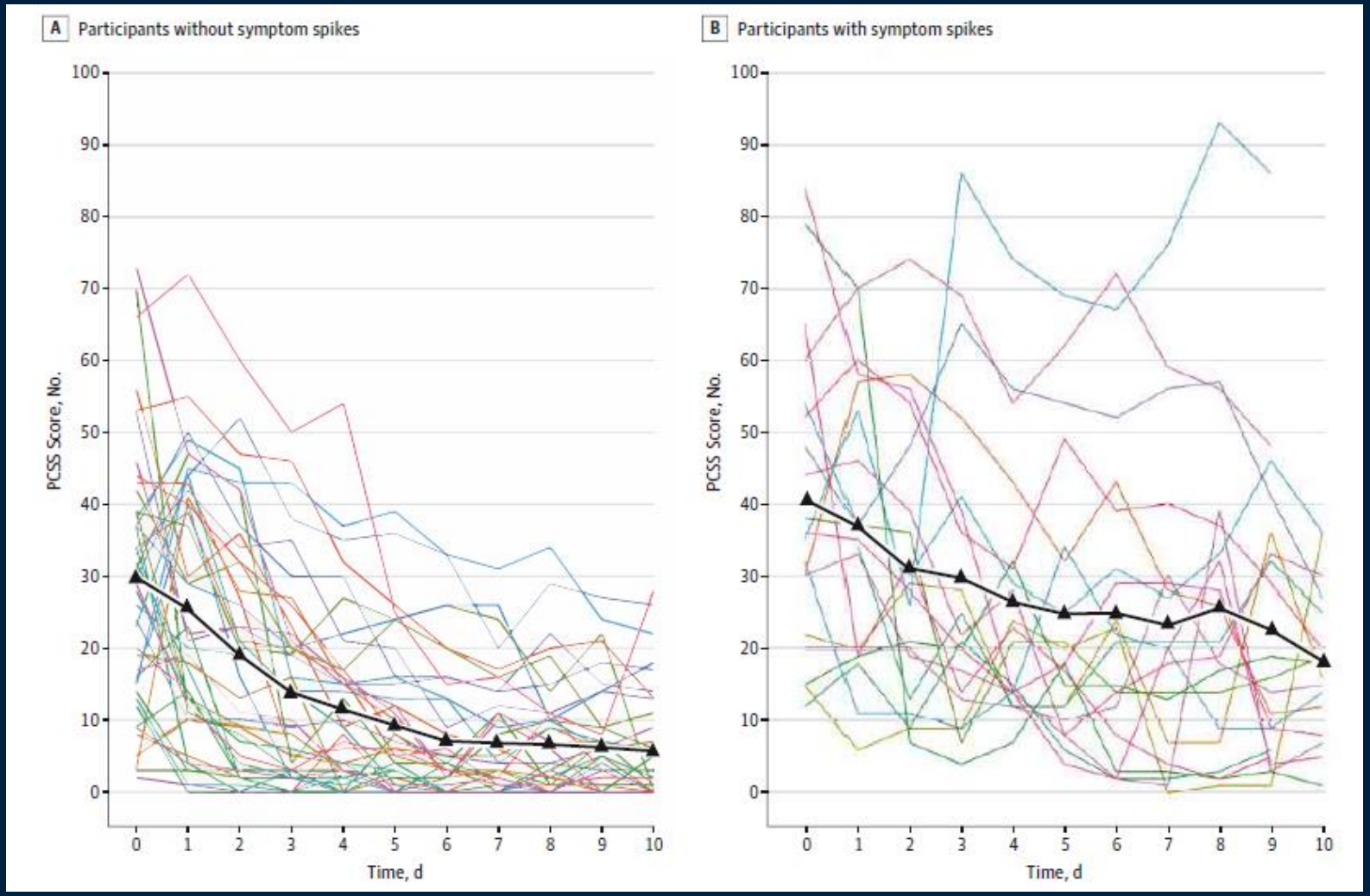
Pediatric and adult emergency departments of a tertiary care center in Worcester, MA

PRIMARY OUTCOME

Time to resolution of concussive symptoms, measured over 10 d on the 22-item Post-Concussive Symptom Scale (PCSS; range, 0-132 with higher scores indicating worse symptoms) and with resolution defined as a total score ≤3

Macnow T, Curran T, Tolliday C, et al. Effect of screen time on recovery from concussion: a randomized clinical trial. *JAMA Pediatr*. Published online September 7, 2021. doi:10.1001/jamapediatrics.2021.2782

What if my patient does “too much”?



Silverberg et al (2016). JAMA Pediatr, 170(10), 946-953.

- 1 in 3 children had a “symptom spike” within the first 10 days
- Often not preceded by a bout of activity
- Not associated with worse cognition or balance outcomes

Table 3. Regression Model Fit and Significance Test for the Predictor of Interest (Had at Least 1 Symptom Spike vs None)

Outcome	R^2 for Full Model	Standardized Coefficient for Symptom Spike (Yes/No)	*t*	*P* Value
Symptoms (PCSS)	0.33	0.53	4.71	<.001
Verbal memory (ImPACT)	0.21	0.06	0.52	.61
Visual memory (ImPACT)	0.34	−0.11	−0.97	.34
Motor speed (ImPACT)	0.18	−0.09	−0.07	.95
Reaction time (ImPACT)	0.31	0	0	.99
Balance (BESS)	0.13	−0.12	−0.80	.43

Silverberg et al (2016). JAMA Pediatr, 170(10), 946-953.

THE LANCET
Child & Adolescent Health

ARTICLES | VOLUME 5, ISSUE 11, P792-799, NOVEMBER 01, 2021

Early targeted heart rate aerobic exercise versus placebo stretching for sport-related concussion in adolescents: a randomised controlled trial

Prof John J Leddy, MD • Prof Christina L Master, MD • Rebekah Mannix, MD • Douglas J Wiebe, PhD • Matthew F Grady, MD • William P Meehan, MD • et al. Show all authors

Published: September 30, 2021 • DOI: https://doi.org/10.1016/S2352-4642(21)00267-4 •

Summary of early clinical management (first week post-injury)

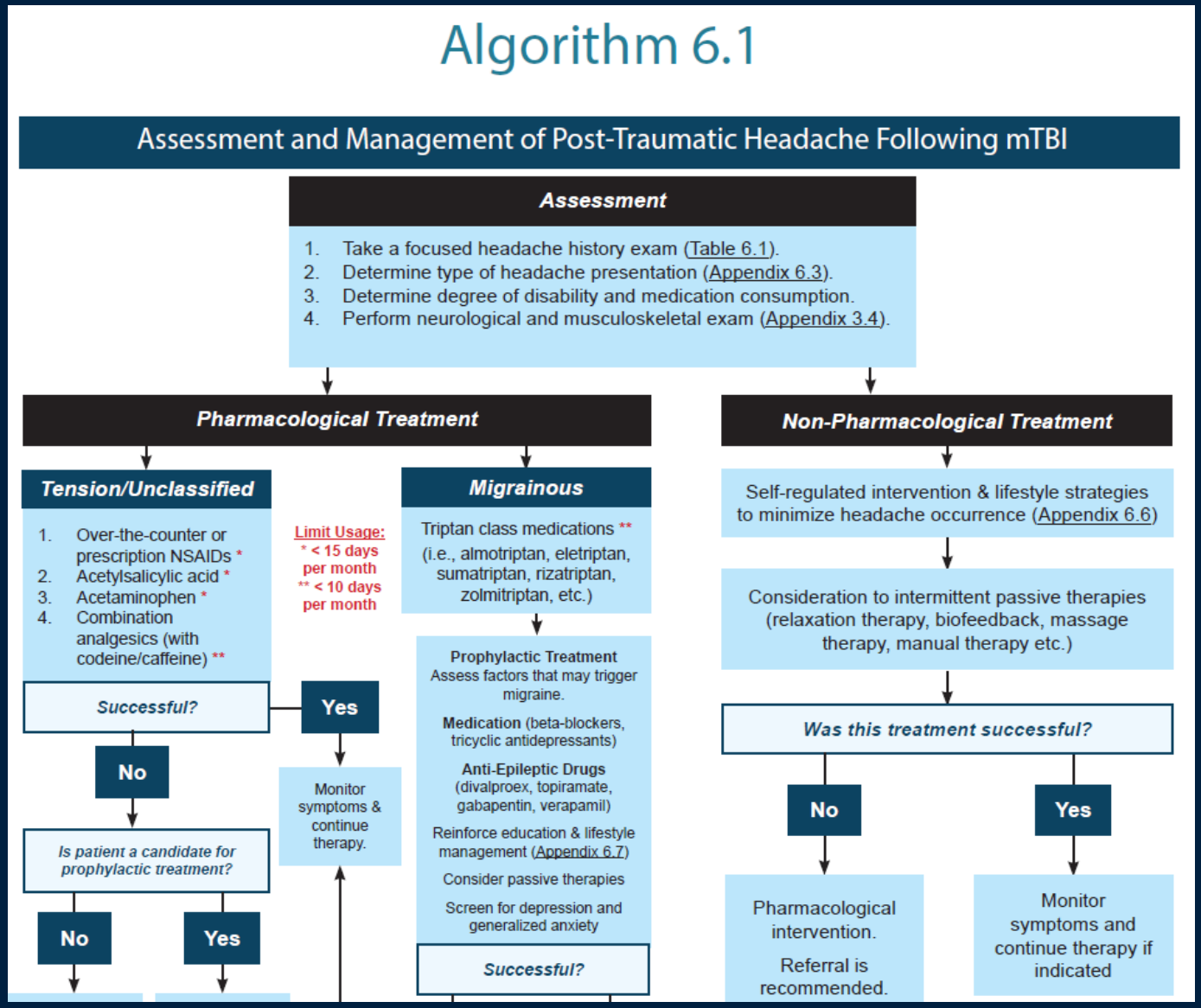
1. Education
2. Relative rest for 24-48 hours → gradual return to activity as tolerated

Managing persistent symptoms

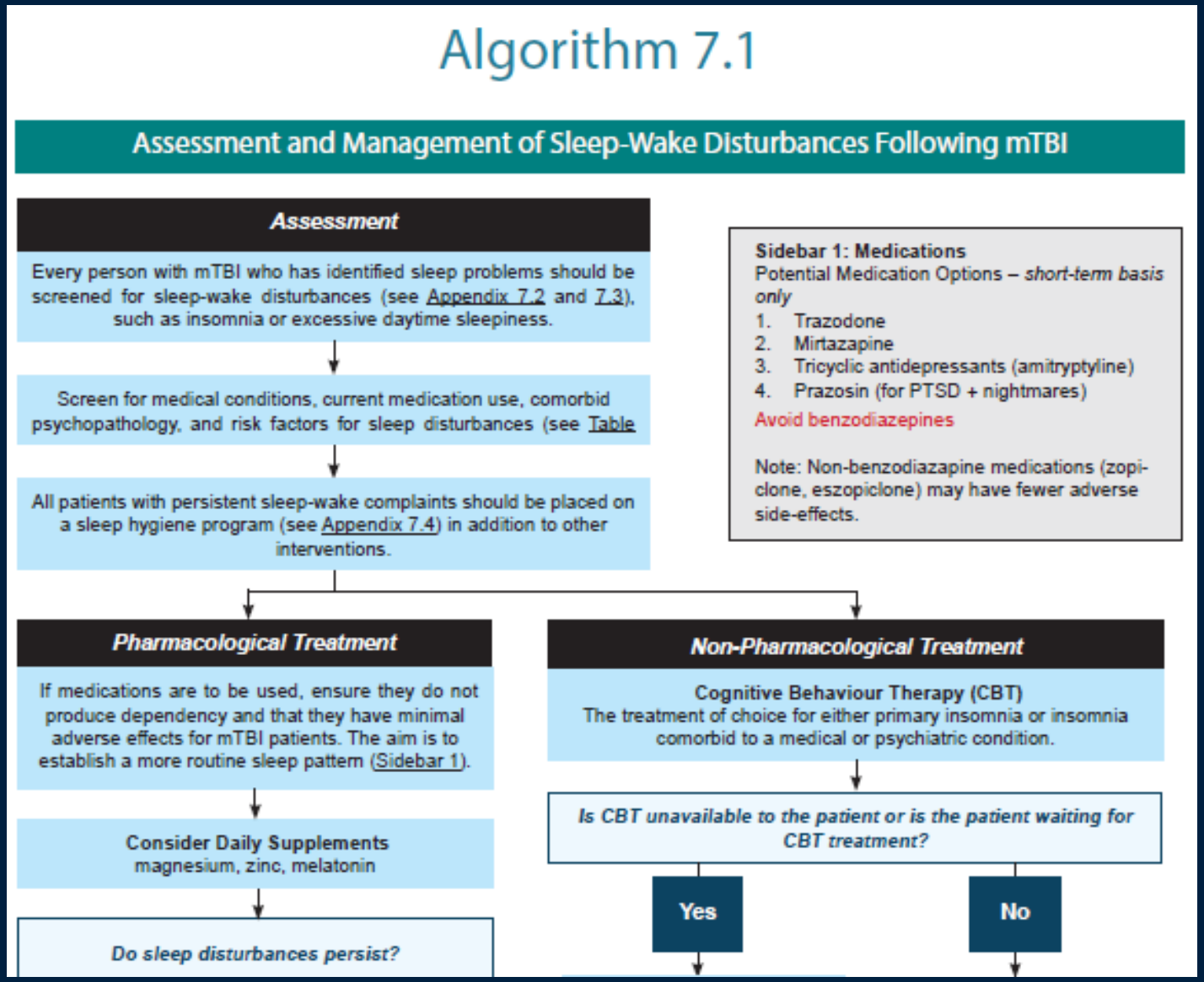
Principles of managing persistent symptoms

1. Target specific symptoms using evidence-based for primary medical/psychiatric conditions (e.g., migraine, insomnia, etc).
2. Prioritize symptoms that are most amenable to intervention and most likely to bring about improvement in other symptoms.
   - Headache
   - Sleep problems
   - Depression and anxiety

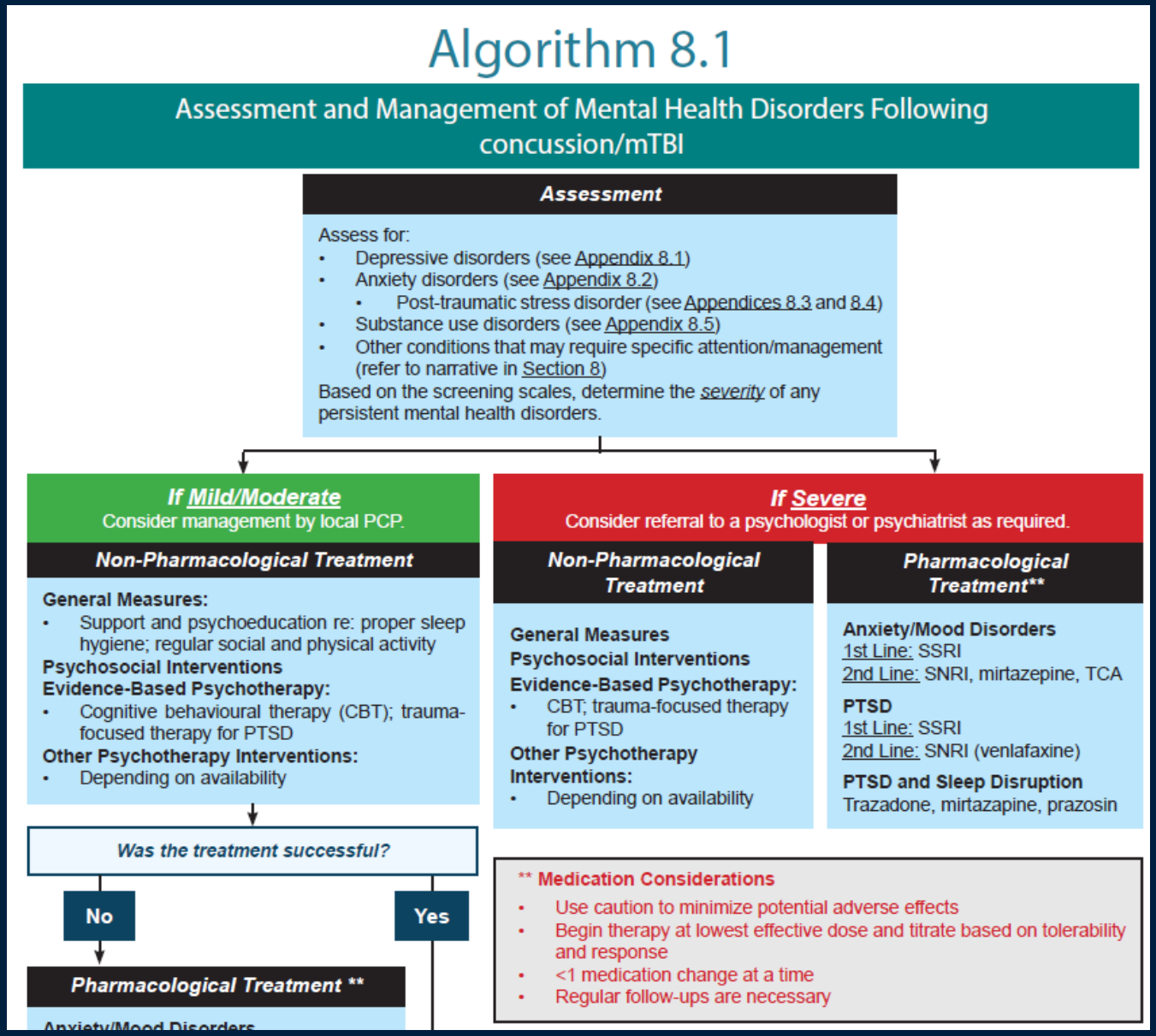
Headache


Algorithm 6.1
Assessment and Management of Post-Traumatic Headache Following mTBI
Assessment
1. Take a focused headache history exam (Table 6.1).
2. Determine type of headache presentation (Appendix 6.3).
3. Determine degree of disability and medication consumption.
4. Perform neurological and musculoskeletal exam (Appendix 3.4).
Pharmacological Treatment
Non-Pharmacological Treatment
Tension/Unclassified
1. Over-the-counter or prescription NSAIDs *
2. Acetylsalicylic acid *
3. Acetaminophen *
4. Combination analgesics (with codeine/caffeine) **
Limit Usage:
* < 15 days per month
** < 10 days per month
Migrainous
Triptan class medications **
(i.e., almotriptan, eletriptan, sumatriptan, rizatriptan, zolmitriptan, etc.)
Successful?
Yes
No
Monitor symptoms & continue therapy.
Is patient a candidate for prophylactic treatment?
No
Yes
Prophylactic Treatment
Assess factors that may trigger migraine.
Medication (beta-blockers, tricyclic antidepressants)
Anti-Epileptic Drugs (divalproex, topiramate, gabapentin, verapamil)
Reinforce education & lifestyle management (Appendix 6.7)
Consider passive therapies
Screen for depression and generalized anxiety
Successful?
Self-regulated intervention & lifestyle strategies to minimize headache occurrence (Appendix 6.6)
Consideration to intermittent passive therapies (relaxation therapy, biofeedback, massage therapy, manual therapy etc.)
Was this treatment successful?
No
Yes
Pharmacological intervention.
Referral is recommended.
Monitor symptoms and continue therapy if indicated

Sleep problems



Depression and anxiety



Algorithm 8.1

Assessment and Management of Mental Health Disorders Following concussion/mTBI

Assessment

Assess for:
- Depressive disorders (see Appendix 8.1)
- Anxiety disorders (see Appendix 8.2)
  - Post-traumatic stress disorder (see Appendices 8.3 and 8.4)
- Substance use disorders (see Appendix 8.5)
- Other conditions that may require specific attention/management (refer to narrative in Section 8)

Based on the screening scales, determine the *severity* of any persistent mental health disorders.

If Mild/Moderate
Consider management by local PCP.

Non-Pharmacological Treatment

General Measures:
- Support and psychoeducation re: proper sleep hygiene; regular social and physical activity

Psychosocial Interventions
Evidence-Based Psychotherapy:
- Cognitive behavioural therapy (CBT); trauma-focused therapy for PTSD

Other Psychotherapy Interventions:
- Depending on availability

Was the treatment successful?

No

Pharmacological Treatment **

Anxiety/Mood Disorders

Yes

If Severe
Consider referral to a psychologist or psychiatrist as required.

Non-Pharmacological Treatment

General Measures
Psychosocial Interventions
Evidence-Based Psychotherapy:
- CBT; trauma-focused therapy for PTSD

Other Psychotherapy Interventions:
- Depending on availability

Pharmacological Treatment**

Anxiety/Mood Disorders
1st Line: SSRI
2nd Line: SNRI, mirtazepine, TCA

PTSD
1st Line: SSRI
2nd Line: SNRI (venlafaxine)

PTSD and Sleep Disruption
Trazadone, mirtazapine, prazosin

** **Medication Considerations**
- Use caution to minimize potential adverse effects
- Begin therapy at lowest effective dose and titrate based on tolerability and response
- <1 medication change at a time
- Regular follow-ups are necessary

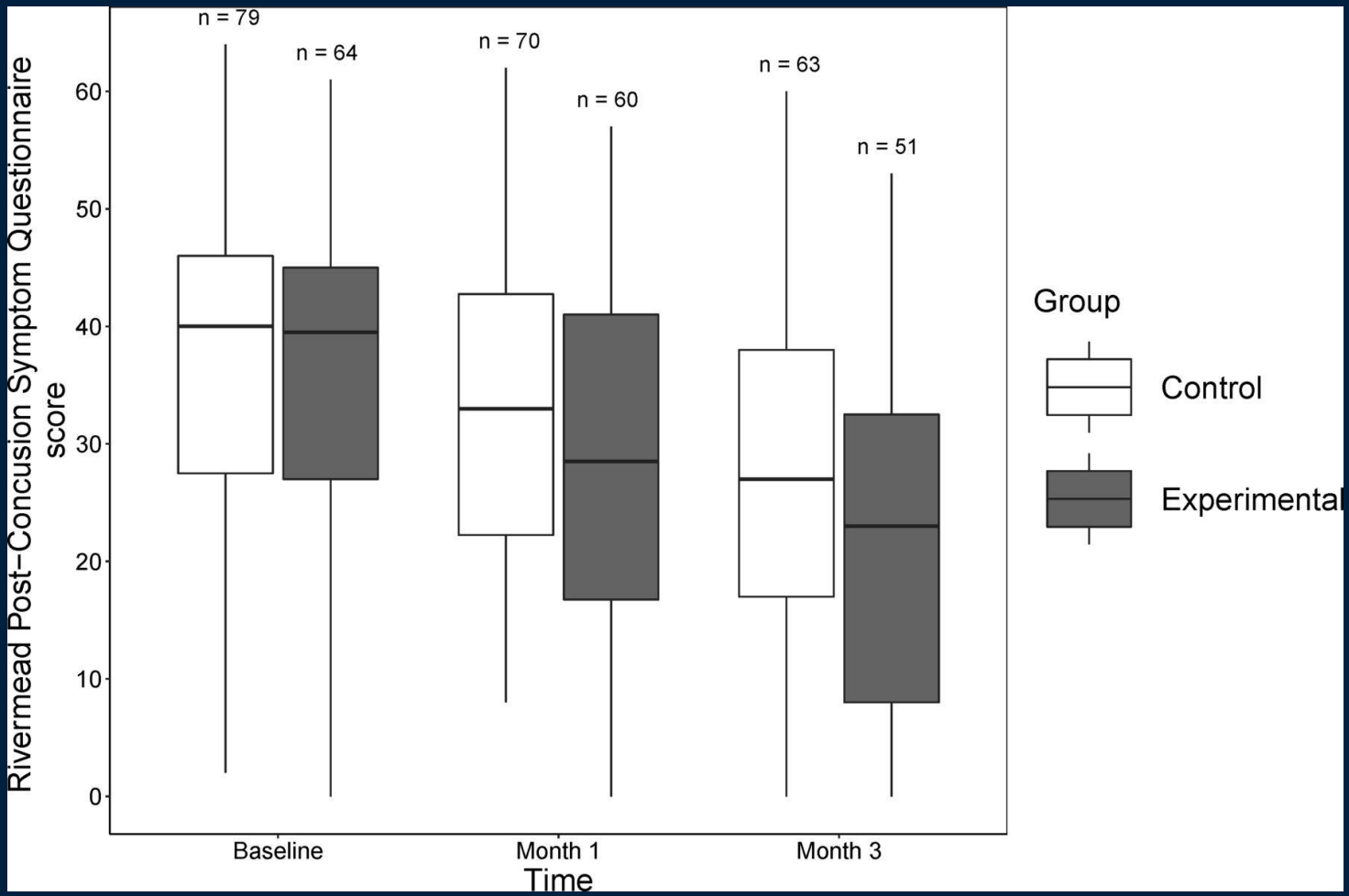
Proactive management in primary care may improve outcomes

Cluster randomized control trial with two groups:

- Support with screening + treatment initiation for headache, sleep, and depression, anxiety
- Usual care

Silverberg et al (2020). BMJ Open;**10:**e035527

Proactive management in primary care may improve outcomes



Silverberg et al (2020). BMJ Open;**10:**e035527

What if my patient is not getting better?

Table 1 Recommendation number/location and strength

Variable	ONF	CDC	VA/DoD	CISG
Use validated symptom scales for initial assessment and to track recovery	4.1 (C)	5A, 10B (B)	C	Pg. 3, 4, 7
Neuropsychological assessment to investigate persistent (>30d) cognitive symptoms	9.4 (A)	19C (C)	17 (Weak)	C
Referral to specialist or higher level of care for slow to recover patients (>10-14d for adult athletes, >30d for others)	2.4 (C)	11B/15F (B)	21 (Weak)	Pg. 5

Silverberg et al (2020). *Arch Phys Med Rehabil*. 2020. 101(2):382-393.

Referral to individual medical specialists or to a specialized multidisciplinary mTBI clinic is appropriate for patients with persistent symptoms (lasting more than 4-6 weeks) that do not respond to treatment in a primary care setting.[24-27] Earlier referral may be helpful when (1) patients have a high symptom burden or known risk factors for prolonged recovery, such as a preexisting mental health disorder,[76,81] (2) patients are unable to progress with their return to activity or are attempting to return to high-stakes roles soon after injury (eg, competitive sport or university examinations), or (3) access to care is limited (eg, long waitlist times). mTBI clinics should have access to a

Learn more about this service

Vancouver Coastal Health

Home / Locations & services

GF Strong Adult Concussion Services (GFACS)

A A Share Print

Read My Guide: Concussion (an online self management to concussion care resource) open to all.

The GF Strong Adult Concussion Services (GFACS) offers 2 streams of service:

1. GFACS Group Education Session

2. GFACS Rehabilitation Program

Concussion Services

The Concussion Services is an early intervention and follow-up service for clients living with the effects of a recent concussion/mild traumatic brain injury (mTBI).

How do I get an appointment?

- Have your health care professional (i.e. family doctor, nurse practitioner, ER,

JAMA Network Open™

Original Investigation | Neurology

Nonpharmacological Treatment of Persistent Postconcussion Symptoms in Adults

A Systematic Review and Meta-analysis and Guideline Recommendation

Hana Malá Rytter, PhD; Heidi J. Graff, PhD; Henriette K. Henriksen, PT; Nicolai Aaen, MSc; Jan Hartvigsen, PhD; Morten Hoegh, PhD; Ivan Nisted, MSc; Erhard Trillingsgaard Næss-Schmidt, PhD; Lisbeth Lund Pedersen, MSc, PT; Henrik Winther Schytz, MD, PhD, DMSc; Mille Møller Thastum, MSc, PhD; Bente Zerlang, OT; Henriette Edemann Callesen, PhD

Table 3. Overview of Recommendations in the Guideline and the Certainty of Evidence[a]

PICO	Intervention	Certainty of evidence	Recommendation
PICO 1	Systematically offered information and advice	Very low	Weak recommendation for
PICO 2	Graded physical exercise	Very low	Weak recommendation for
PICO 3	Vestibular rehabilitation	Very low	Weak recommendation for
PICO 4	Spinal manual therapy	Very low	Weak recommendation for
PICO 5	Oculomotor vision treatment	No relevant evidence identified	Good clinical practice statement
PICO 6	Psychological treatment	Low	Weak recommendation for
PICO 7	Interdisciplinary coordinated rehabilitative treatment	Low	Weak recommendation for

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