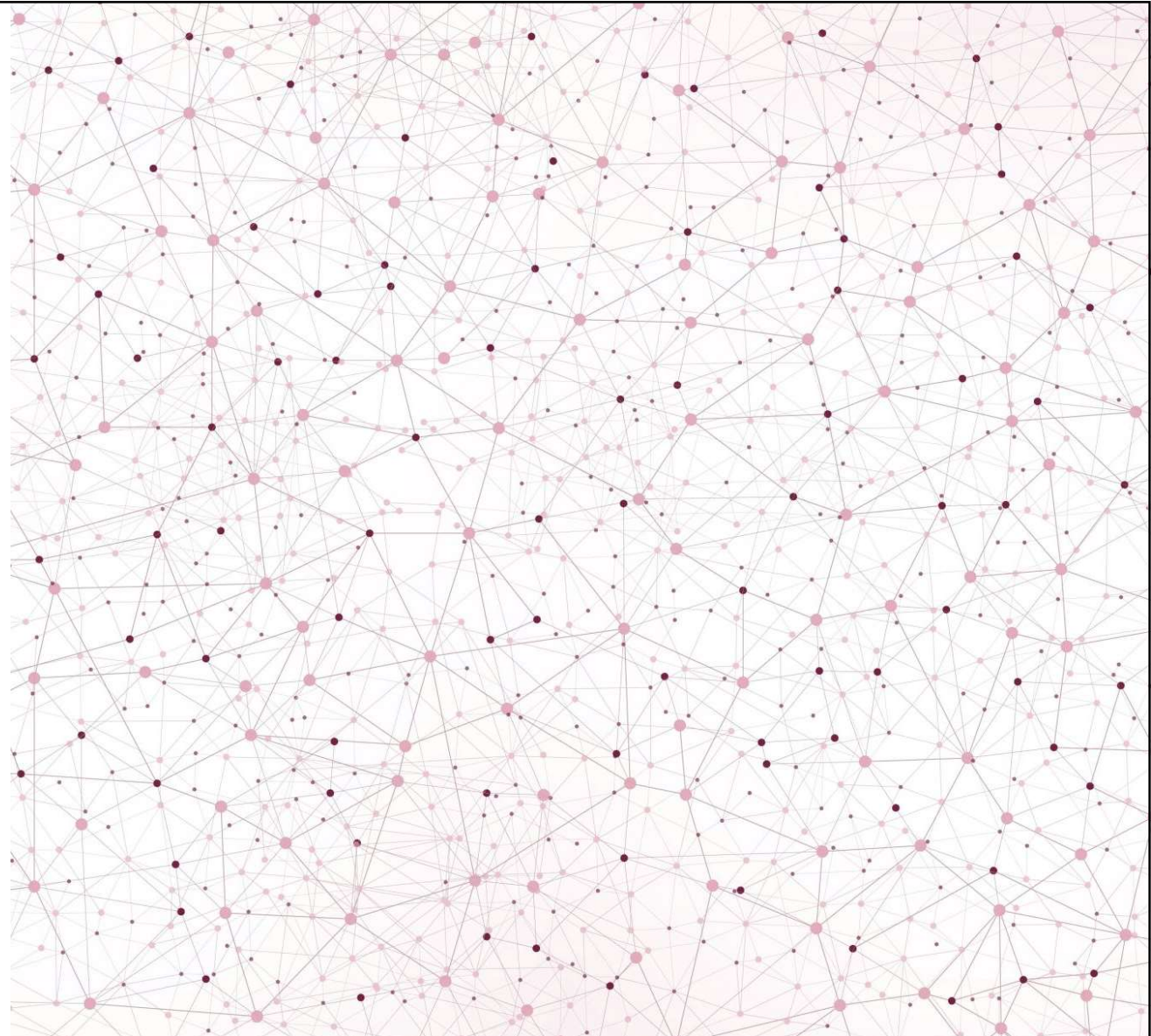


CONCUSSION: HEADS UP ON NEW EVIDENCE FOR PRACTICE

Jessica L. Peck
DNP, APRN, CPNP-PC, CNE,
CNL, FAANP, FAAN



DISCLOSURES

Jessica L. Peck DNP, APRN, CPNP-PC, CNE, CNL, FAANP, FAAN has no financial relationships with commercial interests to disclose

Any unlabeled/unapproved uses of drugs or products referenced will be disclosed

OBJECTIVES

Identify

Identify updates in a standard process for sport-related concussion (SRC) management using the Amsterdam Consensus Statement 11 'R's.

Discuss

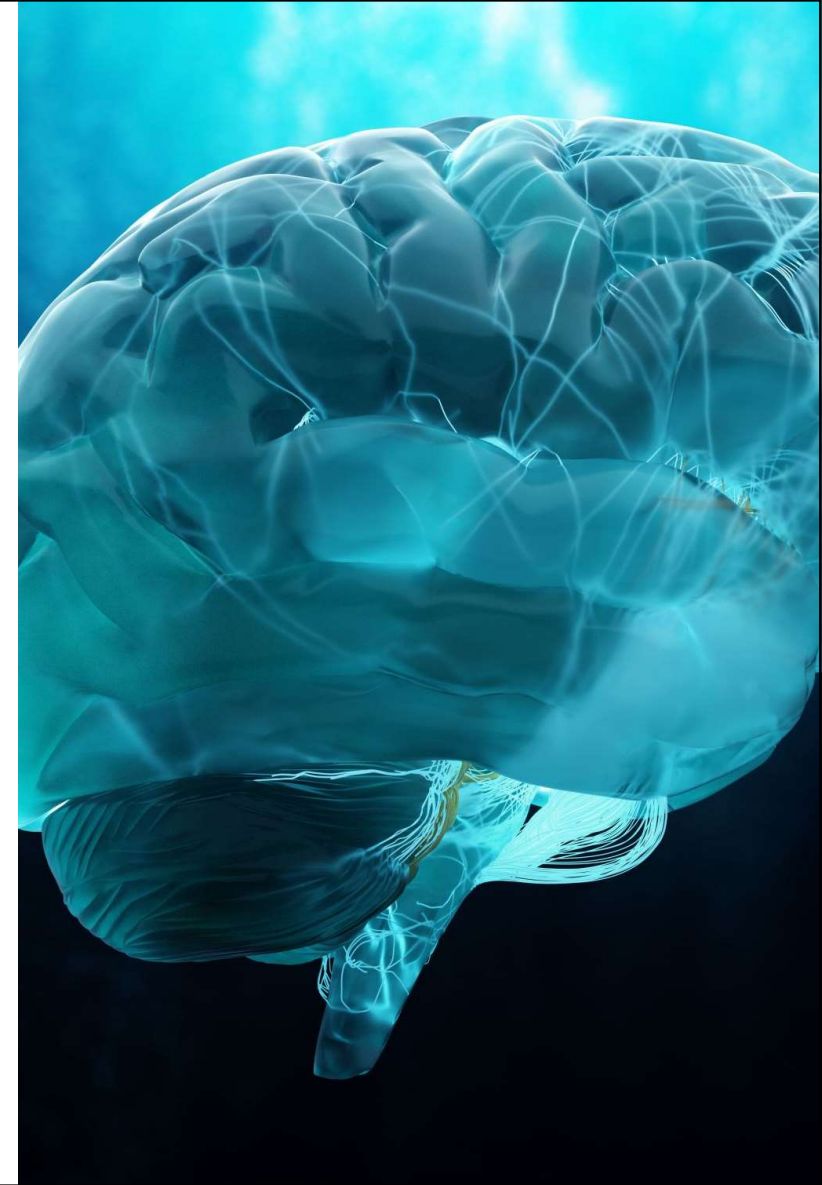
Discuss updates in the sport concussion assessment tools, SCAT6 and Child SCAT6.

Review

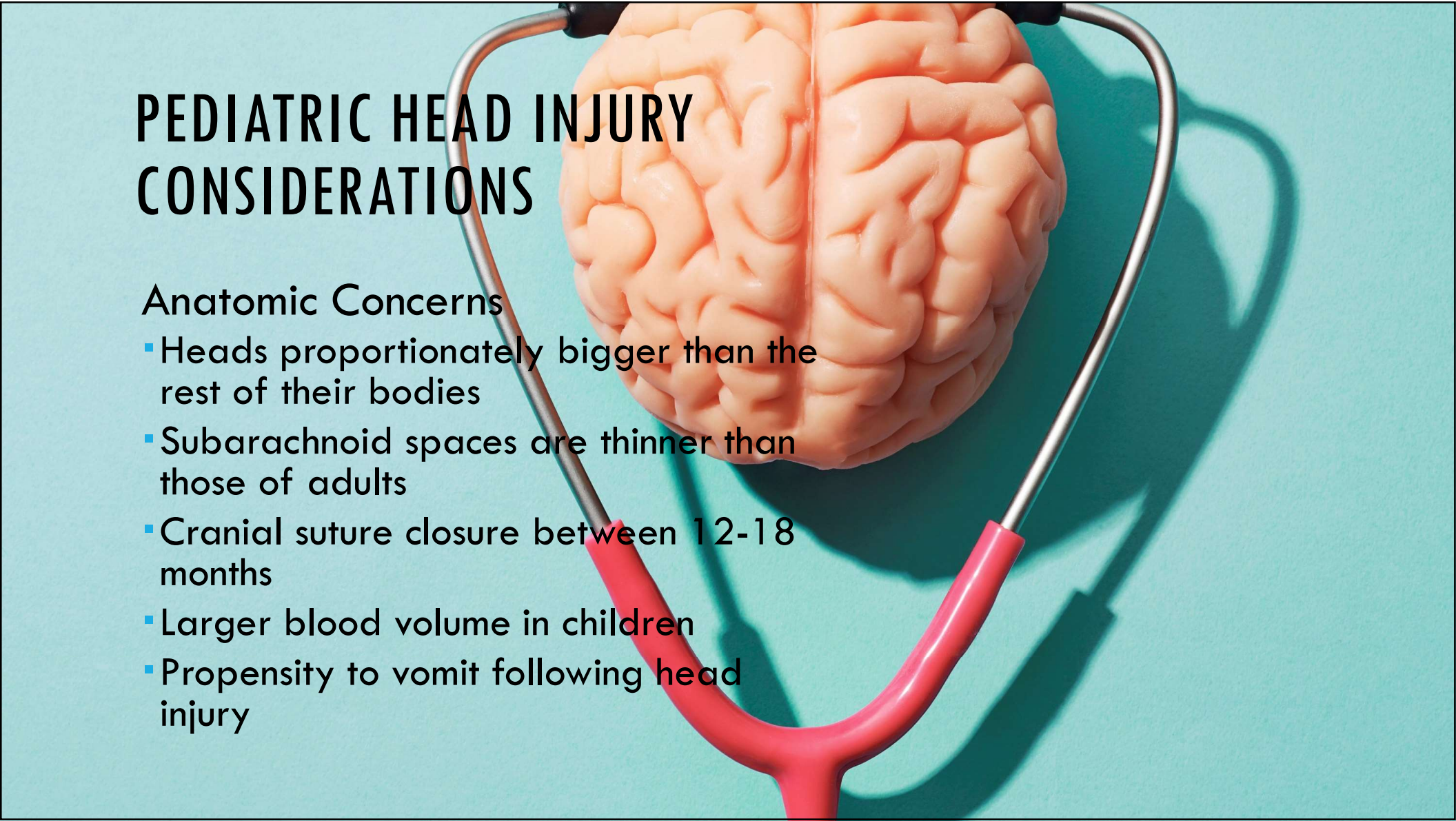
Review the newly developed sport concussion office assessment tools, SCOAT6 and Child SCOAT6.

DID YOU KNOW?

Traumatic brain injury (TBI) is the leading cause of death or severe disability in children older than 1 year.



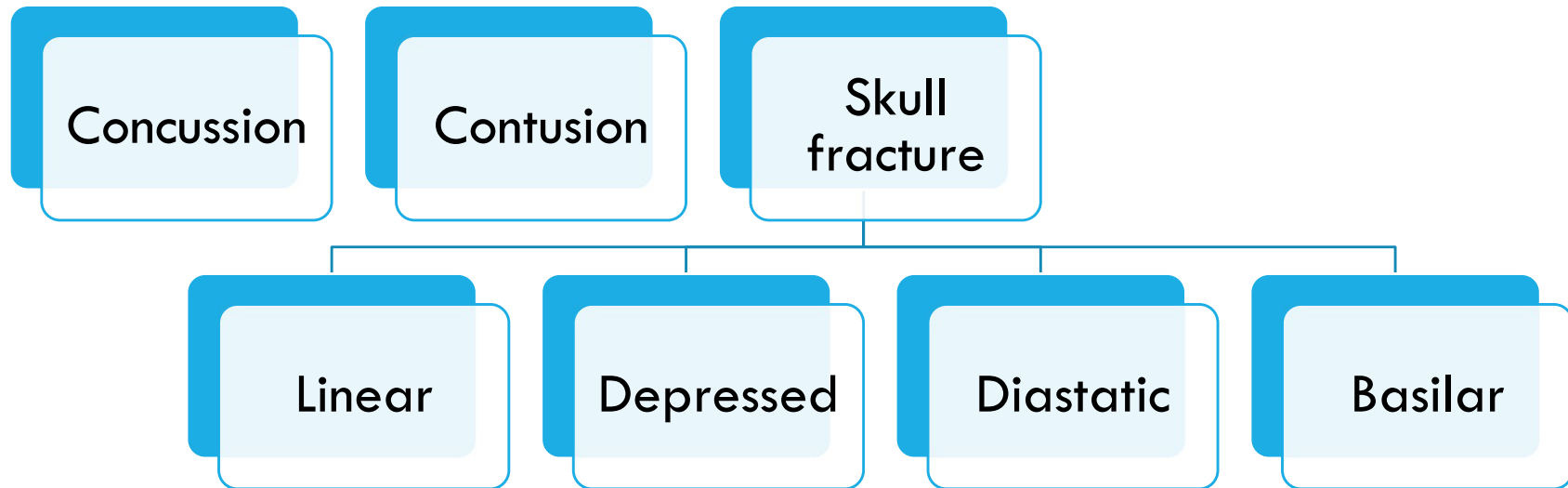
PEDIATRIC HEAD INJURY CONSIDERATIONS



Anatomic Concerns

- Heads proportionately bigger than the rest of their bodies
- Subarachnoid spaces are thinner than those of adults
- Cranial suture closure between 12-18 months
- Larger blood volume in children
- Propensity to vomit following head injury

DIFFERENTIAL



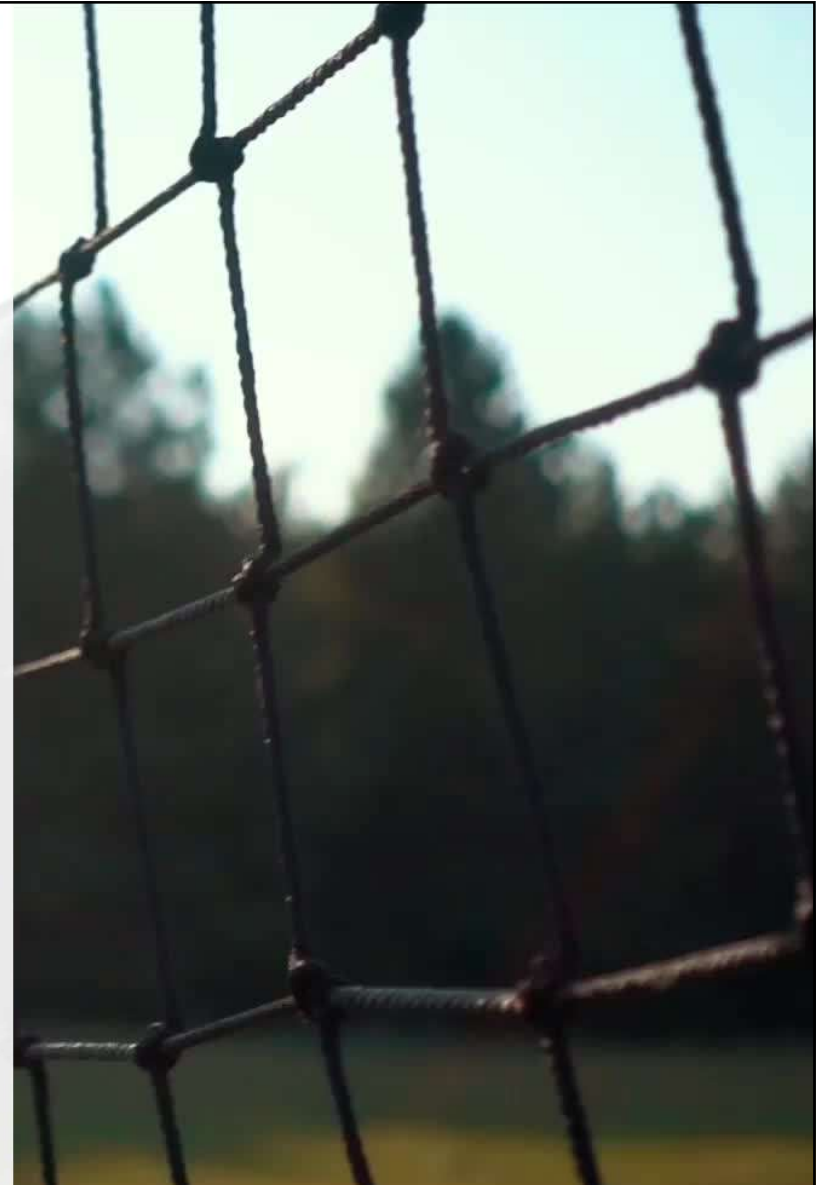
RISKS AND CAUSES

Causes

- Sports
- Fall injury
- MVA
- Abuse

Risks

- Teen Boys
- Spring/Summer months
- Sports



PREVENTION



Sports Physicals



Baseline neurocognitive testing



Coach certification and training



Injury prevention



Safety

ATV

Protective gear

MVA

SPECIFIC PREVENTIONS



CAR SAFETY



CHILDPROOFING
HOME



HELMET USE



PLAYGROUND
SURFACES



SPORTS
CULTURE

PREVENTION RECOMMENDATIONS



Mouthguard use in ice hockey



Disallowing body checking in ice hockey



Limiting contact practice for American football



Emphasis on NMT warm-ups (balance, strength, agility)



Reduce re-concussive events



From: **Pediatric Sport-Related Concussion: Recommendations From the Amsterdam Consensus Statement 2023**

Pediatrics. 2023;153(1). doi:10.1542/peds.2023-063489



Figure Legend:

The Tools developed for use by the lay person (CRT6), and for health care professionals in the acute period (SCAT6 and Child SCAT6) and subacute period (SCOAT6 and Child SCOAT6). Free downloads of all the tools available at <https://bjsm.bmj.com/content/57/11>.

Date of Download: 5/26/2024

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DETERMINING LEVEL OF CARE

- LOC
- somnolent, unresponsive to commands
- confusion, memory loss or decreased LOA
- visual disturbance
- have unequally sized pupils or unilateral weakness
- foreign object penetration, uncontrolled bleeding, deformity
- seizure
- vomit more than once



DETERMINING LEVEL OF CARE

- Bleeding from nose or ear
- Difficulty swallowing
- Poor coordination or clumsiness
- Photophobia
- Sensitivity to noise
- Acting different behaviors
- Severe or persistent headache



CONCUSSION SIGNS



Can't recall events *prior to or after* a hit or fall

Appears dazed or stunned

Forgets an instruction, is confused about an assignment or position, or is unsure of the game, score, or opponent

Moves clumsily

Answers questions slowly

Loses consciousness (*even briefly*)

Shows mood, behavior, or personality changes

https://www.cdc.gov/headsup/basics/concussion_symptoms.html

REPORTED CONCUSSION SYMPTOMS

- Headache or “pressure” in head.
- Nausea or vomiting.
- Balance problems or dizziness, or double or blurry vision.
- Bothered by light or noise.
- Feeling sluggish, hazy, foggy, or groggy.
- Confusion, or concentration or memory problems.
- Just not “feeling right,” or “feeling down”.

https://www.cdc.gov/headsup/basics/concussion_symptoms.html



HISTORY

- Time of the incident
- Details of the mechanism of injury *
- Witnessed loss of consciousness and duration
- Discrete episodes of vomiting
- Assess any amnesia (antegrade or retrograde) and duration. Assessment is not possible in preverbal children and unlikely to be possible before the age of 5 years
- Headache
- Seizures since the injury
- Altered behaviour since the injury
- Ingestion of alcohol or drugs
- Other injuries
- Clinical course prior to consultation – improving/stable/deterioration

ASSESSMENT

 Inspection

 Fundoscopic examination

 Palpation

 Auscultation

 Evaluation

 Extremities

 Reflexes

PEDIATRIC mTBI GUIDELINE

Checklist

Healthcare providers treating children 18 years of age and younger

HEALTHCARE PROVIDERS SHOULD:

ASSESS.

Conduct a physical examination to identify findings that:

- Suggest more severe TBI (e.g., hemotympanum, pupillary asymmetry).
- May impact management of mTBI (e.g., concurrent injuries or baseline deficits, oculomotor dysfunction).
- Suggest other contributions to symptoms (e.g., dehydration, cervical tenderness, scalp hematoma).

Do not image routinely (including CT & MRI).

- Use validated clinical decision rules predicting risk for more severe injury to determine need.

Assess symptoms using validated scales. Consider cognitive and balance testing.

Conduct a history to identify risk factors for poor prognosis using validated prediction rules.

UNSEAL.

Provide information about:

- Warning signs that injury may be more serious.
- Typical recovery course.
- How to prevent further injury.
- Gradual re-introduction of activity that does not worsen symptoms.
- The need for social and emotional support.

Offer clear instructions (preferably verbal and written) on return to activity, including school and sports, customized to the patient's symptoms.

- After a few days of rest (2-3 days), begin light activity & then gradually re-introduce regular activities (not inclusive of sports) that do not significantly worsen symptoms.
- Assess school-related needs & monitor progress in collaboration with parents and school professionals.
- Once back to regular non-sports activities (including school), patient can begin return to sports using a standard progression with gradually increasing levels of physical exertion.
- No return to contact sports activity until symptom-free with exertion (including without the use of pain medication).

REFER.

Identify and tailor treatment plans/referrals to address:

- Acutely worsening symptoms → consider neuroimaging.
- Chronic headache → non-opioid analgesia (monitor for overuse), multi-disciplinary evaluation.
- Vestibulo-ocular dysfunction → vestibular rehabilitation.
- Worsening sleep problem → sleep hygiene, sleep specialist.
- Cognitive impairment → treatment directed at etiology, neuropsychological evaluation.
- Emotional dysfunction → psychotherapeutic evaluation and treatment.

A combination of risk factors that may indicate need for neuroimaging include:

- Age < 2 years old
- Recurrent vomiting
- Loss of consciousness
- Severe mechanism of injury
- Severe or worsening headache
- Amnesia
- Non-frontal scalp hematoma
- Glasgow Coma Score < 15
- Clinical suspicion for skull fracture

Examples of validated scales include, but aren't limited to:

- Post-Concussion Symptom Scale
- Health and Behavior Inventory
- Post-Concussion Symptom Inventory
- Acute Concussion Evaluation

Factors associated with poor prognosis:

- Older age (older children/adolescents) or Hispanic ethnicity
- Lower socio-economic status
- History of intracranial injury
- Premorbid histories of mTBI or increased pre-injury symptoms
- Neurological or psychiatric disorder
- Learning difficulties or lower cognitive ability
- Family and social stressors

Parents should watch for warning signs:

- A headache that gets worse & does not go away
- Significant nausea or repeated vomiting
- Increased confusion, restlessness, or agitation
- Slurred speech, drowsiness, or inability to wake up
- Weakness, numbness, or decreased coordination
- Loss of consciousness, convulsions, or seizures

Steps in a return to play progression generally include:

- Step 1: Return to regular non-sports activities
- Step 2: Light aerobic exercise
- Step 3: Sport-specific exercise
- Step 4: Non-contact training drills
- Step 5: Full contact practice
- Step 6: Return to sport

Refer patients whose symptoms do not resolve as expected with standard care after 4-6 weeks.



To view the full set of recommendations from the CDC Pediatric mTBI Guideline, visit www.cdc.gov/HEADSUP.

EVALUATION CHECK LIST

Assess
 Counsel
 Refer

<https://www.cdc.gov/traumaticbraininjury/PediatricmTBIGuidelineChklist.html>

Do	Use	Assess	Provide	Counsel
<p>Do not routinely image patients to diagnose mTBI.</p>	<p>Use validated, age-appropriate symptom scales to diagnose mTBI.</p>	<p>Assess evidence-based risk factors for prolonged recovery.</p>	<p>Provide patients with instructions on return to activity customized to their symptoms.</p>	<p>Counsel patients to return gradually to non-sports activities after no more than 2-3 days of rest.</p>

<https://www.cdc.gov/traumaticbraininjury/PediatricmTBIGuidelineChklist.html>

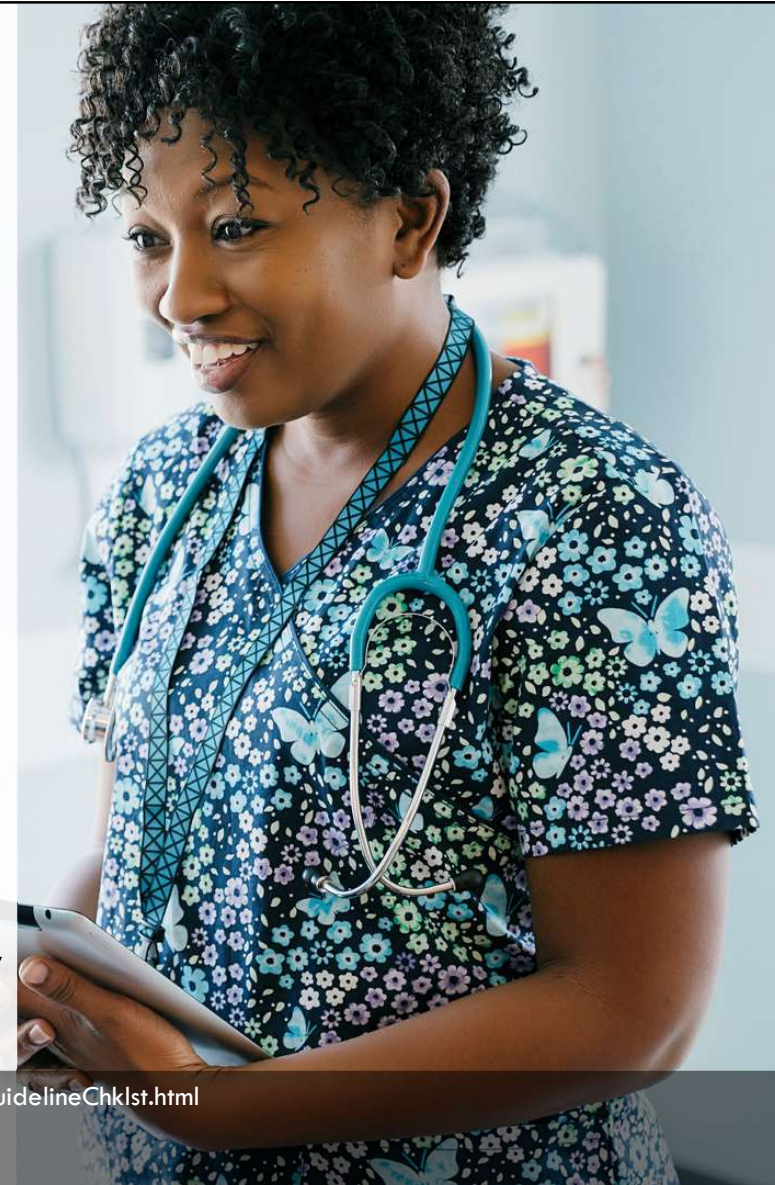
ASSESS

Perform a comprehensive physical examination

Determine risk factors for imaging → less than 2 years old, recurrent vomiting, LOC, severe mechanism of injury, severe or worsening headache, amnesia, non frontal scalp hematoma, $GCS < 15$, clinical suspicion for skull fx

Utilize validated scales

Evaluate for other risk factors for poor prognosis → h/o intracranial injury, lower SES, coexisting neurologic or psych disorders, family and social stressors



<https://www.cdc.gov/traumaticbraininjury/PediatricmTBIGuidelineChk1st.html>

CONCUSSION DANGER SIGNS

- One pupil larger than the other.
- Drowsiness or inability to wake up.
- A headache that gets worse and does not go away.
- Slurred speech, weakness, numbness, or decreased coordination.
- Repeated vomiting or nausea, convulsions or seizures (shaking or twitching).
- Unusual behavior, increased confusion, restlessness, or agitation.
- Loss of consciousness (passed out/knocked out). Even a brief loss of consciousness should be taken seriously.
- An infant who will not stop crying and cannot be consoled.
- An infant who will not nurse or eat.

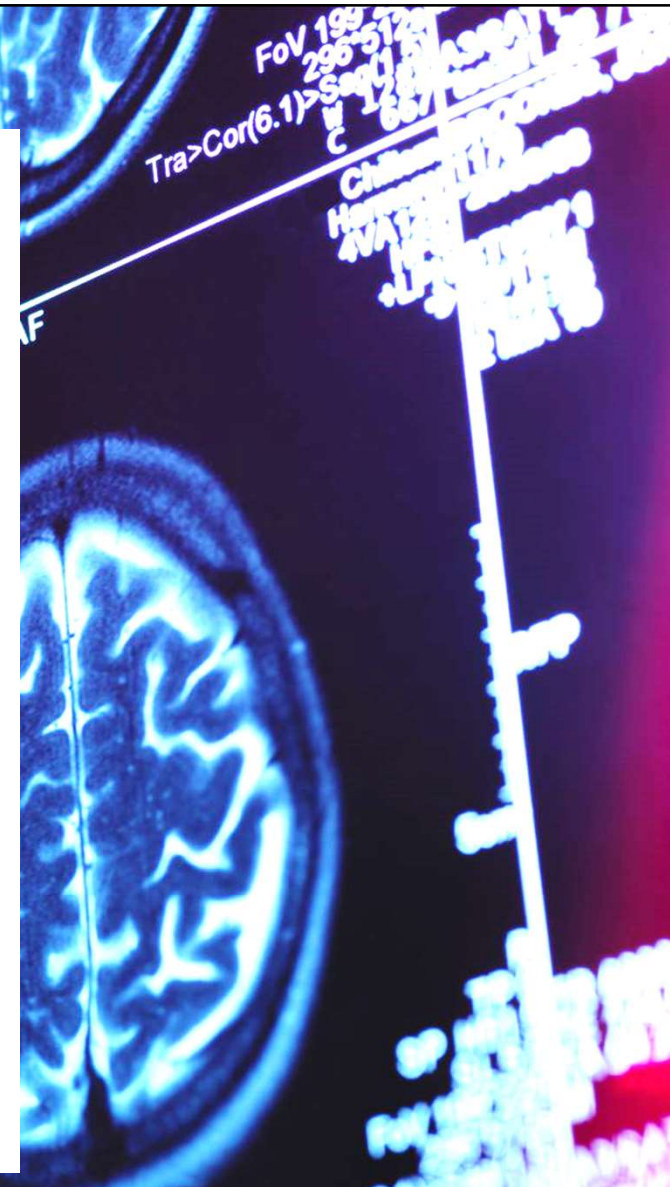


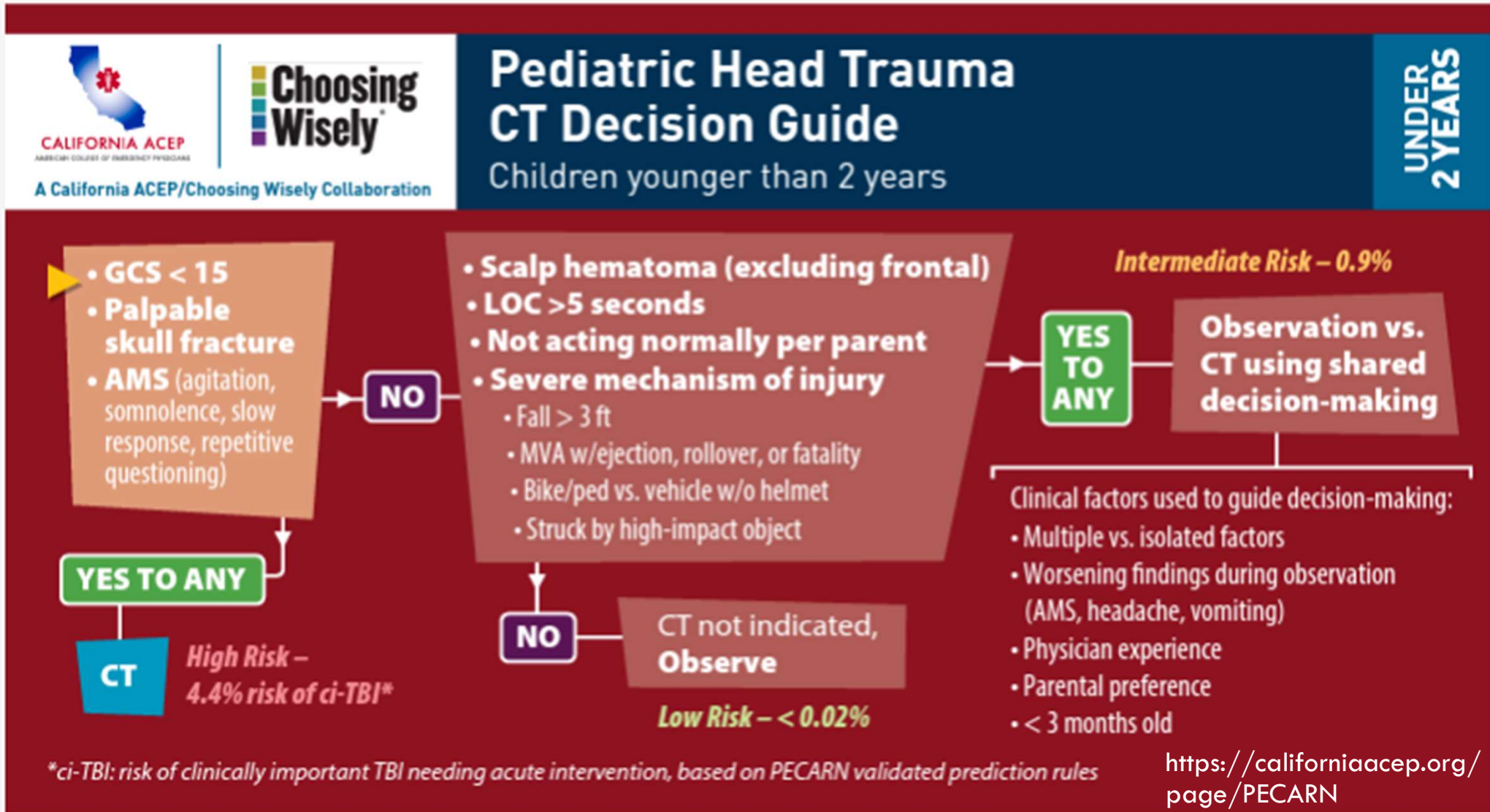
https://www.cdc.gov/headsup/basics/concussion_symptoms.html

PECARN HEAD CT RULE

Largest study to date aiming to derive and validate clinical prediction rules to identify children with very low risk of Clinically Important TBI (ciTBI) following blunt head trauma who would not require imaging

- In the less than 2 year old group, the rule was 100% sensitive.
- In the greater than 2 year old group, the rule had 96.8% sensitivity.
- In those under 2 with GCS=14, AMS, or palpable skull fracture, risk was 4.4% and CT imaging is recommended.
 - Risk with any of the remaining predictors was 0.9%, and less than 0.02% with no predictors.
- In those over 2 with GCS=14, AMS, or signs of basilar skull fracture, risk was 4.3% and CT imaging is recommended.
 - Risk with any of the remaining 4 predictors was 0.9%, and less than 0.05% with no predictors.





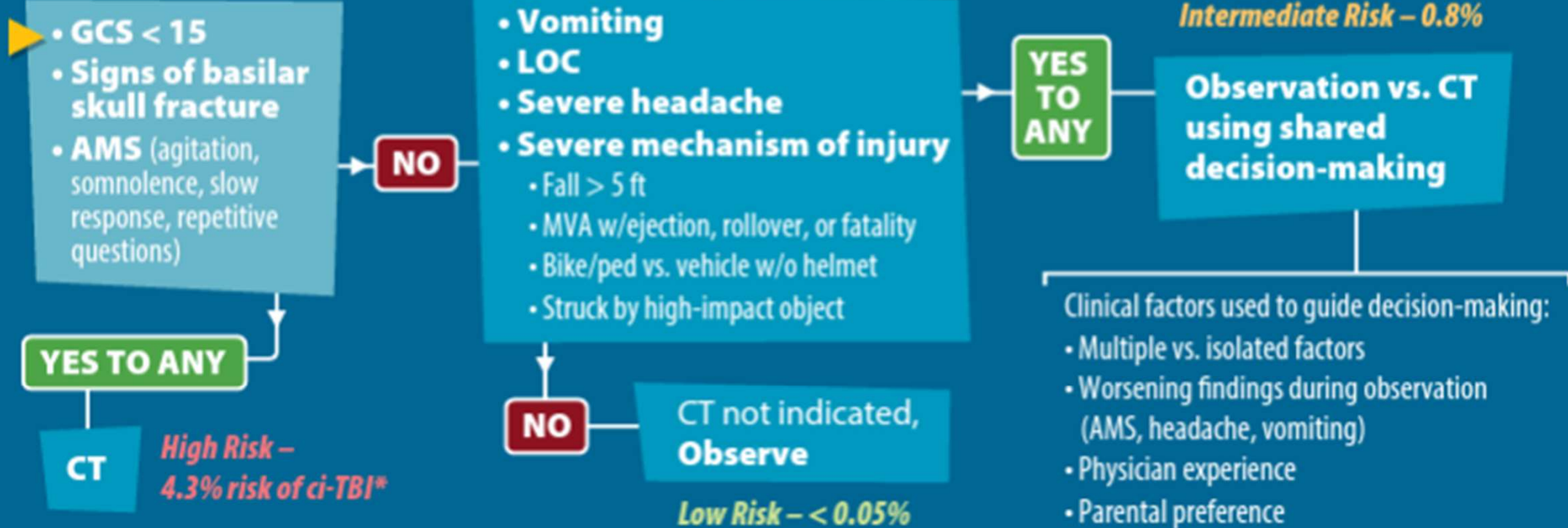


A California ACEP/Choosing Wisely Collaboration

Pediatric Head Trauma CT Decision Guide

Children 2 years and older

2 YEARS
& OLDER



*ci-TBI: risk of clinically important TBI needing acute intervention, based on PECARN validated prediction rules

<https://californiaacep.org/page/PECARN>

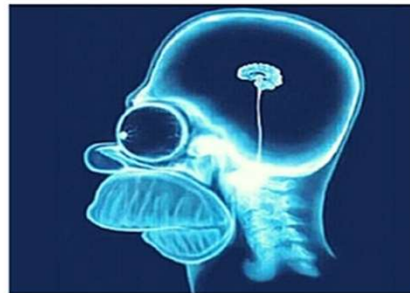
NICE CT CRITERIA

CT head?

Immediately in:

1 of:

- * NAI
- * Seizure (& no epilepsy)
- * Initial assessment:
GCS <14 or <15 in under 1s
- * GCS <15 at 2 hrs from injury
- * Sign of BOS#
- * Focal neuro deficit
- * Under 1 & bruise/swelling/lac >5cm



>1 of*:

- * LOC >5min
- * Abnormal drowsiness
- * >3 episodes of vomiting
- * Dangerous MOI
- * Amnesia >5min

* if only 1: observe for 4 hrs and CT if more vomiting, abnormal drowsiness or GCS <14

CLINICAL TOOLS

Assessment Tools

- Glasgow Coma Scale
- Standardized Assessment of Concussion
- Sport Concussion Assessment Tool 3 (SCAT)
- Military Acute Concussion Evaluation

• Symptom Scales

- Acute Concussion Evaluation
- Health and Behavior Inventory
- Graded Symptom Checklist and Graded Symptom Scale
- Post-Concussion Symptom Inventory



Council, Medicine, I. of, Board on Children, Y., Youth, C. on S.-R. C. in, Spicer, C. M., Ford, M. A., Rivara, F. P., & Graham, R. (2013). *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture*. National Academies Press. <https://doi.org/10.17226/18377>

PEDIATRIC GLASGOW COMA SCALE (GCS)

PEDIATRIC GLASGOW COMA SCALE (PGCS)				
	> 1 Year		< 1 Year	Score
EYE OPENING	Spontaneously		Spontaneously	4
	To verbal command		To shout	3
	To pain		To pain	2
	No response		No response	1
MOTOR RESPONSE	Obeys		Spontaneous	6
	Localizes pain		Localizes pain	5
	Flexion-withdrawal		Flexion-withdrawal	4
	Flexion-abnormal (decorticate rigidity)		Flexion-abnormal (decorticate rigidity)	3
	Extension (decerebrate rigidity)		Extension (decerebrate rigidity)	2
	No response		No response	1
	> 5 Years	2-5 Years	0-23 months	
VERBAL RESPONSE	Oriented	Appropriate words/phrases	Smiles/coos appropriately	5
	Disoriented/confused	Inappropriate words	Cries and is consolable	4
	Inappropriate words	Persistent cries and screams	Persistent inappropriate crying and/or screaming	3
	Incomprehensible sounds	Grunts	Grunts, agitated, and restless	2
	No response	No response	No response	1
TOTAL PEDIATRIC GLASGOW COMA SCORE (3-15):				

IMMEDIATE TREATMENT

Always consider the need for appropriate analgesia.

These children require 30 minutely neurological observations (GCS, pupils and limb power, HR, RR, BP) documented on a PEWS chart while in ED.

If these patients do not fulfil the criteria for a CT head scan then they should be observed in ED for a minimum of 4 hours from the time of injury before they can be discharged.

Should be able to tolerate oral fluids in ED and be steady on their feet before discharge.

No clear evidence for/against Ondansetron.

Sports/Activities management

COUNSEL

- Discuss warning signs
- Expected recovery course
- Rest but not cocooning
- Gradual reintroduction to activity
- Encourage social and emotional support



<https://www.cdc.gov/traumaticbraininjury/PediatricmTBIGuidelineChklist.html>

HOLISTIC SUPPORTS

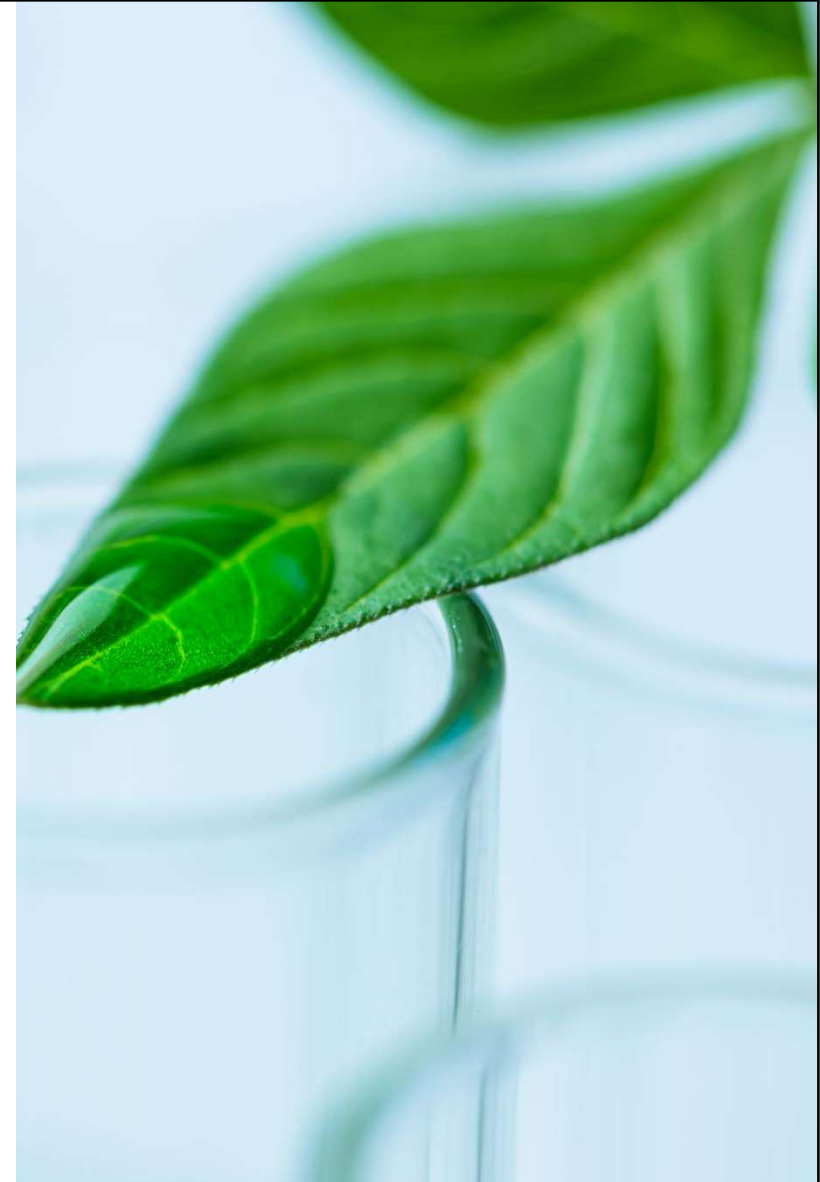
environment

genetic predisposition

temperament

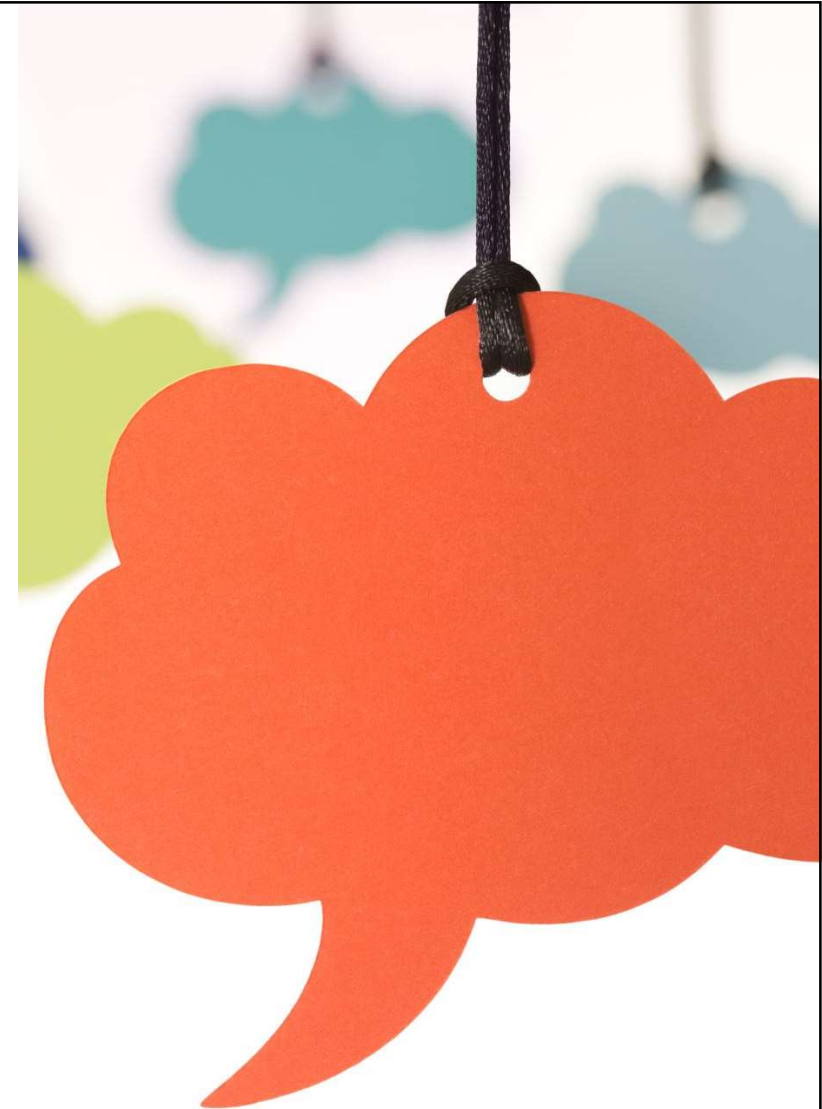
external supports

influencing factors

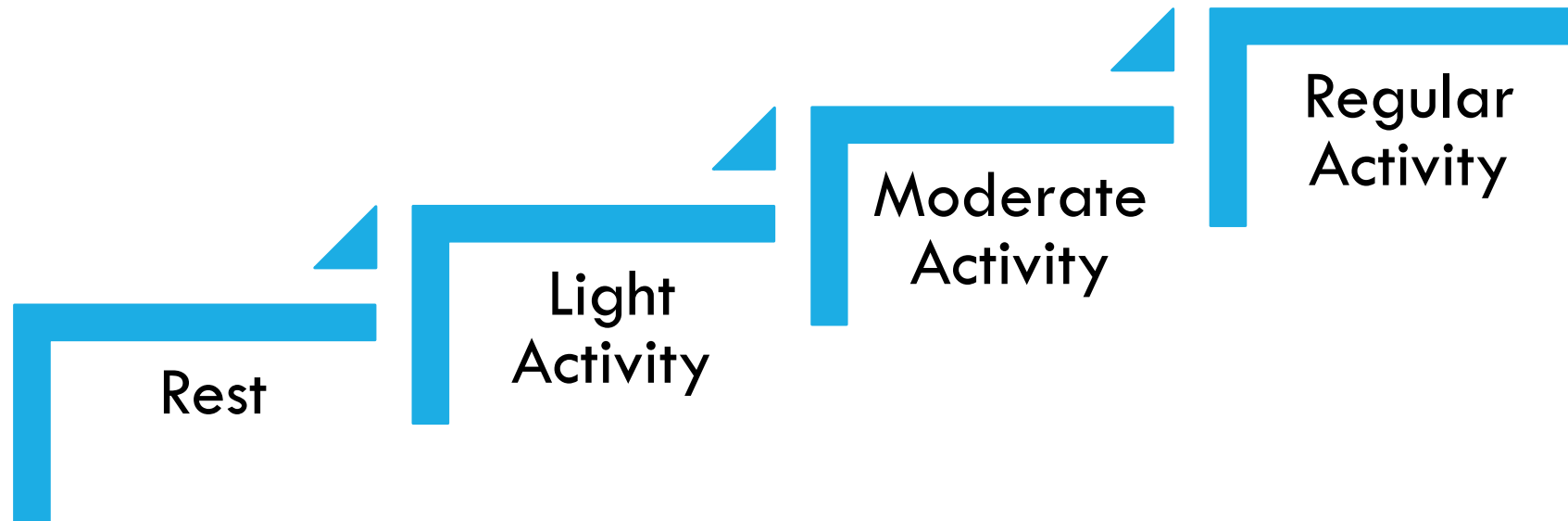


COGNITIVE FATIGUE

- slowness when thinking, understanding and responding to questions or commands
- problems concentrating
- difficulties with memory
- difficulty thinking of the right words to say
- being more demanding than usual, and become easily frustrated
- being more fearful and anxious
- changed sleep patterns
- mood swings and irritability.

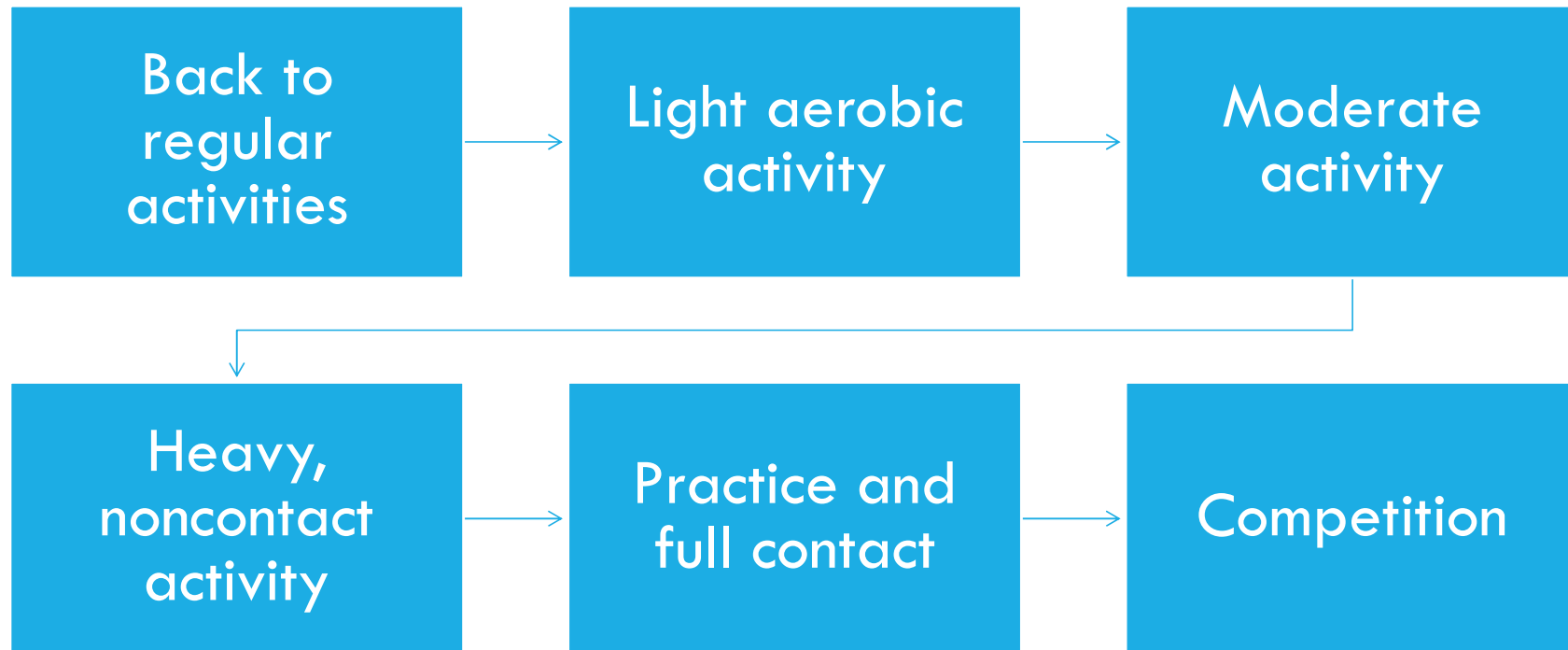


RETURN TO NORMAL ACTIVITIES



https://www.cdc.gov/headsup/basics/concussion_recovery.html

RETURN TO SPORTS



https://www.cdc.gov/headsup/basics/return_to_sports.html

REFER

Symptom	Recommendation
Acutely worsening symptoms	Consider neuroimaging
Chronic headache	Non-opioid analgesia (monitor for overuse), multi-disciplinary evaluation
Vestibulo-ocular dysfunction	Vestibular rehabilitation
Worsening sleep problem	Sleep hygiene, sleep specialist
Cognitive impairment	Treatment directed at etiology, neuropsychological evaluation
Emotional dysfunction	Psychotherapeutic evaluation and treatment

<https://www.cdc.gov/traumaticbraininjury/PediatricMBIGuidelineChk1st.html>

NEW UPDATES

Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport—Amsterdam, October 2022

<https://bjsm.bmj.com/content/57/11/695>



KEY POINTS – CONCUSSION IN SPORT GROUP



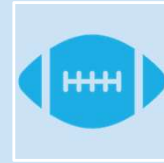
The Amsterdam 2022 International Consensus Statement on Concussion in Sport summarises published evidence at the time of the conference and should be read together with the 10 systematic reviews and the methodology paper.



Content and methodological advances were made in the consensus process including anonymous voting, summaries of alternate viewpoints, declarations of conflicts of interest in the open conference, plus inclusion of the athlete voice, para sport considerations and ethical perspectives.




The Concussion in Sport Group definition of concussion was updated while work continues toward a unified conceptual and operational definition.




Sport-specific strategies recommended as concussion prevention interventions include policy or rule changes reducing collisions, neuromuscular training in warm-ups, mouthguard use in ice hockey and implementation of optimal concussion management strategies to reduce recurrent concussion rates.


KEY POINTS... CONT'D...



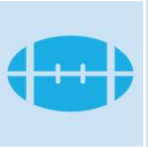
The Concussion Recognition Tool-6 (CRT6), Sport Concussion Assessment Tool-6 (SCAT6) and Child SCAT6 provide updated iterations of the acute sport-related concussion (SRC) tools best used in the first 72 hours (and up to 1 week) after injury. New office tools, the Sport Concussion Office Assessment Tool-6 (SCOAT6) and Child SCOAT6, were designed to better guide evaluation and management in an office setting from 72 hours after injury and for serial evaluations in the following weeks. The overlap between the SCAT6 and SCOAT6 is intentional and designed to facilitate easy transitions across tools.



Advanced neuroimaging, fluid-based biomarkers, genetic testing and emerging technologies are valuable research tools for the study of concussion but not yet suited for routine use in clinical practice.



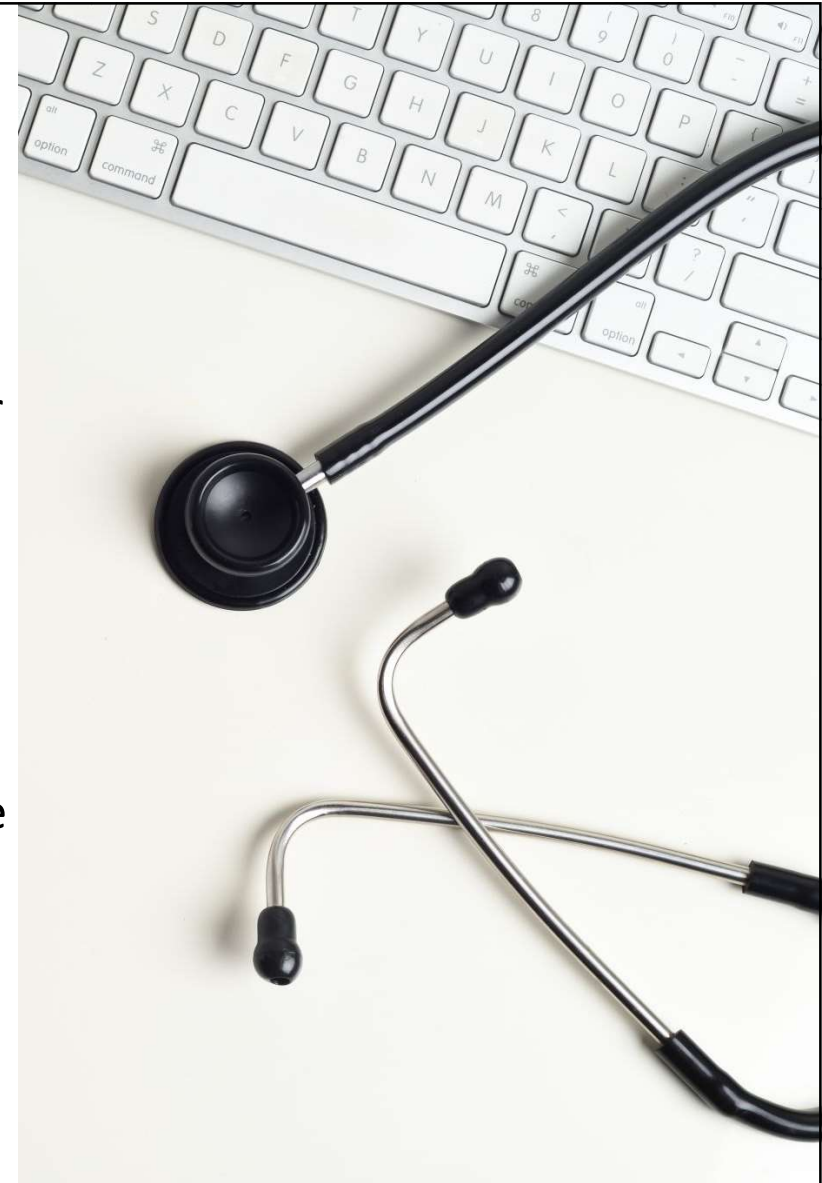
The results of computerised neurocognitive tests should be interpreted in the context of broader clinical findings and are not to be used in isolation to inform management or diagnostic decisions.



Return-to-learn and return-to-sport strategies have been updated based on evolving evidence.

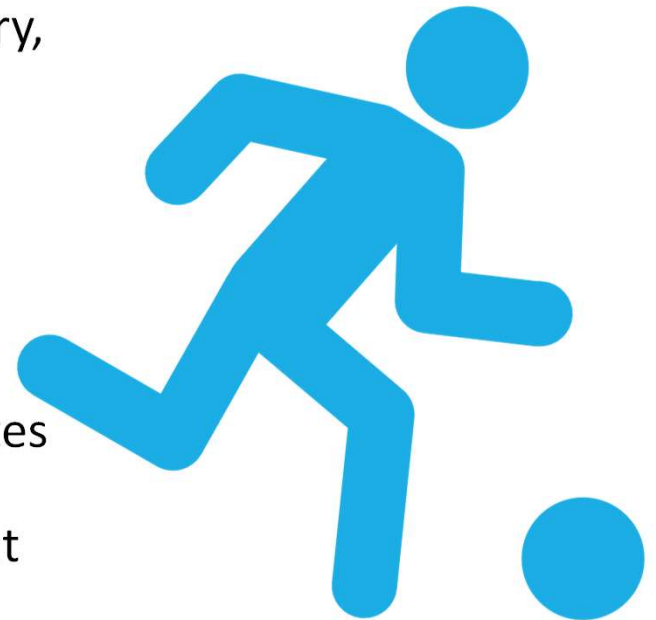
KEY POINTS... CONT'D...

- Strong evidence exists regarding the benefits of physical activity and aerobic exercise treatment as early interventions.
- Cervicovestibular rehabilitation is indicated for athletes with neck pain, headaches, dizziness and/or balance problems.
- Individuals with persisting symptoms (ie, symptom duration >4 weeks) should be evaluated with a multimodal clinical assessment including the use of standardised and validated symptom rating scales.
- The potential long-term effects of SRC and repetitive head impacts are areas of ongoing public health interest and concern among both healthcare professionals and the general public. It is proposed that a working group representing multiple disciplines and perspectives be established to guide appropriate research in this area.



KEY POINTS... CONT'D...

- Decisions regarding retirement or discontinuation from contact or collision sports are complex, multifaceted and should be individualised to consider patient, injury, sport-specific, ethical and psychosocial factors. A comprehensive multidisciplinary clinical evaluation is often necessary to inform decisions.
- Limited evidence exists on SRC in patients aged 5–12 years.
- Concussion diagnosis and management in para athletes is challenging with limited data, requiring further research and dedicated clinical recommendations that consider a range of impairments.
- Future research and consensus processes for concussion in sport should continue to evolve with an inclusive and interdisciplinary approach.



CONCUSSION DEFINITION

Sport-related concussion is a traumatic brain injury caused by a direct blow to the head, neck or body resulting in an impulsive force being transmitted to the brain that occurs in sports and exercise-related activities. This initiates a neurotransmitter and metabolic cascade, with possible axonal injury, blood flow change and inflammation affecting the brain. Symptoms and signs may present immediately, or evolve over minutes or hours, and commonly resolve within days, but may be prolonged.

No abnormality is seen on standard structural neuroimaging studies (computed tomography or magnetic resonance imaging T1- and T2-weighted images), but in the research setting, abnormalities may be present on functional, blood flow or metabolic imaging studies. Sport-related concussion results in a range of clinical symptoms and signs that may or may not involve loss of consciousness. The clinical symptoms and signs of concussion cannot be explained solely by (but may occur concomitantly with) drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction) or other comorbidities (such as psychological factors or coexisting medical conditions).



POLICY CHANGES

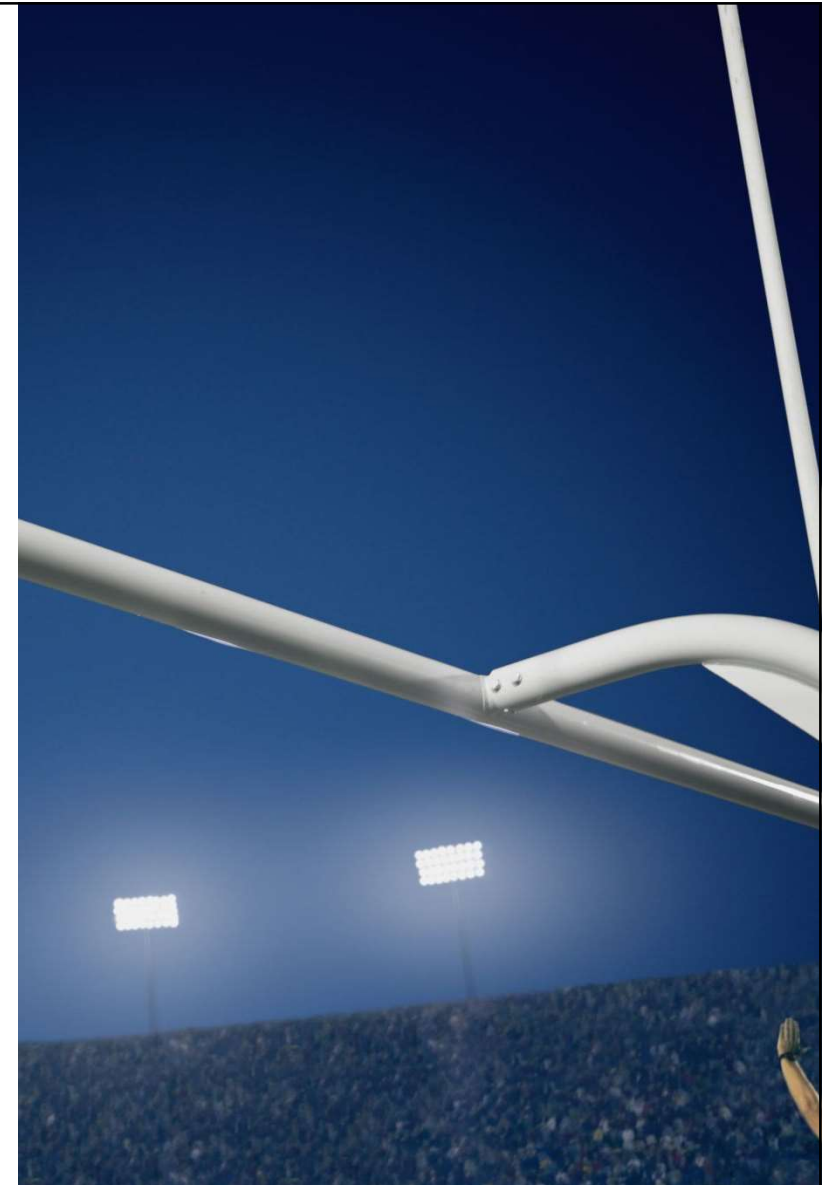
Body checking in hockey (58%)

Number and duration of contact practices in American football (64%)

PPE- Mouthguard (28%)

On-field neuromuscular training

Management



REMOVE SIDELINE EVALUATION

- ***Create both paper and electronic formats of SCAT6/Child SCAT6/CRT6.***
- ***Explore the development of alternate tools for serial evaluation in the office setting.***
- ***Improve psychometric properties: longer word list (eg, 12- or 15-word list) and remove the 5-word list.***
- ***Further examine form differences on existing 10-word lists and consider the use of regression-based norms.***
- ***Create a cognitive composite score to improve test–retest reliability and reduce false positives.***
- ***Add digits (ie, increase the longest string by two digits) to the digit span backward subtest to reduce ceiling effects.***
- ***Revise months backward to include a component of timed information processing.***
- ***Add timed dual gait tasks.***
- ***Implement tests and/or procedures to assess the performance validity of baseline testing.***
- ***Add a more robust set of visible signs to the SCAT6/Child SCAT6/CRT6, including: Falling with no protective action, tonic posturing, impact seizure, ataxia/motor incoordination, altered mental status and blank/vacant/dazed look.***
- ***Support serial SCAT6/Child SCAT6 assessments after an athlete is removed from play, for example, half-time after the game and 24–48 hours after injury.***

This Photo by Unknown Author is licensed under CC BY-SA-NC

RE-EVALUATE OFFICE ASSESSMENT

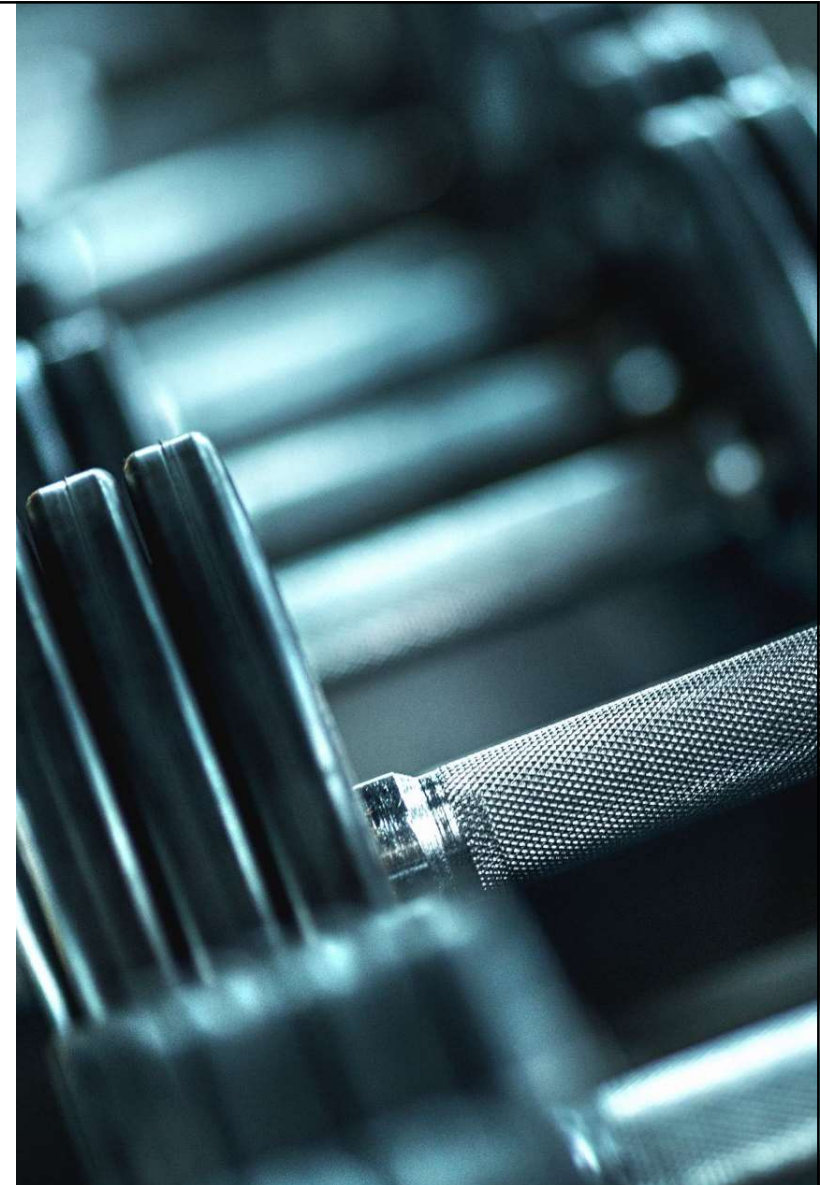
- *Word recall and Digit Backwards tests:*
- *Measurement of systolic and diastolic blood pressure as well as heart rate*
- *Symptoms brought on by a change in postural position*
- *Evaluation of cervical spine*
- *A neurological examination*
- *Timed tandem gait as a single task and a more complex dual task with the addition of a cognitive task*
- *The modified Vestibular-Ocular Motor Screen (VOMS).*
- *Delayed word recall*

NEW ADDITIONS TO OFFICE ASSESSMENT

- Additional symptoms for child and parent reports that capture multiple subacute domains.
- An age-appropriate measure of cognitive reaction time such as the Symbol Digit Modalities Test.
- Validated paediatric measures of (1) orthostatic tachycardia, (2) orthostatic intolerance, (3) vestibular and oculomotor function and (4) child mental health and sleep questionnaires.

REST AND EXERCISE

- *Recommend early return to PA as tolerated*
- *Reduced screen use in the first 48 hours after injury*
- *Systematically advance exercise intensity*
- *HCPs with access to exercise testing can safely prescribe subsymptom threshold aerobic exercise treatment within 2–10 days after SRC*



REFER

- *The term ‘persisting symptoms’ is used for symptoms that persist >4 weeks across children, adolescents and adults.*
- *Persisting symptoms can be assessed using standardised and validated symptom rating scales. However, evidence-based recommendations regarding the use of other specific tests or measures in the clinical diagnosis of persisting symptoms in any age group are not possible based on existing research.³⁷*
- *A multimodal clinical assessment, ideally by a multidisciplinary team, is indicated to characterise individuals with persisting symptoms, including the types, pattern and severity of symptoms, and any associated conditions or other factors that may be causing or contributing to the symptoms.*

REHABILITATION

If dizziness, neck pain and/or headaches persist for more than 10 days, cervicovestibular rehabilitation is recommended.

If symptoms persist beyond 4 weeks in children and adolescents, active rehabilitation and collaborative care may be of benefit.

For children, adolescents and adults with dizziness/balance problems, either vestibular rehabilitation or cervicovestibular rehabilitation may be of benefit.

The inclusion of subsymptom threshold aerobic exercise (as outlined above) in combination with other treatments should be considered.



RECOVER



Assessment of symptom reports



Other outcomes relevant to ongoing symptoms or a specific research question.



Measures of return to activity such as RTL and RTS

RETURN



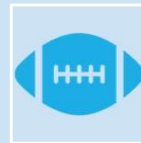
Symptom resolution at rest : resolution of symptoms associated with the current concussion at rest.



Return-to-learn (RTL) : return to preinjury learning activities with no new academic support, including school accommodations or learning adjustments.



Complete symptom resolution : resolution of symptoms associated with the current concussion at rest with no return of symptoms during or after maximal physical and cognitive exertion.



Return-to-sport (RTS) : completion of the RTS strategy with no symptoms and no clinical findings associated with the current concussion at rest and with maximal physical exertion.

RETURN TO
LEARN
ADJUSTMENTS



Environmental



Physical



Curriculum



Testing

1	Daily activities that do not result in more than a mild exacerbation* of symptoms related to the current concussion	Typical activities during the day (eg, reading) while minimising screen time. Start with 5–15 min at a time and increase gradually.	Gradual return to typical activities
2	School activities	Homework, reading or other cognitive activities outside of the classroom.	Increase tolerance to cognitive work
3	Return to school part time	Gradual introduction of schoolwork. May need to start with a partial school day or with greater access to rest breaks during the day.	Increase academic activities
4	Return to school full time	Gradually progress in school activities until a full day can be tolerated without more than mild* symptom exacerbation.	Return to full academic activities and catch up on missed work

- Following an initial period of relative rest (24–48 hours following an injury at Step 1), athletes can begin a gradual and incremental increase in their cognitive load. Progression through the strategy for students should be slowed when there is more than a mild and brief symptom exacerbation.
- *Mild and brief exacerbation of symptoms is defined as an increase of no more than 2 points on a 0–10 point scale (with 0 representing no symptoms and 10 the worst symptoms imaginable) for less than an hour when compared with the baseline value reported prior to cognitive activity.

1	Symptom-limited activity	Daily activities that do not exacerbate symptoms (eg, walking).	Gradual reintroduction of work/school
2	Aerobic exercise 2A—Light (up to approximately 55% maxHR) then 2B—Moderate (up to approximately 70% maxHR)	Stationary cycling or walking at slow to medium pace. May start light resistance training that does not result in more than mild and brief exacerbation* of concussion symptoms.	Increase heart rate
3	Individual sport-specific exercise Note: If sport-specific training involves any risk of inadvertent head impact, medical clearance should occur prior to Step 3	Sport-specific training away from the team environment (eg, running, change of direction and/or individual training drills away from the team environment). No activities at risk of head impact.	Add movement, change of direction

Steps 4–6 should begin after the resolution of any symptoms, abnormalities in cognitive function and any other clinical findings related to the current concussion, including with and after physical exertion.

4	Non-contact training drills	Exercise to high intensity including more challenging training drills (eg, passing drills, multiplayer training) can integrate into a team environment.	Resume usual intensity of exercise, coordination and increased thinking
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Steps 4–6 should begin after the resolution of any symptoms, abnormalities in cognitive function and any other clinical findings related to the current concussion, including with and after physical exertion.

4	Non-contact training drills	Exercise to high intensity including more challenging training drills (eg, passing drills, multiplayer training) can integrate into a team environment.	Resume usual intensity of exercise, coordination and increased thinking
5	Full contact practice	Participate in normal training activities.	Restore confidence and assess functional skills by coaching staff
6	Return to sport	Normal game play.	

- ***Mild and brief exacerbation of symptoms (ie, an increase of no more than 2 points on a 0–10 point scale for less than an hour when compared with the baseline value reported prior to physical activity). Athletes may begin Step 1 (ie, symptom-limited activity) within 24 hours of injury, with progression through each subsequent step typically taking a minimum of 24 hours. If more than mild exacerbation of symptoms (ie, more than 2 points on a 0–10 scale) occurs during Steps 1–3, the athlete should stop and attempt to exercise the next day. Athletes experiencing concussion-related symptoms during Steps 4–6 should return to Step 3 to establish full resolution of symptoms with exertion before engaging in at-risk activities. Written determination of readiness to RTS should be provided by an HCP before unrestricted RTS as directed by local laws and/or sporting regulations.**
- HCP, healthcare professional; maxHR, predicted maximal heart rate according to age (ie, 220-age).

RECONSIDER: LONG TERM EFFECTS

Cognitive deficit

CTE



RETIRE

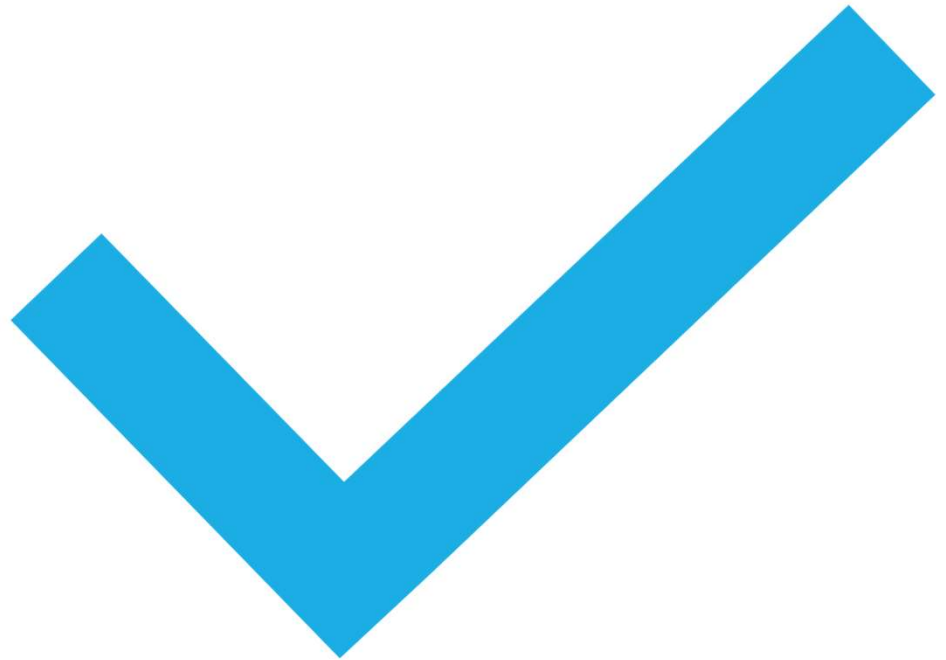
Comprehensive evaluation

Shared decision making

Careful recommendations

Documentation

Risk vs. benefit



OTHER CONSIDERATIONS

Para sports

Developmental considerations

Athlete voice

DEI

Stakeholder inclusion



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SPECIAL ARTICLE | DECEMBER 04 2023

Pediatric Sport-Related Concussion: Recommendations From the Amsterdam Consensus Statement 2023

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Connected Content

A commentary has been published: What's New With Pediatric Sport Concussions?

ADOLESCENT CASE STUDY

Chief Complaint: Follow up from concussion

HPI: A 15-year-old girl presents today for follow with the PCP after being knocked unconscious while playing soccer 10 days ago. She passed a sideline concussion screening, but then later complained of dizziness and was evaluated in the ED. A CT scan was performed, which showed no bleed, contusion, or fracture. Initially she had headaches that have now resolved and difficulty concentrating for the first week, but this has normalized. Her physical exam is normal. She has not returned to school yet. She wants to know when she can play soccer again.

What do you want to do?

ADDITIONAL REFERENCES

California ACEP. PECARN. <https://californiaacep.org/page/PECARN>

Centers for Disease Control and Prevention. Traumatic Brain Injury and Concussion.

<https://www.cdc.gov/traumaticbraininjury/PediatricmTBIGuidelineChklist.html>

Council, Medicine, I. of, Board on Children, Y., Youth, C. on S.-R. C. in, Spicer, C. M., Ford, M. A., Rivara, F. P., & Graham, R. (2013). *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture*. National Academies Press. <https://doi.org/10.17226/18377>