



CONCUSSION

Dr Claire Hinnell
on behalf of the Shared Care
Collaborative Project

Agenda

- Intro to shared care project – Dr Hinnell
- FHA Concussion Clinic team:
 - Current process for referrals to the concussion clinic
 - Overview of what patients learn at their education session
 - What advice can family doctors give patients at the first few visits post-concussion
- Current guidelines, recommendations for concussion assessment and treatment– Dr Hinnell
- Questions, comments and feedback
 - what do you see are the unmet needs in services of patients with concussion

Shared Care Project

- Working to improve access to and capacity of neurology services and improve communication between all health care team members
 - Increase quality of life for patients and families
 - Enhance relationships between family doctors and neurologists
 - Decrease inappropriate or unnecessary referrals to increase capacity
 - Increase co-management of patients
 - Reduce ER visits

- Areas of particular challenge
 - Headache
 - Education session
 - New referral process with enhanced primary care pathway in the works
 - Concussion
 - Education session
 - Reduce post-concussion syndrome with increased awareness and treatment of concussion acutely
 - Improve management of post-concussion syndrome
 - Local FHA concussion services – Surrey site

Headache

Seeing stars

Confusion

Slurred speech

Lack of orientation

Amnesia

Fatigue

Blurred vision

Vomiting

Mood changes

Difficulty sleeping

Sensitivity to light

Nausea

Decreased reaction time

Lack of energy

Knocked out

Ringing in ears

Loss of consciousness

Lack of concentration

Dizziness

Irritability

Sensitivity to noise

Reduced coordination

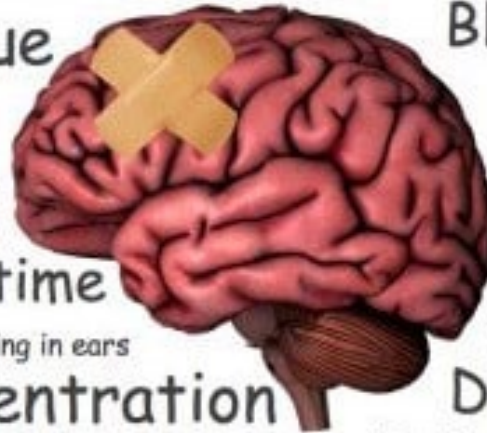
Inappropriate emotions

Feelings of sadness

Getting your "bell rung"

Concussion

Easily distracted



Guidelines

- <https://braininjuryguidelines.org/concussion>
 - June 2018
 - Ontario Neurotrauma foundation - used by CMA
 - Linked resources for patient and physician
 - Searchable website
 - Addresses each symptom with associated resources and evidence-based recommendations for treatment
 - Also includes information on pediatric concussion which we won't address specifically today

Guidelines

- [http://www.parachutecanada.org/downloads/injurytopics/Canadian Guideline on Concussion in Sport-Parachute.pdf](http://www.parachutecanada.org/downloads/injurytopics/Canadian%20Guideline%20on%20Concussion%20in%20Sport-Parachute.pdf)
 - July 2017
 - Directed to athletes but applicable to any return to school, sport or work

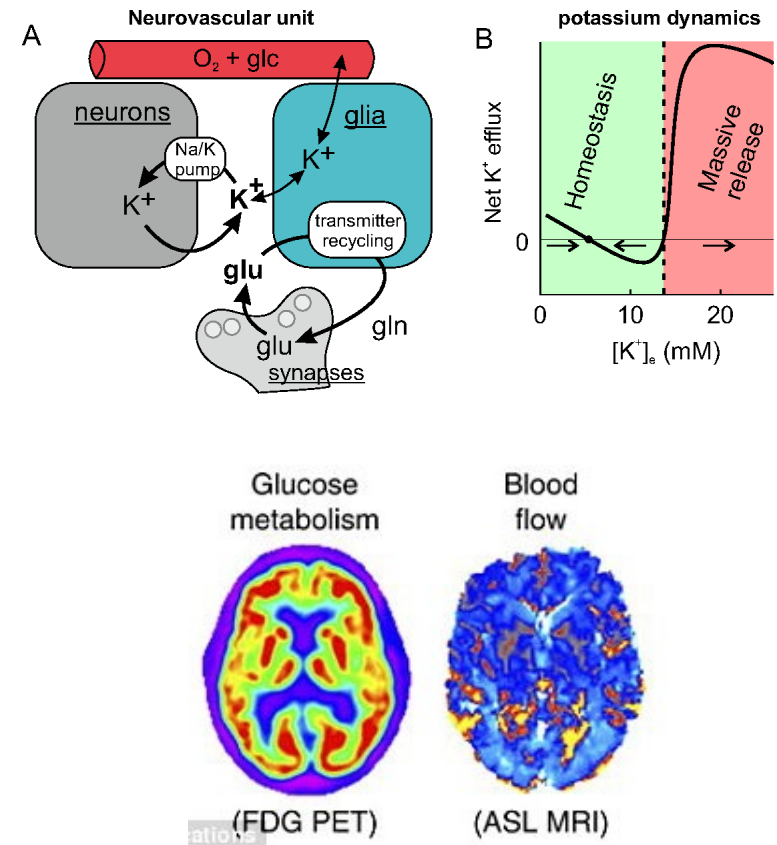


Definition: Concussion or mild TBI

- a complex pathophysiologic process affecting the brain
- induced by traumatic biomechanical forces secondary to direct **or indirect** forces to the head
- disturbance of brain function is related to neurometabolic dysfunction, rather than structural injury, and is typically associated with normal structural imaging
- may or may not involve a LOC
- results in a constellation of physical, cognitive, emotional, and sleep-related symptoms
- symptoms may last from several minutes to days, weeks, months or even longer in some cases

Mechanism of Concussion

- rotational and angular forces to the brain (direct impact to the head is NOT required)
- metabolic and neurochemical changes
- homeostasis usually restored within min-hrs but long-term perturbations may occur - ? responsible for post-concussive symptoms



Symptoms

- LOC
- headache
- dizziness
- tinnitus
- decreased concentration
- fatigue
- irritability
- poor sleep

Assessment

- rule out
 - more severe forms of TBI
 - cervical spine injuries
 - medical and neurological conditions

Assessment

Acute Concussion Evaluation (ACE): Physician/Clinician Office Version

ACUTE CONCUSSION EVALUATION (ACE) PHYSICIAN/CLINICIAN OFFICE VERSION

Gerard Gioia, PhD¹ & Micky Collins, PhD²
¹Children's National Medical Center
²University of Pittsburgh Medical Center

Patient Name: _____
DOB: _____ Age: _____
Date: _____ ID/MR# _____

A. Injury Characteristics Date/Time of Injury _____ Reporter: Patient Parent Spouse Other _____

1. Injury Description _____

1a. Is there evidence of a forcible blow to the head (direct or indirect)? Yes No Unknown
1b. Is there evidence of intracranial injury or skull fracture? Yes No Unknown
1c. Location of Impact: Frontal LT Temporal RT Temporal LT Parietal RT Parietal Occipital Neck Indirect Force
2. Cause: MVC Pedestrian-MVC Fall Assault Sports (spatial) _____ Other _____
3. **Amnesia Before (Retrograde)** Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? Yes No Duration _____
4. **Amnesia After (Anterograde)** Are there any events just AFTER the injury that you/ person has no memory of (even brief)? Yes No Duration _____
5. **Loss of Consciousness:** Did you/ person lose consciousness? Yes No Duration _____
6. **EARLY SIGNS:** Appears dazed or stunned Is confused about events Answers questions slowly Repeats Questions Forgetful (recent info)
7. **Seizures:** Were seizures observed? No Yes Detail _____

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day?
Indicate presence of each symptom (0=No, 1=Yes). Lovel & Collins, 1998 JHTR

PHYSICAL (10)	COGNITIVE (4)	SLEEP (4)		
Headache	0 1	Feeling mentally foggy	0 1	
Nausea	0 1	Feeling slowed down	0 1	
Vomiting	0 1	Difficulty concentrating	0 1	
Balance problems	0 1	Difficulty remembering	0 1	
Dizziness	0 1	COGNITIVE Total (0-4) _____	SLEEP Total (0-4) _____	
Visual problems	0 1	EMOTIONAL (4)	Exertion: Do these symptoms <u>worsen</u> with: Physical Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Cognitive Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Overall Rating: How <u>different</u> is the person acting compared to his/her usual self? (circle) Normal 0 1 2 3 4 5 6 Very Different	
Fatigue	0 1	Irritability		0 1
Sensitivity to light	0 1	Sadness		0 1
Sensitivity to noise	0 1	More emotional		0 1
Numbness/Tingling	0 1	Nervousness	0 1	
PHYSICAL Total (0-10) _____	EMOTIONAL Total (0-4) _____			
(Add Physical, Cognitive, Emotion, Sleep totals)		Total Symptom Score (0-22) _____		

C. Risk Factors for Protracted Recovery (check all that apply)

Concussion History? Y ___ N ___	Headache History? Y ___ N ___	Developmental History	Psychiatric History
Previous # 1 2 3 4 5 6+	Prior treatment for headache	Learning disabilities	Anxiety
Longest symptom duration Days ___ Weeks ___ Months ___ Years ___	History of migraine headache ___ Personal ___ Family	Attention-Deficit/ Hyperactivity Disorder	Depression Sleep disorder
If multiple concussions, has force caused reinjury? Yes ___ No ___		Other developmental disorder	Other psychiatric disorder

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures) _____

D. RED FLAGS for acute emergency management: Refer to the emergency department with urgent care if any of the following:

- * Headaches that worsen
- * Repeated vomiting
- * Focal neurologic signs
- * Seizures
- * Slurred speech
- * Locks very drowsy/ can't be awakened
- * Repeated vomiting
- * Increasing confusion or irritability
- * Weakness or numbness in arms/legs
- * Can't recognize people or places
- * Neck pain
- * Unusual behavioral change
- * Change in state of consciousness

E. Diagnosis (ICD): Concussion w/ LOC 850.0 Concussion w/ LOC 850.1 Concussion (Unspecified) 850.9 Other (854) _____
 No diagnosis

F. Follow-Up Action Plan Complete ACE Care Plan and provide copy to patient/family.

No Follow-Up Needed
 Physician/Clinician Office Monitoring: Date of next follow-up _____
 Referral:
 Neuropsychological Testing
 Physician: Neurosurgery _____ Neurology _____ Sports Medicine _____ Physiatrist _____ Psychiatrist _____ Other _____
 Emergency Department

ACE Completed by: _____

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This form is part of the "Head Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).

Assessment

Table 1.2. Key Features of mTBI Assessment in an Emergency Department or Doctor's Office

<p>(a) A medical history encompassing a review of:</p> <ul style="list-style-type: none">• Current symptoms and health concerns• Setting and mechanism of injury• Severity/duration of altered consciousness and immediate symptoms• Presence of co-occurring injuries• Pre-existing medical and mental health conditions• Potentially contributing psychosocial factors
<p>(b) An examination including an assessment of:</p> <ul style="list-style-type: none">• Mental status and cognition• Physical status• Cranial nerves• Extremity tone, strength, and reflexes• Gait and balance
<p>(c) An assessment of the patient's clinical status, including whether there has been improvement or deterioration since the time of injury. This may require additional information from others, including eyewitnesses to the injury.</p>
<p>(d) Determination of the need for urgent neuroimaging to exclude a more severe brain injury (see Figure 1.1), such as a structural abnormality or hemorrhage.</p>

Adapted from the NSW Ministry of Health. Closed Head Injury in Adults - Initial Management (PD2012_013).

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 \geq 2 episodes
5. Age \geq 65 years

Medium Risk (for Brain Injury on CT)

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

*Signs of Basal Skull Fracture

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

** Dangerous Mechanism

- pedestrian struck by vehicle
- occupant ejected from motor vehicle
- fall from elevation \geq 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

Assessment

Table 1.1. Risk Factors Influencing Recovery Post mTBI

<p><u>Medical Factors:</u> Pre-existing/ concurrent medical conditions or post- injury symptoms that are associated with poor outcomes post mTBI</p>	<ul style="list-style-type: none"> • History of previous traumatic brain injury • History of previous physical limitations • History of previous neurological or psychiatric problems • Skull fracture • Early onset of pain and in particular headache within 24 hours after injury • Confounding effects of other health-related issues, e.g., pain medications, disabling effects of associated injuries, emotional distress • Anxiety • High number of symptoms reported early after injury i.e., high score on the Rivermead or Post Concussion Symptom Questionnaire <ul style="list-style-type: none"> - Vestibular/vestibular-ocular abnormalities - Pre-injury sleep disturbance or post-injury changes - Reduced balance or dizziness - Nausea after injury - Memory problems after injury - Post-traumatic amnesia (PTA)
<p><u>Contextual Factors:</u> Personal, psychosocial, or environmental factors that may negatively influence recovery post mTBI</p>	<ul style="list-style-type: none"> • Injury sustained in a motor vehicle accident • Potential influence of secondary gain issues related to litigation and compensation • Not returning to work or significant delays in returning to work following the injury • Being a student • Presence of life stressors at the time of the injury • Higher levels of symptom reporting is associated with mood symptoms and heightened self-awareness of deficits • Older age • Lack of social supports • Lower education/low social economic status • Female gender • Lower Resilience • Returning to a contact/ risk of contact sport activity

Case 1



- John- 45 year old hit his head at work
- comes in the next day with a cloudy feeling in his head, headache and dizziness

Case 2

- Phil - 54-year-old male
- MVA 8 mo prior
- attended physiotherapy and received orthopaedic tx but stopped because he had plateaued

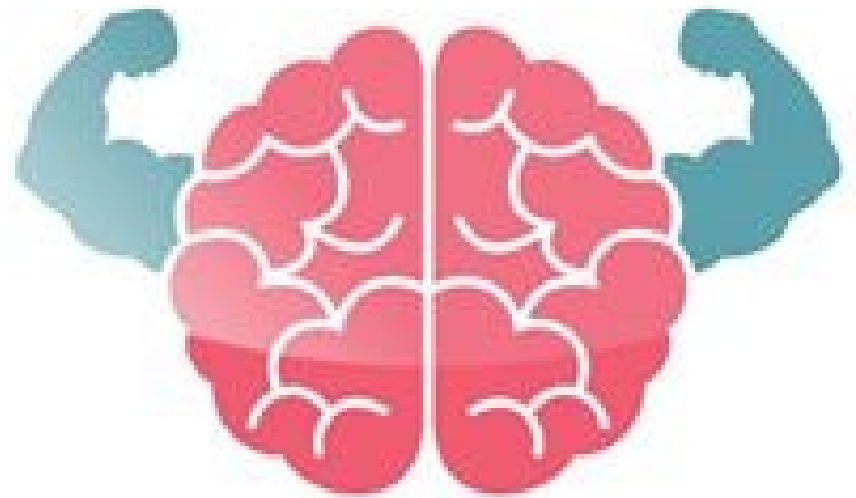
- cervical spine pain, left shoulder pain
- headaches
- dizziness
- nausea
- light sensitivity





Initial management and recovery

- Providing information on symptoms and expectations for recovery, as well as instructions for follow-up, have been shown to be one of the more effective strategies in preventing the development of persistent symptoms post-concussion
- www.braininjuryguidelines.org has examples



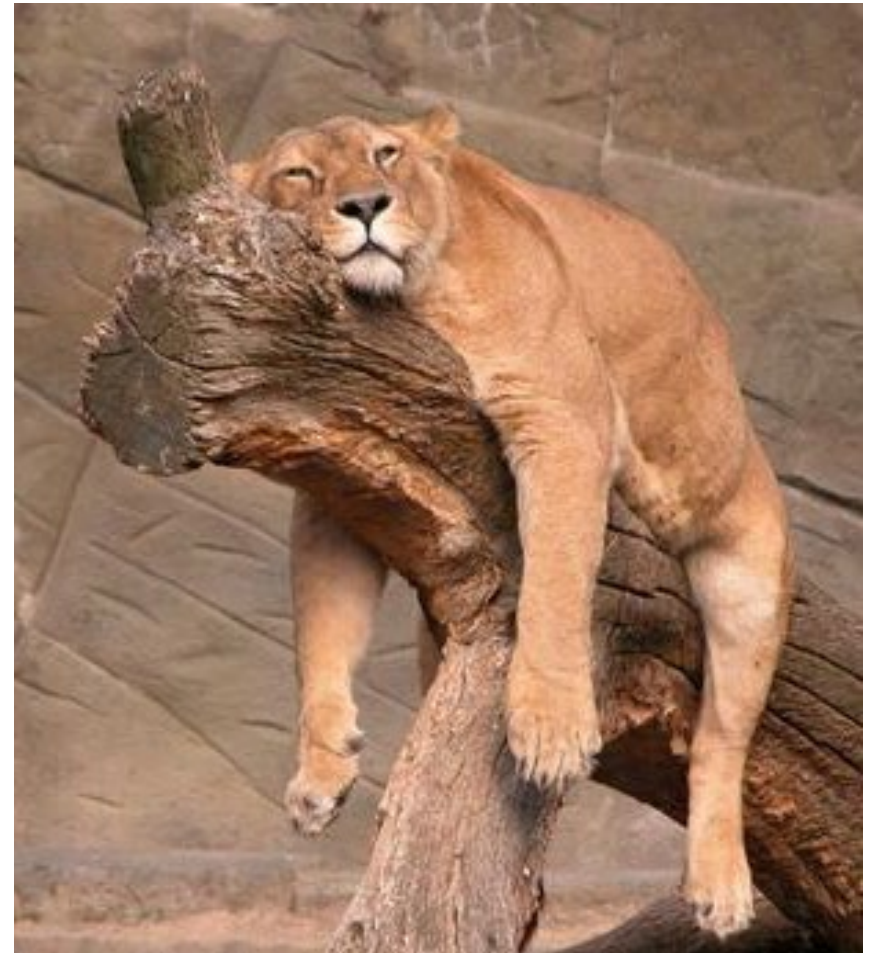
Expectations for recovery

John

- full recovery of symptoms, including cognitive functioning, is typically seen within as early as a few days up to 1 to 3 months post-injury
- 10% to 15% of patients with TBI suffer from long-term complications and require specialized care

Early recommendations

- REST, REST, REST until ASYMPTOMATIC
- Most concussions resolve on their own in 7-10 days
 - Physical Rest - from all physical activity including sport
 - Cognitive Rest - from mental activity (may include a break from school, computer use, texting, iPods, video games, television, loud music)
 - Symptom free without the use of medication for 24 hours before any activity is attempted



What to Expect Once You're Home from the Hospital

Most people with a concussion recover quickly and fully. During recovery, you may have a range of symptoms that appear right away, while others may not be noticed for hours or even days after the injury. You may not realize you have problems until you try to do your usual activities again. Most symptoms go away over time without any treatment. Below is a list of some of the symptoms you may have:



Thinking/Remembering

- Difficulty thinking clearly ■ Feeling slowed down
- Trouble concentrating ■ Difficulty remembering new information



Physical

- Headache ■ Balance problems ■ Blurred vision ■ Dizziness
- Nausea or vomiting ■ Lack of energy ■ Sensitivity to noise or light



Emotional/Mood

- Irritability ■ Nervousness ■ Sadness ■ More emotional



Sleep

- Sleeping more than usual ■ Sleeping less than usual ■ Trouble falling asleep

How to Feel Better

- Get plenty of rest and sleep.
- Avoid activities that are physically demanding or require a lot of thinking.
- Do not drink alcohol.
- Return slowly and gradually to your routine.
- Ask a doctor when it is safe to drive, ride a bike, or operate heavy equipment.

WHEN TO RETURN TO THE HOSPITAL

Sometimes serious problems develop after a head injury. Return to the emergency department right away if you have any of these symptoms:

- Repeated vomiting
- Worsening or severe headache
- Unable to stay awake during times you would normally be awake
- More confused and restless
- Seizures
- Difficulty walking or difficulty with balance
- Difficulty with your vision
- Any symptom that concerns you, your family members, or friends

Appendix 1.4 (Continued)

Brain Injury Advice Cards - Short Versions: Example # 2

Brain Injury Advice Card (Short Version)

Important Points about Mild Brain Injury

- You had a mild brain injury or what is sometimes called a concussion. Most people recover quickly following a mild brain injury/concussion. A few people may experience symptoms over a longer period.
- There is a small risk of you developing serious complications so you should be watched closely by another adult for 24 hours after the accident.
- Please read the following. It outlines what signs to look for after a brain injury and what you need to do if you have problems.

Warning Signs

If you show any of these symptoms or signs after your brain injury/concussion, or you get worse, go to the nearest hospital, doctor or call 911 immediately.

- Fainting or blacking out, drowsiness, or can't be woken up
- A constant severe headache or a headache that gets worse
- Vomiting or throwing up more than twice
- Cannot remember new events, recognise people or places (increased confusion)
- Acting strange, saying things that do not make sense (change in behaviour)
- Having a seizure (any jerking of the body or limbs)
- Inability to move parts of your body, weakness in arms or legs, or clumsiness
- Blurred vision or slurred speech
- Being unsteady on your feet or loss of balance
- Continual fluid or bleeding from the ear or nose

The First 24-48 Hours After Injury

- **Warning Signs:** You should be observed and return to hospital if you develop any of the above warning signs.
- **Rest/Sleeping:** Rest (both physical and mental) and avoid strenuous activity for at least 24 hours. It is alright for you to sleep tonight but you should be checked every four hours by someone to make sure you are alright.
- **Driving:** Do not drive for at least 24 hours. You should not drive until you feel much better and can concentrate properly. Talk to your doctor.
- **Drinking/Drugs:** Do not drink alcohol or take sleeping pills or recreational drugs in the next 48 hours. All of these can make you feel worse. They also make it hard for other people to tell whether the injury is affecting you or not.
- **Pain Relief:** Use **acetaminophen** or **acetaminophen/codeine** for headaches (e.g., Tylenol).
- **Sports:** Do not return to sports until you have received medical clearance from a healthcare professional.

See your primary care provider or visit the ED if you are not starting to feel better within a few days of your injury.

Risk factors for prolonged recovery

- older age
- prolonged post-traumatic amnesia
- reduced premorbid intellectual capacity
- > 3 symptoms at presentation
- specific symptoms (i.e., fatigue, tiredness, or fogginess)
- headache > 60 hours
- LOC > 60 seconds
- amnesia
- prior concussion
- Comorbid conditions
- Medication use (psychotropic drugs, anticoagulants)

Psychosocial factors

- changes in the patient's support system
- mental health history
- co-occurring conditions (chronic pain, mood disorders, stress disorders, personality changes)
- substance and medication use disorders
- unemployment or changes in job status

Barriers to recovery

- female take longer to recover than men
- alcohol, cigarette and marijuana users had longer recovery
- patients who played video/phone/computer games had nearly double recovery period length compared to those who didn't play games
- pts with previous concussions had a recovery length 3.5 x longer than first time concussion pts

Post concussion syndrome

- an array of symptoms that persist in the days/weeks/months following a concussion
- headache, dizziness, tinnitus, fatigue, irritability, difficulty concentration or performing mental tasks, memory impairment
- intolerance to stress, emotional excitement or alcohol
- typically 11-40% of patients
- 7% symptomatic > 1 year

DDx of post-concussion

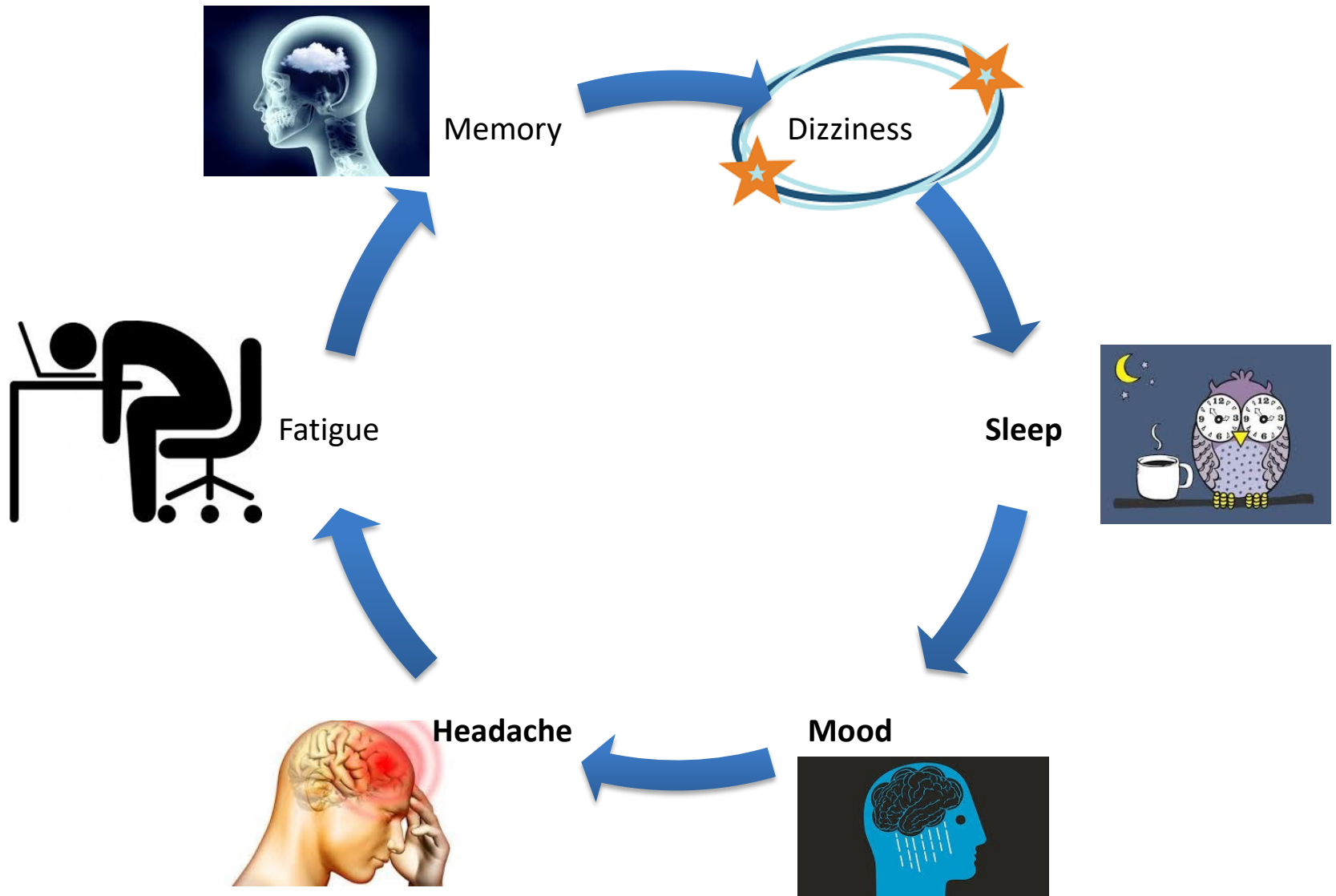
Table 4.1. Differential Diagnoses Related to Concussion/mTBI

Major depressive disorder
Generalized anxiety disorder
Post-traumatic 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: e.g., obstructive sleep apnea

Post concussion syndrome management

- SYMPTOMATIC
- Be aware that some medications may mask post-concussive symptoms
- family doctor
- physiotherapy
- occupational therapy
- psychologist
- neurologist
- physiatrist

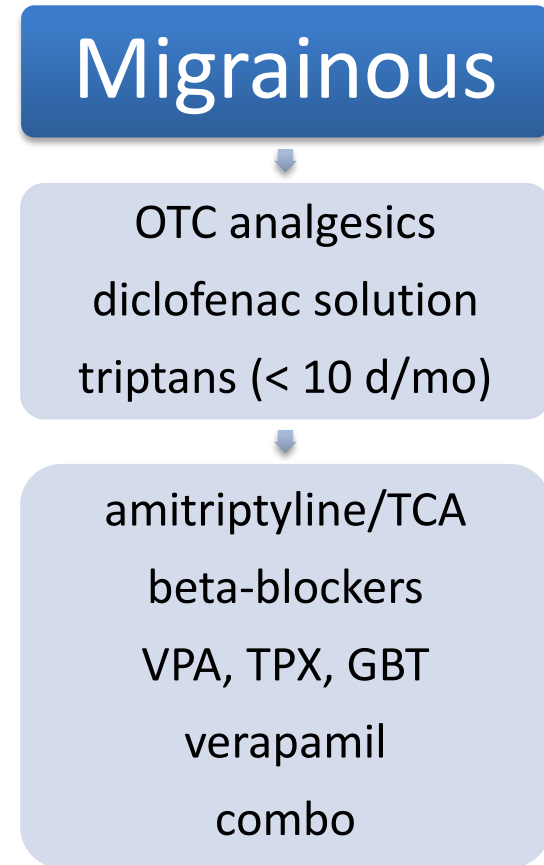
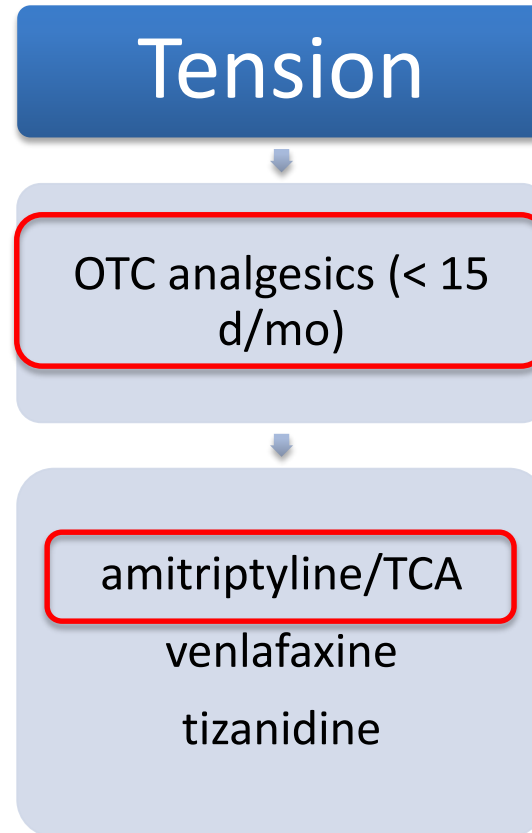
Post concussion management





HEADACHE (off-label)

- Behavioural
 - pacing
 - rest breaks
 - decrease stimulation
 - earplugs or noise cancelling headphones for phonophobia
 - sunglasses for photophobia
 - screen for mood d/o



Avoid narcotics

DEPRESSION/ANXIETY



- Behavioural
 - mindfulness
 - relaxation
 - counselling
 - psychotherapy (CBT and others)



- Medications
 - SSRIs = first line
 - consider SNRI, mirtazapine
 - avoid benzos
 - minimize s/e on cognition, motivation, coordination

POOR SLEEP



- Behavioural
 - sleep hygiene
 - CBT
 - mindfulness
- Medications
 - melatonin
 - low dose trazodone
 - TCA
 - non-benzo's (zopiclone)
 - short term use
 - avoid benzos

DIZZINESS



- Common vestibular dysfunction in concussion
 - altered vestibular-ocular reflex (VOR)
 - impaired static and dynamic balance
 - benign paroxysmal positional vertigo (BPPV)
- Refer to ENT, neuro-ophtho, neuro, specialist physiotherapy
- vestibular therapy



MEMORY/COGNITION

- cognitive symptoms not resolving or interfering in daily function > 4 weeks – consider referral for specialized cognitive assessment (e.g. neuropsychological assessment)
- Behavioural
 - pacing
 - note taking, reminders, schedules
 - relaxation techniques, avoid anxiety
 - implement temporary work or school accommodations or modifications
 - neurorehab

Marijuana



- no evidence yet
- doesn't mean no harm
- some evidence that endocannabinoids are part of brain's repair or compensation mechanisms after injury
- BUT study showed marijuana users had longer recovery*

? Referral ?



First-time concussion:

- advise through early education, support and or assurance that a full recovery of symptoms, including cognitive functioning, is typically seen within as early as a few days up to 1 to 3 months post-injury.

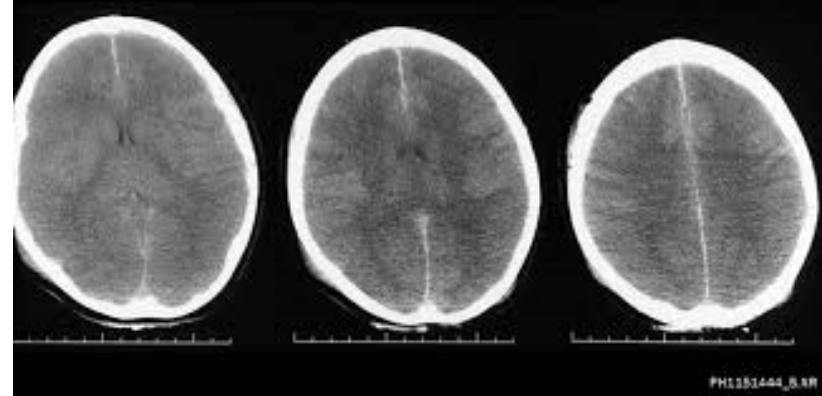
Referral



- 1) comorbidities or identified health or risk factors and not on a trajectory of improvement within the first month, or
- 2) persistent symptoms > 4 wks post-injury
- refer for more comprehensive interdisciplinary evaluation to specialized concussion services/clinics

"I'M REFERRING YOU TO A DOCTOR WITH DIFFERENT SOFTWARE."

Second impact syndrome



- rare but potentially lethal
- after early return to activity without recovery from an initial concussion
- defect in autoregulation resulting in rapid and severe brain swelling
- can lead to death or permanent disability
- younger patients and children are more susceptible



PREVENTION
Is THE BEST
TREATMENT

SUMMARY: Initial intervention



- rule out other injuries
- asses for risk factors
- CT head rules
- Education
- Reassurance

SUMMARY:

Symptomatic Tx



- screen for factors prolonging recovery
- 1⁰ symptoms: depression, sleep and headache
- 2⁰ symptoms: fatigue, irritability, apathy, cognition, dizziness, imbalance

Refer:

- 1) comorbidities or risk factors and not on a trajectory of improvement within the first month, or
- 2) persistent symptoms > 4 wks post-injury
- refer for more comprehensive interdisciplinary evaluation to specialized concussion services/clinics



References

- <https://braininjuryguidelines.org/concussion>
- http://www.parachutecanada.org/downloads/injurytopics/Canadian_Guideline_on_Concussion_in_Sport-Parachute.pdf
- Current Concepts in Concussion: Evaluation and Management. K Scorza, M Raleigh, F O'Connor. *Am Fam Physician* 2012 Jan 15;85(2):123-132.
- Endocannabinoids and traumatic brain injury. E Shohami et al. *Br J Pharmacol*. 2011 Aug; 163(7): 1402–1410.
- Barriers to Recovery from Concussion (P7.169). T Shetty et al. April 06, 2015; 84 (14 Supplement)
- Continuum. American Academy of Neurology. 2010. Concussion and mild TBI.