

# Kids and Concussion: An Update



Northern Ontario  
School of Medicine  
École de médecine  
du Nord de l'Ontario  
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# Faculty/Presenter Disclosure

**Speaker Name: Tara Baldisera, Shannon Kenrick-Rochon, Jairus Quesnele**

- **We have NO relationships with for-profit organizations.**
- **We have the following relationships with not-for-profit organizations**
  - **Grants/Research Support:** NOAMA research support
  - **Speakers Bureau/Honoraria:** Optometry group honorarium
  - **Other:** T.Baldisera -ONF Concussion Advisory Committee, T.Baldisera & S.Kenrick-Rochon Co-Leads of CEP Primary care concussion tool, S. Kenrick-Rochon - HQO Concussion Standards Committee

# Disclosure of Financial Support

- **This session/program has not received financial support**





# Objectives

- Identify updates to concussion care in pediatric patients
- Apply concepts in **return to learn** and **return to play** to produce specific reactivation plans for school and sport/exercise with a focus on communication
- Troubleshoot common **challenges in reactivation plans**
- Identify **prognostic factors** contributing to persisting symptoms, and when referral should be considered



## Case #1

- 16 yo hockey player took aggressive hit and came off the ice complaining of headache
- Assessed in the local ED - diagnosed with a concussion
- Follows up in PCP office Day 4 post concussion having not been at school however symptoms have been steadily decreasing
- Priority in office: Return to school with accommodations and reactivation

Rowan's Law

Rowan's Law Day  
Sept 26, 2018



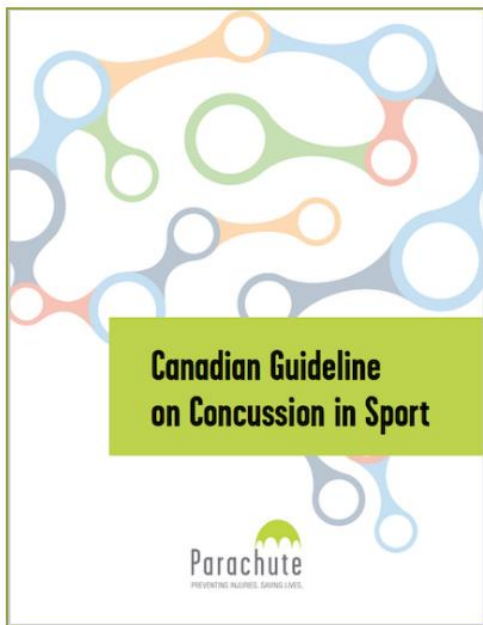
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5<sup>th</sup>

International  
Consensus  
Conference on

# Concussion in Sport

27 – 28 October 2016  
Berlin, Germany

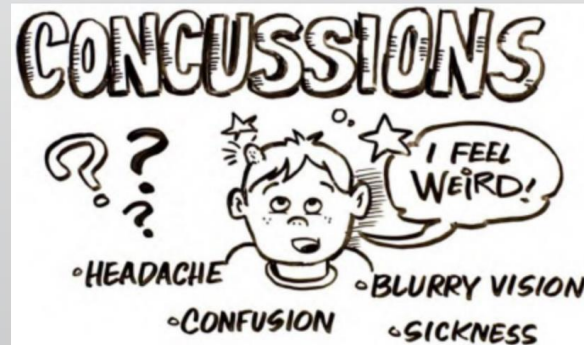


## Guideline for Concussion/Mild Traumatic Brain Injury & Persistent Symptoms

Healthcare Professional Version

Third Edition

Adults (18+ years of age)



Released June 25th 2014 by the Ontario Neurotrauma Foundation.

PEDIATRIC UPDATE COMING SOON

# Sport Related Concussion (SRC)

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Direct blow to **head or body**

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Rapid, short lived, transient  
impairment of neurological function

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Functional not structural injury

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Range of other signs/symptoms

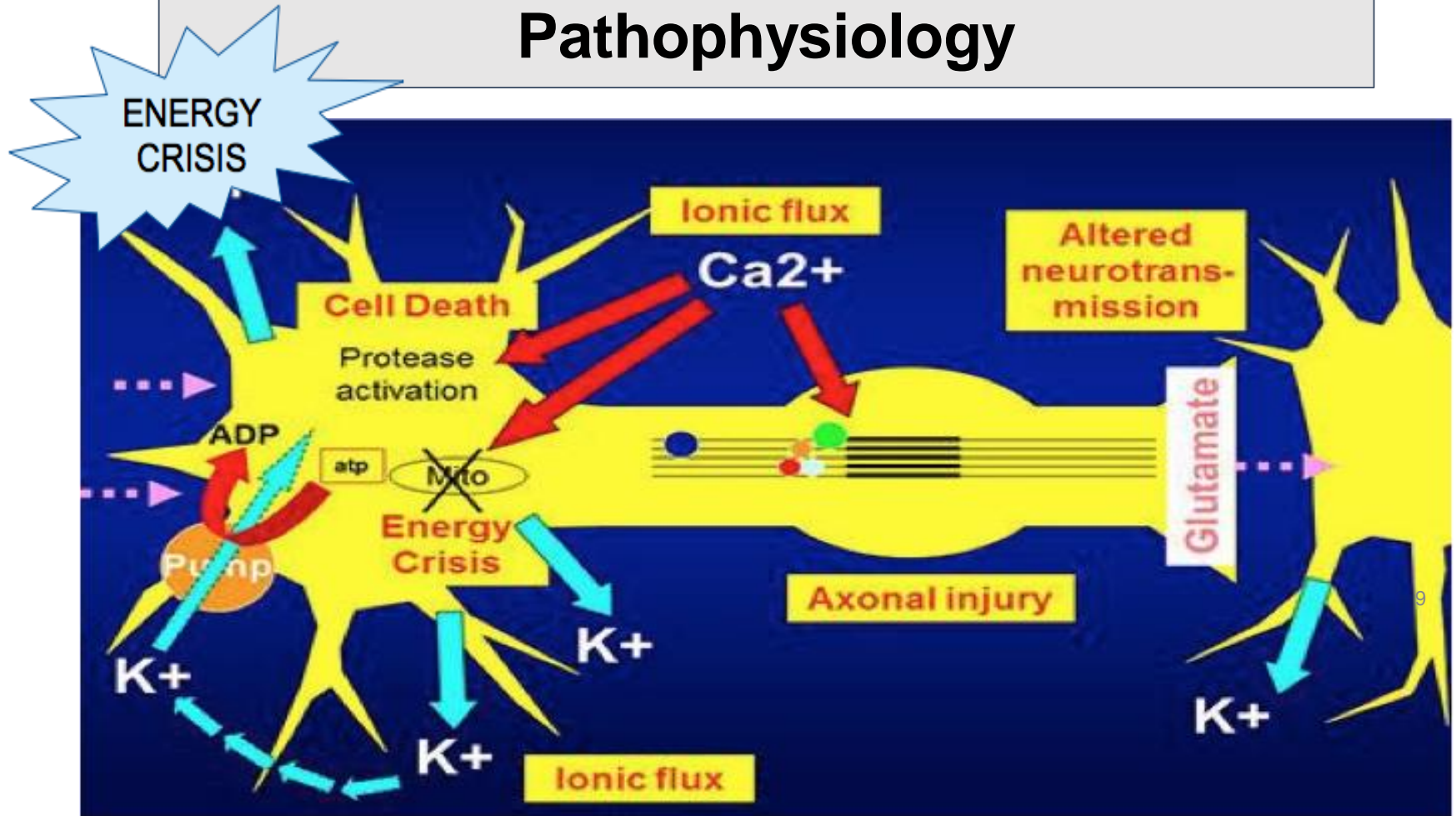
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Cannot be explained by other  
medical factors

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# Pathophysiology



# Heads-up on sport-related brain injuries

Over the last 5 years

The number of emergency department (ED) visits for sport-related brain injuries in Ontario and Alberta has increased by



The increase has been highest in the youngest age group



17,000+  
sport-related brain injuries seen in Ontario and Alberta EDs in 2016-2017

Top sporting activities associated with brain injuries

Numbers for hockey were almost double those for each of cycling, football/rugby and ski/snowboard



2016-2017

Of all brain injuries seen in Ontario and Alberta EDs, slightly more than a quarter were sport-related



Sport-related brain injuries

Majority concussion-related



More males than females



Highest proportion of injuries among 10- to 14-year-olds



CIHI

## Expected Recovery

### **Adults:**

- 2-4 weeks
- 15% experience persistent symptoms over 3 months

### **Children/Adolescents:**

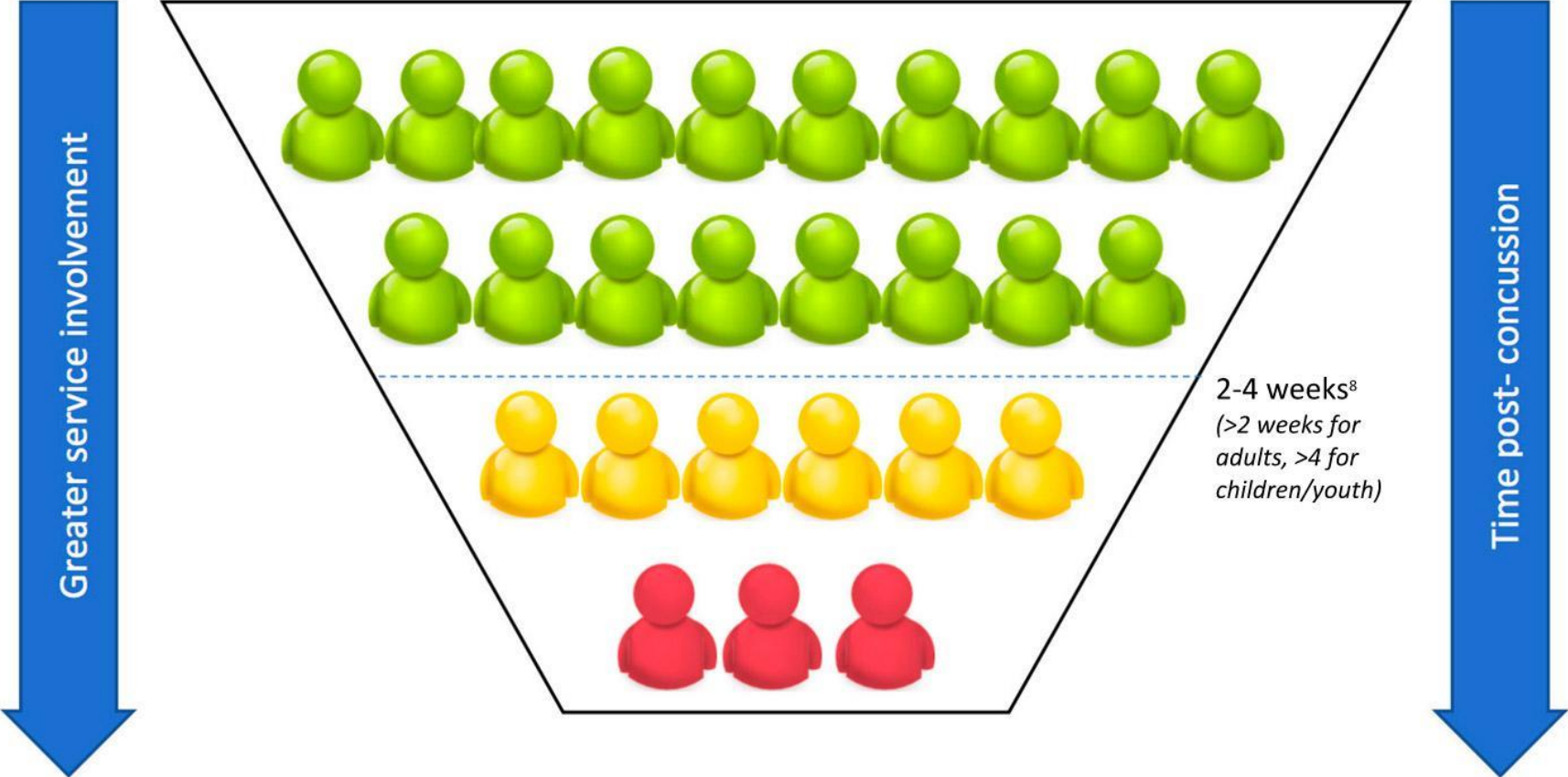
- 2-4 weeks
- 30% experience persistent symptoms

Zemek, R., et al., (2016), Nelson et al., (2016); Henry et al., (2016)

Zemek, R., et al., (2016); McCrea M., et al., (2013); Babcock et al., (2013) (McCrorry et al. 2017)

ONF Concussion Standards 2017

# Persistent Post Concussion Symptoms (PPCS)



# CONCUSSION RECOGNITION TOOL 5 ©

To help identify concussion in children, adolescents and adults



Supported by



## RECOGNISE & REMOVE

Head impacts can be associated with serious and potentially fatal brain injuries. The Concussion Recognition Tool 5 (CRT5) is to be used for the identification of suspected concussion. It is not designed to diagnose concussion.

### STEP 1: RED FLAGS – CALL AN AMBULANCE

If there is concern after an injury including whether ANY of the following signs are observed or complaints are reported then the player should be safely and immediately removed from play/game/activity. If no licensed healthcare professional is available, call an ambulance for urgent medical assessment:

- Neck pain or tenderness
- Double vision
- Weakness or tingling/burning in arms or legs
- Severe or increasing headache
- Seizure or convulsion
- Loss of consciousness
- Deteriorating conscious state
- Vomiting
- Increasingly restless, agitated or combative

#### Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Assessment for a spinal cord injury is critical.
- Do not attempt to move the player (other than required for airway support) unless trained to do so.
- Do not remove a helmet or any other equipment unless trained to do so safely.

If there are no Red Flags, identification of possible concussion should proceed to the following steps:

### STEP 2: OBSERVABLE SIGNS

Visual clues that suggest possible concussion include:

- Lying motionless on the playing surface
- Slow to get up after a direct or indirect hit to the head
- Disorientation or confusion, or an inability to respond appropriately to questions
- Blank or vacant look
- Balance, gait difficulties, motor incoordination, stumbling, slow laboured movements
- Facial injury after head trauma

### STEP 3: SYMPTOMS

- Headache
- “Pressure in head”
- Balance problems
- Nausea or vomiting
- Drowsiness
- Dizziness
- Blurred vision
- Sensitivity to light
- Sensitivity to noise
- Fatigue or low energy
- “Don’t feel right”
- More emotional
- More Irritable
- Sadness
- Nervous or anxious
- Neck Pain
- Difficulty concentrating
- Difficulty remembering
- Feeling slowed down
- Feeling like “in a fog”

### STEP 4: MEMORY ASSESSMENT

(IN ATHLETES OLDER THAN 12 YEARS)

Failure to answer any of these questions (modified appropriately for each sport) correctly may suggest a concussion:

- “What venue are we at today?”
- “Which half is it now?”
- “Who scored last in this game?”
- “What team did you play last week/game?”
- “Did your team win the last game?”

### Athletes with suspected concussion should:

- Not be left alone initially (at least for the first 1-2 hours).
- Not drink alcohol.
- Not use recreational/ prescription drugs.
- Not be sent home by themselves. They need to be with a responsible adult.
- Not drive a motor vehicle until cleared to do so by a healthcare professional.

The CRT5 may be freely copied in its current form for distribution to individuals, teams, groups and organisations. Any revision and any reproduction in a digital form requires approval by the Concussion in Sport Group. It should not be altered in any way, rebranded or sold for commercial gain.

**ANY ATHLETE WITH A SUSPECTED CONCUSSION SHOULD BE IMMEDIATELY REMOVED FROM PRACTICE OR PLAY AND SHOULD NOT RETURN TO ACTIVITY UNTIL ASSESSED MEDICALLY, EVEN IF THE SYMPTOMS RESOLVE**

# Diagnosis

- ACE tool
- Detailed history:
  - Injury description
  - Symptom Checklist (PCSS)
  - Risk Factor for Recovery
- Red Flags
- Physical Examination
  - Cranial nerves, peripheral neuro,
  - Gait, balance, brief cognitive

**HEADS UP**  
CLINICIANS

**PHYSICIAN/CLINICIAN OFFICE VERSION**

Gerard Gioia, PhD & Micky Collins, PhD<sup>1</sup>  
Children's National Medical Center  
University of Pittsburgh Medical Center

Patient Name: \_\_\_\_\_

DOB: \_\_\_\_\_ Age: \_\_\_\_\_

Date: \_\_\_\_\_ ID/MR#: \_\_\_\_\_

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**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 (specify) \_\_\_\_\_ Other \_\_\_\_\_

3. **Amnesia Before (Retrospective)** 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 \_\_\_\_\_

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**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). Lovell & Collins, 1988 JNTR

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	<b>COGNITIVE Total (0-4)</b> _____		<b>SLEEP Total (0-4)</b> _____	
Visual problems	0 1	<b>EMOTIONAL (4)</b>		<b>Exertion:</b> Do these symptoms worsen with: Physical Activity ___ Yes ___ No ___ N/A Cognitive Activity ___ Yes ___ No ___ N/A  <b>Overall Rating:</b> How different 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		
<b>PHYSICAL Total (0-10)</b> _____		<b>EMOTIONAL Total (0-4)</b> _____			
(Add Physical, Cognitive, Emotion, Sleep totals) <b>Total Symptom Score (0-22)</b> _____					

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**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, less force caused injury? Yes ___ No ___		Other developmental disorder	Other psychiatric disorder

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

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**D. RED FLAGS for acute emergency management:** Refer to the emergency department with sudden onset of any of the following:

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

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

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**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

# Prognostic Factors for Persistent Symptoms



# Concussions are like snowflakes



## STEP 3: SYMPTOMS

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- Headache
- “Pressure in head”
- Balance problems
- Nausea or vomiting
- Drowsiness
- Dizziness
- Blurred vision
- Sensitivity to light
- Sensitivity to noise
- Fatigue or low energy
- “Don’t feel right”
- More emotional
- More Irritable
- Sadness
- Nervous or anxious
- Neck Pain
- Difficulty concentrating
- Difficulty remembering
- Feeling slowed down
- Feeling like “in a fog”



# When in doubt sit them out!

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- Don't leave them alone immediately following - but you can let them sleep
- Advise them not to drive
- Evolving injury...
- *Clarifying the SCAT-5 - what should you be using in the office?*



# ROAD TO RECOVERY



**rest**



**education**



**re-integration**



## Rest and Re-activation

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Prolonged rest is not best!



# Rest and Re-activation

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Brief rest (24-72 hours)

Gradual reintegration to activities

Early exercise

McCrary et al. 2017, Ledd et al  
2018

# STAGES

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## STAGE ONE

### REST

**Goal:** Reduce frequency/intensity of symptoms and/or dissolve evidence of any symptoms.

**Description:**

- No physical activities that raise your heart rate above resting rate.
- Perform non-vigorous isometric stabilization exercises for neck.

## STAGE TWO

### RE-INTRODUCTION OF EXERCISE

**Goal:** Establish the ability to raise your heart rate through cardio without symptoms arising (or without symptoms being worsened).

**Description:**

- Stationary bike (no head movement) with progression of intensity/duration (don't increase both intensity and duration in the same session):
  - 15 mins @ 120 bpm
  - Increase duration to 30 mins @ 120 bpm
  - 30 mins @ 140 bpm
  - 30 mins @ 140 bpm with 1-min maximal sprints every 5 mins (@ 5 mins, 10 mins, etc)



## Graduated return-to-sport (RTS) strategy

Stage	Aim	Activity	Goal of each step
1	Symptom-limited activity	Daily activities that do not provoke symptoms	Gradual reintroduction of work/school activities
2	Light aerobic exercise	Walking or stationary cycling at slow to medium pace. No resistance training	Increase heart rate
3	Sport-specific exercise	Running or skating drills. No head impact activities	Add movement
4	Non-contact training drills	Harder training drills, eg, passing drills. May start progressive resistance training	Exercise, coordination and increased thinking
5	Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6	Return to sport	Normal game play	

# Return to Play

- **MUST** be symptom free and at school full-time before clearance



## Case #1 Returned

- Returns Day 10- school going well and no difficulty with light physical activity
- Starts with Stage 2 of graduated RTP and instructions to progress 1 level per 24 hours up to Stage 4 (non-contact)
- Patient required to see PCP prior to clearance to contact
- Seen Day 18 post concussion- symptom free and progressed without difficulty
- In full school with no difficulty, is reading without difficulty
- Full clearance for full contact practice and if no symptoms - progress to game play

## Graduated return-to-school strategy

Stage	Aim	Activity	Goal of each step
1	Daily activities at home that do not give the child symptoms	Typical activities of the child during the day as long as they do not increase symptoms (eg, reading, texting, screen time). Start with 5–15 min at a time and gradually build up	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 increased breaks during the day	Increase academic activities
4	Return to school full time	Gradually progress school activities until a full day can be tolerated	Return to full academic activities and catch up on missed work

## Return to Learn

- Long periods out of school is a source of social isolation and anxiety for students
- Goal is returning to school within 1 week
- Students will not be symptom free



# Accommodations Note (SAMPLE)

The <INSERT PT NAME>'s current work capacity is \_\_\_\_\_minutes and forced breaks need to occur at that point for 5-10 minutes in order to settle symptoms

- Avoid prolonged time at the computer (<\_\_\_\_\_ minutes at a time)
- Avoid prolonged meetings, including busy meetings with many people in conversation and group work
- Avoid school tasks requiring quick head and eye movements (ie: taking notes from lectures etc.).
- Provide notes to the student
- Allow the student to photograph board/slides during lecture
- Avoid activities requiring frequent/repetitive scrolling actions
- Elevated work station
- Access to text to voice
- Use written instruction to supplement verbal requests
- Other: \_\_\_\_\_

## *Workload Reduction:*

- Postpone tests/exams
- Postpone assignments
- Reduce overall amount of work and deadlines
- Shorten/modify tasks and projects
- Allow extra time to complete assignments/tests
- Consider reducing course load for the semester
- Allow time and a half for testing

# Who needs a concussion clinic?

- Majority recover spontaneously
- 30% may benefit from interdisciplinary specialized care
- Potential predictors of longer recovery times
- Individualized treatment

Ontario Concussion Care Strategy, 2018



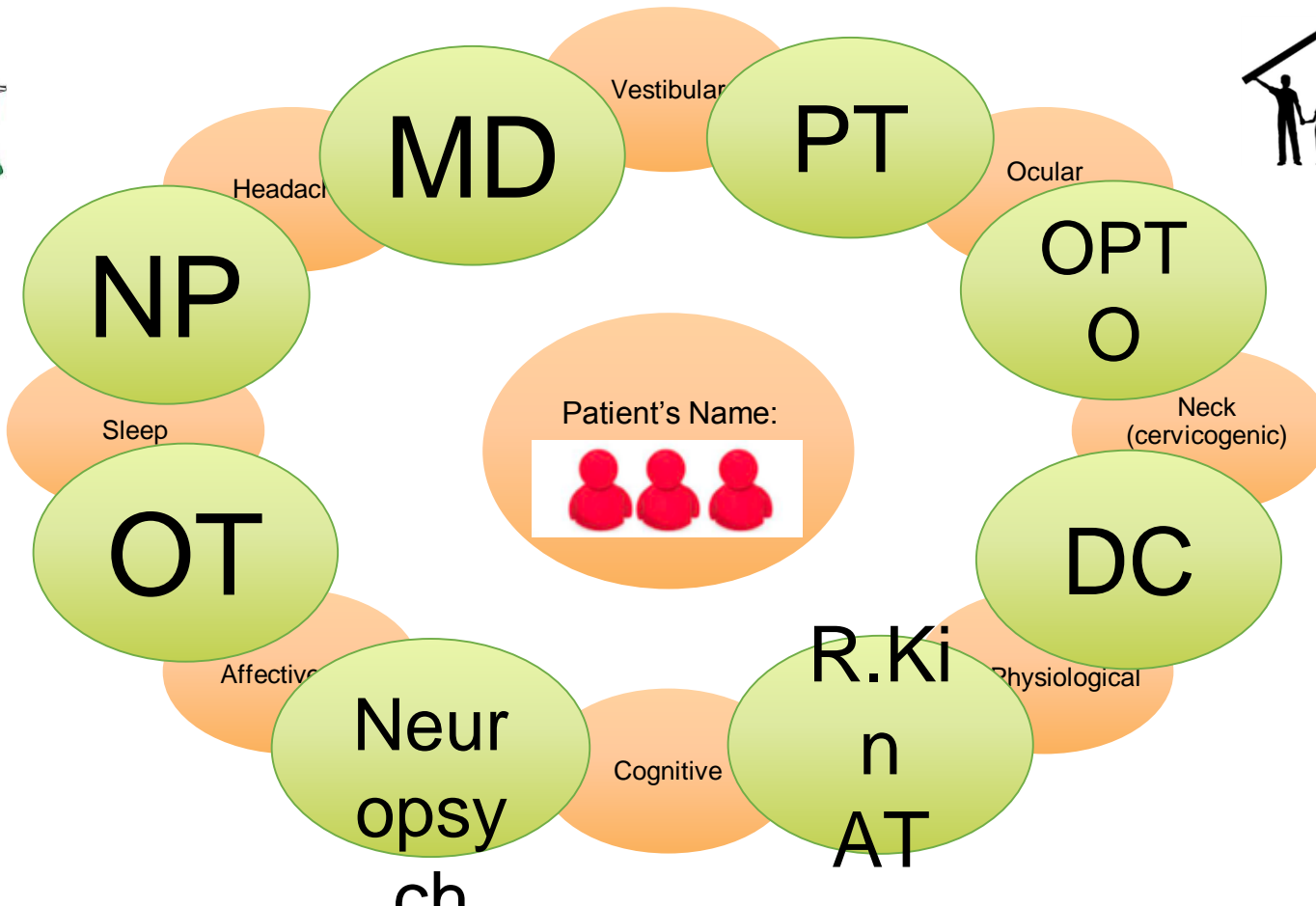


## What if....with Case #1

- 4 weeks out he continues to struggle with school
- He can't remember anything he is reading
- He can't progress his return to play...he get symptomatic everytime he tries

*What symptoms can you manage in the meantime?*

# Rehabilitation



# Future Risk

- Concussions happening closer together
- Less force resulting in symptoms
- Increase in severity and duration



# Future Sport

It is **NEVER no sport** but may be transition to **no contact sport**



# Creating a Culture of Safety in Sport

- ✓ Education!
- ✓ Helmets
- ~~Bodychecking~~ in youth hockey  
<13 years old



# Creating a Culture of Safety in Sport

- Adolescents, especially females, may be our highest risk group
- Safe sport policy
- Brain Health Holiday





*“Teammates don’t let  
teammates play with  
concussion”*

Sudbury Sport and Exercise Medicine



# Additional Resources

*Parachute Canada - Canadian Guideline on Concussion in Sport* <http://www.parachutecanada.org/injury-topics/item/concussion>

*Concussions Ontario* <http://concussionsontario.org/>

*Ontario Neurotrauma Foundation - Guidelines Diagnosis and Managing Pediatric Concussion*  
<http://onf.org/documents/guidelines-diagnosing-and-managing-pediatric-concussion>

*Concussion Legacy Foundation Team Up Speak Up Campaign* <https://concussionfoundation.org/programs/team-up-speak-up/how-to-participate>



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THANK YOU!

Questions?