

## Concussion in Hockey Adding to the Hockey Canada Perspective

### Who?

- 1 injury every 66 practice/games = Novice
- 1 injury every 24 practice/games = Atom
- 1 injury every 5.5 practice/games = Pee Wee
- 1 injury every 5.6 practice/games = Bantam
- 1 injury every 2 practice/games = Midget
- 1.5 injuries every practice/games = Junior

### Mechanism

- Blow to the head, face or jaw, or even somewhere else on the body
- Force transmitted to the brain/brainstem

### Where?

- Injuries occur more often in games than practices
- Preseason games have more injuries than regular and post-season for kids
- Injuries occur in later periods (42% in 3rd), and later minutes in each period (47% last 5)

### Where?

- 86% of injuries occur from contact
  - 95% Body checking
    - 16% Penalty
    - Elbow, cross-check, slash
    - Trip, roughing
  - Difference in body wt/size

### Why?

- Force transmitted to head and/or neck
- Mass involved
- Velocity at impact

How much force is generated in a check?

The kinetic energy of each player before the collision can be calculated with the equation:

$$\text{Energy} = (1/2)\text{Mass} \times \text{Velocity}^2$$

Newton's Third Law of Motion:

**For every action, there is an equal and opposite reaction**

Consider transfer of kinetic energy

### #87 Sidney Crosby vs. #22 David Steckel

**Weight lbs.** 205 lb vs. 217 lb

**Speed in mph** 10 mph vs. 23 mph

**Calculations:** Energy produced: 5,194 joules

Equivalent to shooting a puck:

- **250 rinks, initially at 390 mph**

Stopping force **632 lbs. or 287 kg.**

Enough energy to light a 60 watt bulb for 86 seconds

### Definition of Concussion

- Minor traumatic brain injury
- Temporary alteration of function
- May or may not involve Loss of Consciousness

***Do you have to lose consciousness to have a concussion?***

- Many people will NOT report a loss of consciousness because they cannot recall events before, during or after their concussion.
- Unless this is witnessed as a true loss of consciousness, it may be that the person is experiencing amnesia.

**Amnesia**

- Types: Retrograde and Antegrade
  - 27% of all concussions
- Correlation to severity??
- Correlation to rate of recovery???

**Symptoms & Signs**

Concussion is a SYMPTOM-DRIVEN problem

- Immediate
- Delayed

**Concussion: Symptoms & Signs**  
**SYMPTOMS**

- Headache
- Dizzy
- Feeling dazed
- Seeing stars
- Sensitivity to light
- Ringing in the ears
- Tiredness
- Nausea & vomiting
- Irritability
- Confusion-disorientation

**SIGNS**

- Poor balance or coordination
- Slow or slurred speech
- Poor concentration
- Delayed response to ?'s
- Vacant stare
- Decreased playing ability
- Unusual emotions
- Personality change
- Unusual behavior

**Concussion is Symptom Driven**

Any One of these Symptoms or Signs is enough to Remove the Player from the Game

**Sideline Assessment:**

Maddocks and Pocket SCAT2

**Concussion: Pre-Testing**

- SAC (Standardized Assessment Concussion)
- SCAT2 (Standardized Concussion Assessment Test 2)
- BESS (Balance Error Severity Score)
- NCT (Neurocognitive Testing)

### **Neurocognitive Testing**

- Information processing speed
- Attention
- Concentration
- Reaction time
- Visual scanning
- Visual tracking
- Memory recall
- Problem solving

### **Why Neuropsychological Testing?**

- Computerized tests
  - Can be repeated as often as necessary
- *Ideally, baseline testing done in high risk sports to assist in RTP decisions*
  - Test is repeated after concussion
  - Results are compared to baseline

### **First Response**

- Initiate Emergency Action Plan
- Call 911
- Protect head & neck
- ABC's
- Monitor
- Notify Parents/Guardian

### **Who Should See A Doctor?**

- Anyone who has had a concussion should see a physician
- Anyone with a loss of consciousness should be seen that day

### **ED Assessment**

- Improvement or deterioration since the time of injury?
- Hx from parents, coaches, teammates and eyewitness to the injury
- A determination of the need for emergent neuroimaging

### **Neuroimaging (CT, MRI)**

- Contributes little to concussion evaluation
- Use when suspicion of intra-cerebral structural lesion exists:

### **Concussion General Management**

- CORNERSTONE = Rest until Asymptomatic
- Rest from activity
  - No training, playing, exercise, weights
  - Beware of exertion with activities of daily living
- Cognitive rest
  - No television, extensive reading, video games?
  - Caution re: daytime sleep
  - School rest

REST = ABSOLUTE REST!

### **Concussion Management**

- Medical clearance

- Repeat exam – Day 1,3 & 6
- Repeat Baseline Tests
- Neurocognitive Testing
- Return to play (RTP)
  - 6 step protocol

### **Concussion Management: Return to Play: Protocol**

- No activity, complete rest
- Light aerobic exercise
  - walking or stationary cycling
  - no resistance training
- Sport specific exercise
  - skating (hockey), running (soccer)
  - progressive resistance training
- Non-contact training drills
- Full contact training
- Return to play

### **Same day RTP?**

- Same Day?
  - Not in young (<18 years)
  - Collegiate & High School athletes show deficits with same day RTP
- With adult athletes,
  - Where there are team physicians experienced in concussion management &
  - Access to immediate NCT (i.e. sideline)
  - RTP management may be more rapid

### **Child & Adolescent Athlete**

- Symptom resolution may take longer
- Consider extending symptom free period before starting RTP protocol
- Consider extending length of the graded exertion protocol
- Do not RTP same day

### **Elite vs. Non-elite**

- All athletes should be managed the same regardless of level of participation
- However, available resources and expertise may facilitate a more aggressive management approach

### **Multiple or Repeated Concussions**

#### **How Many is Too Many?**

- There is no magic number of how many concussions are too many.
- This must be evaluated individually.
- RTP decisions should be guided by NCT results & symptoms reported by the athlete, **regardless** of the number of concussions.

### **History of Concussions**

- Increased susceptibility to concussions
- Risk of another concussion = 4 to 6 times greater if there is a history of a prior concussion

### **2<sup>nd</sup> Mild Concussion**

- What happens when an athlete suffers a second mild concussion in the same season?
  - Removal from competition for at least 2 weeks
  - Extended RTP protocol
  - Consultation with a physician is essential

### **3 Concussions**

- After an athlete has sustained 3 or more concussions, serious consideration should be given to removal from contact sports.
- However, each athlete should be considered on an individual basis.
- Athletes with a history of 3 or more concussions have a slower rate of recovery than athletes with a Hx of 1 prior concussion.

### **Second Impact Syndrome**

- True incidence of SIS is unknown
  - 17 probable cases
- Males 16-24 yr old
  - Boxing, football, ice hockey
- Outcome: catastrophic or fatal
  - 100% morbidity
  - 50% mortality

### ***PREVENTION IS PARAMOUNT***

### **Concussive Convulsions**

- Incidence 1/70 concussions
- Sudden onset, Tonic-Clonic for a few minutes
- Often focal activity
- Brief post-ictal phase
- Imaging normal, transient EEG changes
- No anticonvulsant therapy needed
- No predilection for seizure disorder

### **Post-Concussive Syndrome:**

#### **ICD-C Definition (Code 310-2)**

- Incidence between trauma with LOC and development of Sx < 4 weeks
- Symptoms in at least 3 of the following categories:
  - HA, dizzy, fatigue, noise intolerance
  - Irritability, depression, anxiety, emotional lability
  - Subjective concentration, memory or intellectual difficulties
  - Insomnia
  - Reduced alcohol tolerance
  - Preoccupation with above symptoms & fear of brain damage with hypochondriacal concern & adoption of sick role
- 887 NFL players with documented concussion
  - 7-14 days out from play = 6.5%
  - >14 days out from play = 1.5%
- All recovered fully without discernible residual neurocognitive effects

### **Traumatic Post-Concussive Encephalopathy**

- Symptoms and signs develop progressively over a long latent period
  - Average time of onset 12–16 years
  - 15-20% of professional boxers.
- The condition is caused by repeated concussive & sub-concussive blows
- Blows that are below the threshold of force necessary to cause concussion

- AKA: **Chronic Traumatic BI associated with Boxing (CTBI-B), Punch-Drunk Syndrome**

### Concussion in Hockey Prevention

- Education
- Research
- The Future

### **Prevention:** **Player Equipment & Arena Characteristics**

#### **Helmets**

- Concussions may result from abrupt rotations in any of three vector planes.
- Current helmet materials and designs do not sufficiently dampen these forces.

#### **Helmets: What the Messier Project Says...**

- Many concussions in ice hockey are the result of impacts to the back of the head, following a backward fall....
- A specialized liner in the back
  - of the helmet can dissipate energy transfer from outside the helmet to the brain
- A softer outer shell, adjacent to foam (or other optimal liner) and a hard, inner liner would facilitate reduction of energy.

#### **Helmets**

- Concussions often occur because helmets fall off during play because they are not properly secured

#### **Facial Protection**

- A helmet with facial protection is now required for all minor hockey players
  - Not the NHL
- Reduction in ocular, facial and dental injuries.

#### **Facial Protection**

- Full & partial facial protection significantly reduce the risk of facial injuries and lacerations, with no increase in the risk of concussion or neck injury.
- Concussed players wearing full facial protection returned to practices and games sooner than those wearing partial facial protection.

#### **Mouth Guards**

- Do mouth guards prevent concussions?
- Prospective cohort study of 1033 NHL hockey players
- Concussion risk was not affected by mouth guard use

#### **Mouth Guards**

- 94 youth hockey players
  - Between 8 and 16 years of age (mean 9.4 years)
- 90 wore mouth pieces
  - 72 (78.3%) wore them always
  - 18 (19.6%) wore them sometimes

#### **Shoulder Pads and Elbow Pads**

- Designed to reduce impact injuries to the acromion, clavicle & olecranon
- From collisions with
  - Opponents
  - The boards
  - The ice

### **Shoulder Pads and Elbow Pads**

- Equipment worn on the upper body must be designed so players don't perceive them as weapons.
- Shoulder pad size, materials and shape should meet specific standards.
- NHL Injury Analysis Panel, 2000
  - They recommended shoulder and elbow pad designs with softer padding rather than exposed hard plastic.

### **Arena Characteristics**

#### **Glass and Boards**

- Seamless, hardened glass systems that don't require metal supports are much more rigid than previous Plexiglas® systems
- This increased rigidity of the boards and glass is likely to predispose to injuries, including concussion.
- Coincident with the introduction of the new glass systems in NHL rinks:
  - Concussions in the NHL increased **from 17** in 1995-96 across 82 games with 26 teams in the league
  - To **a high of 74** in 2000-01 across the same number of games played by 30 teams
    - Wennberg and Tator, 2003

#### **Ice Size in Arenas**

- Games played by Team Canada.....
  - Large ice in the Czech Republic (2002)
  - Small ice in Canada (2003)
  - Intermediate ice in Finland (2004)
- .....were videotaped to identify collisions and head impacts
- Smaller ice surfaces had greater numbers
  - Collisions and volitional body checks
  - Total head impacts (direct and indirect)
  - Severe head impacts.

**Therefore, larger ice surfaces may decrease concussion risk.**

### **Rules, Policies & Enforcement**

- Rule enforcement helps to reduce violence and preserve sportsmanship.
- Inconsistent officiating magnifies aggression and contributes to violence.
- In hockey, concussions account for 18% of all injuries, many a result of illegal head hits.
- The highest recorded impacts resulted from:
  - a slash
  - a moving elbow
  - a static punch
  - a moving crosscheck
  - a static crosscheck.
- Mihalik et al, 2010, showed that on ice head impacts with the highest "G" force occurred from
  - Elbowing
  - Head contact
  - High sticking
- Higher rotational accelerations occurred after infractions than following legal collisions.
  - Need to Focus on the Major Penalties
  - Elbowing

- Fighting
- High sticking
- Head hits
- Cross checking

Lead to high impacts & concussions

### **Referees & Enforcement**

- Why is Enforcement so Difficult?
  - Less than 50% of observed infractions are called
- Why????
  - Young referees, often only a few years older than the players
  - Frequently penalties called are based on the outcome of infractions rather than on the infraction itself
  - Many referees are afraid of calling the game by the rule book.
  - Fear of angering coaches, players or fans who may retaliate to a bad call, lessened the likelihood of a right call being made.

### **The Players & Coaches:**

Subculture on a Canadian Bantam Rep team:

- Opponent is viewed as the enemy
  - There is no respect for opponents
  - Players infringe on the rules
- Intimidation in ice hockey is defined as the ability to instill fear or exert control over opponents, particularly by physical aggression.
  - Intimidating tactics are knowingly used by players and coaches to instill fear and gain control over an opponent.
  - Aggression leads to intimidation and intimidation also leads to aggression.

### **Education on Concussions**

- All hockey education programs relevant to concussion share the objective of PREVENTING concussions by decreasing violence and poor sportsmanship.
- In addition, they must INCREASE AWARENESS of the mechanisms and consequences of concussion.
- 2009, Canadian players, coaches, trainers & parents of Atoms and Bantams from house & AA leagues.
  - 25% of players could not name a single symptom.
  - 5% of adults did not know how concussions occurred & thought players must lose consciousness to be diagnosed with a concussion
- Head impact profiles were analyzed in 13 Bantam hockey players across 27 games.
- Game video analysis showed that 5 players sustained most of the head hits over 10 games
  - Had 7 behaviors predisposing them to concussion.

Players don't report symptoms because they want to play and hate missing a competition.

- Motivation to win
- A desire to advance in hockey
- A need to earn the respect of teammates, coaches, and parents

### **Education on Concussions**

- Education of athletes, parents, coaches
- Awareness of concussion
- symptoms and signs
- Fair play and respect

### **Education on Concussions**

- Questionnaires/Posters/Contracts
- Contribute indirectly to knowledge transfer when they are administered to players in the presence of parents and coaches

### **Education on Concussions**

- Many medical professionals, coaches, players and parents remain
  - Uninformed
    - Inappropriate management
    - Specifically RTP

### **Education on Concussions**

- **Educational Programs**
  - Think First
- **Other Hockey Specific Examples**
  - Fair Play
  - HEP with Fair Play
  - Respect and Protect
  - Heads Up Hockey
  - Play it Cool
  - CDC/USA Hockey website

### **Future Directions**

- Validation of the SCAT2
- On-field injury severity predictors
- Gender effects on injury risk, severity, outcome
- Pediatric injury & management paradigms
- Rehab strategies
- Concussion surveillance using consistent definitions & outcomes
- Best practice neuropsychological testing
- Long term outcomes

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## Return To Play (or Activity) Guidelines

A concussion is a serious event, but you can recover fully from such an injury if the brain is given enough time to rest and recuperate. Returning to normal activities, including sport participation, is a step-wise process that requires patience, attention, and caution. Sometimes these steps can cause symptoms of a concussion to return. This means that the brain has not yet healed, and needs more rest. If any signs or symptoms return during the Return To Play process, the player must be re-evaluated by a physician before trying any activity again. Remember, symptoms may return later that day or the next, not necessarily during the activity!

**Step 1:** No activity, only complete rest. This means no work, no school, and no physical activity. When symptoms are gone, a physician must be consulted. The physician will be able to clear the player to slowly return to some activities.

**Step 2:** Light aerobic exercise, such as walking or stationary cycling. The player should be supervised by someone who can help monitor for symptoms and signs. No resistance training or weight lifting. The duration and intensity of the aerobic exercise can be gradually increased over time if no symptoms or signs return during the exercise or the next day. **Symptoms? Go back to Step 1. No symptoms? Proceed to Step 3 the next day.**

**Step 3:** Sport specific activities, such as skating or throwing, can begin at step 3. There should be no body contact or other jarring motions such as high speed stops or hitting a baseball with a bat. **Symptoms? Go back to Step 2. No symptoms? Proceed to Step 4 the next day.**

**Step 4:** Drills without body contact.

**Symptoms? Go back to Step 3. No symptoms? Read below:**

The time needed to progress from non-contact exercise will vary with the severity of the concussion and with the player. Proceed to **Step 5** only after medical clearance.

**Step 5:** Begin drills with body contact.

**Step 6:** Game play

Please remember: these steps do not correspond to days! It may take many days to progress through one step, especially if the concussion is severe. As soon as symptoms appear, the player should return to the previous step and wait at least one more day before attempting any activity. The only way to heal a brain is to rest it. **Never return to play if symptoms persist!** A player who returns to active play before full recovery from the first concussion is at high risk of sustaining another concussion, with symptoms that may be increased and prolonged.

# ThinkFirst-SportSmart Concussion Education and Awareness Program

## CONCUSSION IN SPORT

### Always Assess Airway, Breathing and Circulation

- ◆ All players who experience a concussion must be seen by a physician as soon as possible. A concussion is a brain injury.
- ◆ A concussion may involve loss of consciousness. However, a concussion most often occurs without a loss of consciousness.
- ◆ Mechanism: Blow to the head, face or jaw, or even elsewhere on the body. May also result from a whiplash effect to the head and neck.

### Common Symptoms and Signs

- ◆ Symptoms and signs may have a delayed onset (may be worse later that day or even the next morning), so players should continue to be observed even after the initial symptoms and signs have returned to normal.

#### Symptoms

- ◆ Headache
- ◆ Dizziness
- ◆ Feeling dazed
- ◆ Seeing stars
- ◆ Sensitivity to light
- ◆ Ringing in ears
- ◆ Tiredness
- ◆ Nausea, vomiting
- ◆ Irritability
- ◆ Confusion, disorientation

#### Signs

- ◆ Poor balance or coordination
- ◆ Slow or slurred speech
- ◆ Poor concentration
- ◆ Delayed responses to questions
- ◆ Vacant stare
- ◆ Decreased playing ability
- ◆ Unusual emotions, personality change, and inappropriate behaviour

**Caution:** All players should consult a physician after a concussion. Coaches, trainers/safety people, players and parents should not attempt to treat a concussion without a physician's involvement.

### Initial Response

- ◆ If there is loss of consciousness – Initiate Emergency Action Plan and call an ambulance. Assume possible neck injury.

### Concussion

- ◆ Remove the player from the current game or practice
- ◆ Do not leave the player alone; monitor signs and symptoms
- ◆ Do not administer medication
- ◆ Inform the coach, parent or guardian about the injury
- ◆ The player should be evaluated by a medical doctor
- ◆ The player must not return to play in that game or practice



## Return To Play Steps

◆ The return to play process is gradual, and begins after a doctor has given the player clearance to return to activity. If any symptoms/signs return during this process, the player must be re-evaluated by a physician. No return to play if any symptoms or signs persist. Remember, symptoms may return later that day or the next, not necessarily when exercising!

**Step 1** No activity, only complete rest. Proceed to step 2 only when symptoms are gone. This includes avoiding both mental and physical stress.

**Step 2** Light aerobic exercise, such as walking or stationary cycling. Monitor for symptoms and signs. No resistance training or weight lifting.

**Step 3** Sport specific activities and training (e.g. skating).

**Step 4** Drills without body contact. May add light resistance training and progress to heavier weights.

The time needed to progress from non-contact to contact exercise will vary with the severity of the concussion and the player. Go to step 5 after medical clearance.

**Step 5** Begin drills with body contact.

**Step 6** Game play.  
(The earliest a concussed athlete should return to play is one week).

**Note:** Players should proceed through return to play steps only when they do not experience symptoms or signs and a physician has given clearance. Each step should be a minimum of one day. If symptoms or signs return, the player should return to the previous step, and be re-evaluated by a physician.

## Never return to play if symptoms persist!

### Prevention Tips

#### Players

- ◆ Make sure your helmet fits snugly and that the strap is fastened
- ◆ Get a custom fitted mouth guard
- ◆ Respect other players
- ◆ No hits to the head
- ◆ No hits from behind

#### Coach/Trainer/ Safety Person/Referee

- ◆ Eliminate all checks to the head
- ◆ Eliminate all hits from behind
- ◆ Recognize signs and symptoms of concussion
- ◆ Inform and educate players about the risks of concussion

#### Education Tips

[www.hockeycanada.ca](http://www.hockeycanada.ca)

Smart Hockey: More Safety, More Fun! Injury Prevention Program  
ThinkFirst Canada website ([www.thinkfirst.ca](http://www.thinkfirst.ca))

Dr. Tom Pashby Sport Safety Fund website ([www.drpushby.ca](http://www.drpushby.ca))

Drafted with the assistance of ThinkFirst Canada.

# Pocket SCAT2



Concussion should be suspected in the presence of **any one or more** of the following: symptoms (such as headache), or physical signs (such as unsteadiness), or impaired brain function (e.g. confusion) or abnormal behaviour.

## 1. Symptoms

Presence of any of the following signs & symptoms may suggest a concussion.

- Loss of consciousness
- Seizure or convulsion
- Amnesia
- Headache
- "Pressure in head"
- Neck Pain
- Nausea or vomiting
- Dizziness
- Blurred vision
- Balance problems
- Sensitivity to light
- Sensitivity to noise
- Feeling slowed down
- Feeling like "in a fog"
- "Don't feel right"
- Difficulty concentrating
- Difficulty remembering
- Fatigue or low energy
- Confusion
- Drowsiness
- More emotional
- Irritability
- Sadness
- Nervous or anxious

## 2. Memory function

Failure to answer all questions correctly may suggest a concussion.

*"At 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?"*

## 3. Balance testing

Instructions for tandem stance

*"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. You should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."*

Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more than 5 seconds) then this may suggest a concussion.

**Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, urgently assessed medically, should not be left alone and should not drive a motor vehicle.**

# Preparticipation Physical Evaluation

**HISTORY FORM**

DATE OF EXAM \_\_\_\_\_

Name _____	Sex _____	Age _____	Date of birth _____
Grade _____	School _____	Sport(s) _____	
Address _____		Phone _____	
Personal physician _____			
<i>In case of emergency, contact:</i>			
Name _____	Relationship _____	Phone (H) _____	(W) _____

**Explain "Yes" answers below.  
Circle questions you don't know the answers to.**

	Yes	No		Yes	No
1. Has a doctor ever denied or restricted your participation in sports for any reason?	<input type="checkbox"/>	<input type="checkbox"/>	24. Do you cough, wheeze, or have difficulty breathing during or after exercise?	<input type="checkbox"/>	<input type="checkbox"/>
2. Do you have an ongoing medical condition (like diabetes or asthma)?	<input type="checkbox"/>	<input type="checkbox"/>	25. Is there anyone in your family who has asthma?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are you currently taking any prescription or nonprescription (over-the-counter) medications or pills?	<input type="checkbox"/>	<input type="checkbox"/>	26. Have you ever used an inhaler or taken asthma medicine?	<input type="checkbox"/>	<input type="checkbox"/>
4. Do you have any allergies to medicines, pollens, foods, or stinging insects?	<input type="checkbox"/>	<input type="checkbox"/>	27. Were you born without or are you missing a kidney, an eye, a testicle, or any other organ?	<input type="checkbox"/>	<input type="checkbox"/>
5. Have you ever passed out or nearly passed out DURING exercise?	<input type="checkbox"/>	<input type="checkbox"/>	28. Have you had infectious mononucleosis (mono) within the last month?	<input type="checkbox"/>	<input type="checkbox"/>
6. Have you ever passed out or nearly passed out AFTER exercise?	<input type="checkbox"/>	<input type="checkbox"/>	29. Do you have any rashes, pressure sores, or other skin problems?	<input type="checkbox"/>	<input type="checkbox"/>
7. Have you ever had discomfort, pain, or pressure in your chest during exercise?	<input type="checkbox"/>	<input type="checkbox"/>	30. Have you had a herpes skin infection?	<input type="checkbox"/>	<input type="checkbox"/>
8. Does your heart race or skip beats during exercise?	<input type="checkbox"/>	<input type="checkbox"/>	31. Have you ever had a head injury or concussion?	<input type="checkbox"/>	<input type="checkbox"/>
9. Has a doctor ever told you that you have (check all that apply):			32. Have you been hit in the head and been confused or lost your memory?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> High blood pressure			33. Have you every had a seizure?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> High cholesterol			34. Do you have headaches with exercise?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> A heart murmur			35. Have you ever had numbness, tingling, or weakness in your arms or legs after being hit or falling?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> A heart infection			36. Have you ever been unable to move your arms or legs after being hit or falling?	<input type="checkbox"/>	<input type="checkbox"/>
10. Has a doctor ever ordered a test for your heart? (for example, ECG, echocardiogram)	<input type="checkbox"/>	<input type="checkbox"/>	37. When exercising in the heat, do you have severe muscle cramps or become ill?	<input type="checkbox"/>	<input type="checkbox"/>
11. Has anyone in your family died for no apparent reason?	<input type="checkbox"/>	<input type="checkbox"/>	38. Has a doctor told you that you or someone in your family has sickle cell trait or sickle cell disease?	<input type="checkbox"/>	<input type="checkbox"/>
12. Does anyone in your family have a heart problem?	<input type="checkbox"/>	<input type="checkbox"/>	39. Have you had any problems with your eyes or vision?	<input type="checkbox"/>	<input type="checkbox"/>
13. Has any family member or relative died of heart problems or of sudden death before age 50?	<input type="checkbox"/>	<input type="checkbox"/>	40. Do you wear glasses or contact lenses?	<input type="checkbox"/>	<input type="checkbox"/>
14. Does anyone in your family have Marfan syndrome?	<input type="checkbox"/>	<input type="checkbox"/>	41. Do you wear protective eyewear, such as goggles or a face shield?	<input type="checkbox"/>	<input type="checkbox"/>
15. Have you ever spent the night in a hospital?	<input type="checkbox"/>	<input type="checkbox"/>	42. Are you happy with your weight?	<input type="checkbox"/>	<input type="checkbox"/>
16. Have you ever had surgery?	<input type="checkbox"/>	<input type="checkbox"/>	43. Are you trying to gain or lose weight?	<input type="checkbox"/>	<input type="checkbox"/>
17. Have you ever had an injury, like a sprain, muscle or ligament tear, or tendonitis, that caused you to miss a practice or game? If yes, circle affected area below:	<input type="checkbox"/>	<input type="checkbox"/>	44. Has anyone recommended you change your weight or eating habits?	<input type="checkbox"/>	<input type="checkbox"/>
18. Have you had any broken or fractured bones or dislocated joints? If yes, circle below:	<input type="checkbox"/>	<input type="checkbox"/>	45. Do you limit or carefully control what you eat?	<input type="checkbox"/>	<input type="checkbox"/>
19. Have you had a bone or joint injury that required x-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches? If yes, circle below:	<input type="checkbox"/>	<input type="checkbox"/>	46. Do you have any concerns that you would like to discuss with a doctor?	<input type="checkbox"/>	<input type="checkbox"/>

  

Head	Neck	Shoulder	Upper arm	Elbow	Forearm	Hand/fingers	Chest
Upper back	Lower back	Hip	Thigh	Knee	Calf/shin	Ankle	Foot/toes

  

20. Have you ever had a stress fracture?	<input type="checkbox"/>	<input type="checkbox"/>	24. Do you cough, wheeze, or have difficulty breathing during or after exercise?	<input type="checkbox"/>	<input type="checkbox"/>
21. Have you been told that you have or have you had an x-ray for atlantoaxial (neck) instability?	<input type="checkbox"/>	<input type="checkbox"/>	25. Is there anyone in your family who has asthma?	<input type="checkbox"/>	<input type="checkbox"/>
22. Do you regularly use a brace or assistive device?	<input type="checkbox"/>	<input type="checkbox"/>	26. Have you ever used an inhaler or taken asthma medicine?	<input type="checkbox"/>	<input type="checkbox"/>
23. Has a doctor ever told you that you have asthma or allergies?	<input type="checkbox"/>	<input type="checkbox"/>	27. Were you born without or are you missing a kidney, an eye, a testicle, or any other organ?	<input type="checkbox"/>	<input type="checkbox"/>

  

**FEMALES ONLY**

47. Have you ever had a menstrual period?

48. How old were you when you had your first menstrual period? \_\_\_\_\_

49. How many periods have you had in the last 12 months? \_\_\_\_\_

**Explain "Yes" answers here:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

I hereby state that, to the best of my knowledge, my answers to the above questions are complete and correct.  
 Signature of athlete \_\_\_\_\_ Signature of parent/guardian \_\_\_\_\_ Date \_\_\_\_\_

# Preparticipation Physical Evaluation

## PHYSICAL EXAMINATION FORM

Name \_\_\_\_\_ Date of birth \_\_\_\_\_

Height \_\_\_\_\_ Weight \_\_\_\_\_ % Body fat (optional) \_\_\_\_\_ Pulse \_\_\_\_\_ BP \_\_\_\_/\_\_\_\_ (\_\_\_\_/\_\_\_\_, \_\_\_\_/\_\_\_\_)

Vision R 20/ \_\_\_\_ L 20/ \_\_\_\_ Corrected: Y N Pupils: Equal \_\_\_\_ Unequal \_\_\_\_

### Follow-Up Questions on More Sensitive Issues

- |  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| 1. Do you feel stressed out or under a lot of pressure?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Do you ever feel so sad or hopeless that you stop doing some of your usual activities for more than a few days?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Do you feel safe?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Have you ever tried cigarette smoking, even 1 or 2 puffs? Do you currently smoke?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. During the past 30 days, did you use chewing tobacco, snuff, or dip?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. During the past 30 days, have you had a least 1 drink of alcohol?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Have you ever taken steroid pills or shots without a doctor's prescription?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Have you ever taken any supplements to help you gain or lose weight or improve your performance?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Questions from the Youth Risk Behavior Survey ( <a href="http://www.cdc.gov/HealthyYouth/yrbs/index.htm">http://www.cdc.gov/HealthyYouth/yrbs/index.htm</a> ) on guns, seatbelts, unprotected sex, domestic violence, drugs, etc. | <input type="checkbox"/> | <input type="checkbox"/> |

Notes: \_\_\_\_\_

	NORMAL	ABNORMAL FINDINGS	INITIALS
<b>MEDICAL</b>			
Appearance			
Eyes/Ears/Nose/Throat			
Hearing			
Lymph nodes			
Heart			
Murmurs			
Pulses			
Lungs			
Abdomen			
Genitourinary <small>(males only)*</small>			
Skin			
<b>MUSCULOSKELETAL</b>			
Neck			
Back			
Shoulder/arm			
Elbow/forearm			
Wrist/hand/fingers			
Hip/thigh			
Knee			
Leg/ankle			
Foot/toes			

\*Multiple-examiner set-up only.  
\*Having a third party present is recommended for the genitourinary examination.

Notes: \_\_\_\_\_

Name of physician (print/type) \_\_\_\_\_ Date: \_\_\_\_\_

Address \_\_\_\_\_ Phone: \_\_\_\_\_

Signature of physician \_\_\_\_\_, MD or DO

# Preparticipation Physical Evaluation

CLEARANCE FORM

Name \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_ Date of birth \_\_\_\_\_

- Cleared without restriction
- Cleared, with recommendations for further evaluation or treatment for: \_\_\_\_\_

Not cleared for  All sports  Certain sports: \_\_\_\_\_ Reason: \_\_\_\_\_  
Recommendations: \_\_\_\_\_

## EMERGENCY INFORMATION

Allergies \_\_\_\_\_

Other Information \_\_\_\_\_

IMMUNIZATIONS (eg, tetanus/diphtheria; measles, mumps, rubella; hepatitis A, B; influenza; poliomyelitis; pneumococcal; meningococcal; varicella)

- Up to date (see attached documentation)
- Not up to date Specify \_\_\_\_\_

Name of physician (print/type) \_\_\_\_\_ Date: \_\_\_\_\_

Address \_\_\_\_\_ Phone: \_\_\_\_\_

Signature of physician \_\_\_\_\_, MD or DO

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# Preparticipation Physical Evaluation

CLEARANCE FORM

Name \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_ Date of birth \_\_\_\_\_

- Cleared without restriction
- Cleared, with recommendations for further evaluation or treatment for: \_\_\_\_\_

Not cleared for  All sports  Certain sports: \_\_\_\_\_ Reason: \_\_\_\_\_  
Recommendations: \_\_\_\_\_

## EMERGENCY INFORMATION

Allergies \_\_\_\_\_

Other Information \_\_\_\_\_

IMMUNIZATIONS (eg, tetanus/diphtheria; measles, mumps, rubella; hepatitis A, B; influenza; poliomyelitis; pneumococcal; meningococcal; varicella)

- Up to date (see attached documentation)
- Not up to date Specify \_\_\_\_\_

Name of physician (print/type) \_\_\_\_\_ Date: \_\_\_\_\_

Address \_\_\_\_\_ Phone: \_\_\_\_\_

Signature of physician \_\_\_\_\_, MD or DO

## REVIEW

# A proposal for an evidenced-based emergency department discharge form for mild traumatic brain injury

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### Abstract

*Primary objective:* To examine and compare a sample of head injury care instruction forms available in hospital emergency departments (EDs) against evidence-based factors predictive of haemorrhage or traumatic lesions and to propose an easy-to-understand discharge instruction form for patients with concussion or mild traumatic brain injury (MTBI).

*Research design/methods:* Fifteen hospital discharge instruction forms were reviewed for inclusion of six factors known to be associated with the presence of haemorrhage after MTBI. ED instruction forms were also evaluated for readability.

*Results:* The 15 hospital ED instruction forms varied in what patients' caretakers were instructed to observe. Some but not all important factors associated with haemorrhage were included. The mean Flesch-Kincaid reading grade level of the discharge instruction forms was 8.2 with a mean Reading Ease score of 59.9%.

*Conclusion:* EDs use discharge instruction forms listing signs and symptoms that are highly variable, confusing, not all evidence-based and often not easy to understand. This review proposes a discharge instruction form containing the six best evidence-based variables (according to the current literature) as being useful and understandable to patients and their families for home observation after MTBI.

**Keywords:** *Mild, traumatic, brain, trauma, concussion, head, injury*

### Introduction

According to data from the Head Injury Task Force, National Institute of Neurologic Disorders and Stroke, ~2 million traumatic brain injuries (TBIs) occur in the USA per year [1]. The majority are considered to be mild [2–6]. Emergency and family physicians see a large number of patients with minor traumatic brain injury (MTBI) and routinely discharge them home with instructions for observation. While less than 10% of patients with MTBI will have positive findings on CT scans and less than 1% require neurosurgical intervention [7, 8], it is haemorrhage that can lead to death. The responsibility rests with the parent/guardian or caretaker to monitor the patient for a rare but life-threatening cerebral pathology requiring surgery or hospital monitoring, e.g. an intra-cranial haematoma or cerebral oedema. In addition, it is the responsibility

of the attending physician to inform the family what to observe and what actions to take if the patient's neurologic condition deteriorates significantly after discharge from the ED.

The majority of the research that evaluates factors associated with haemorrhage identifies a change in the Glasgow Coma Scale (GCS) as a risk factor for intra-cranial complications following mild head injury [2, 3, 5, 6, 9–19]. GCS < 15, for example, is listed in many studies as a risk factor [3, 6, 10, 12, 13, 16, 18–20]. A GCS of 15, however, does not rule out radiographic intra-cranial lesions given that 3% of patients with a GCS of 15 in one study had CT evidence of head injury [12]. Loss of consciousness and change in mental status have also been associated with the risk of intra-cranial complications [2, 3, 5, 9, 11, 15, 16, 20]. Palchak et al. [21] suggest that loss of consciousness alone, however,

is not predictive of TBI on CT or of requiring surgical intervention.

Various mechanisms of injury have been shown to be associated with intra-cranial pathology. Seven studies [2, 5–7, 10, 11] either specifically state the form of, or imply, a high energy mechanism such as bicyclist/pedestrian struck by a motor vehicle. The use of drugs and/or alcohol has also been identified as a significant risk factor for developing a brain injury complication [3, 6, 10, 13, 22]. A number of studies state that a neurologic deficit is associated with intra-cranial lesions and haemorrhage [3, 6, 11, 13, 15–17]. Nee et al. [23] demonstrated that vomiting after MTBI is associated with a four-fold increase in the risk of a skull fracture, which in turn increases the risk of an extradural haematoma. Numerous studies have identified vomiting as an important risk factor for CT lesions post-MTBI [3, 5, 6, 8–11, 13–15, 17, 22].

Headache is a common symptom post-MTBI; however, the nature and intensity of the headache is described inconsistently over selected studies. Nevertheless, headache has been significantly associated with head injury complications identified by CT scanning [3, 6, 8, 10, 13–15, 22].

Amnesia is an important risk factor for haemorrhage; although the manner in which amnesia is described and evaluated is inconsistent across studies. Memory loss, whether retrograde or anterograde, has been identified as a potential risk factor in 10 recent studies [3, 5, 6, 9–11, 13, 15, 17, 22]. Conversely, one recent study concluded that isolated amnesia was not predictive of TBI on CT or of requiring surgical intervention [21].

The Miller criteria published in 1996 define a population of patients with a GCS of 15 after minor head trauma that may safely be released from the ED without obtaining a head CT [4]. Conversely, the Miller criteria suggest that a CT scan is recommended if there is significant headache or nausea, vomiting or signs of depressed skull fracture. Subsequently, a prospective, observational study by Holmes et al. [4] applied these criteria for CT scanning in a population with a GCS of 14 and identified 18 of 35 cases with abnormalities on CT. Haydel et al. [22] selected seven clinical items to apply to 520 patients with minor brain injuries. The sensitivity and specificity for the constellation of items was 100% (95% CI: 95–100%) and 25% (95% CI: 22–28%), respectively, for identifying patients with a positive CT scan. The clinical items selected were: short-term memory deficits, drug or alcohol intoxication, physical evidence of trauma above the clavicles, age > 60 years, seizure, headache and vomiting.

The Canadian CT Head Rule [5] identifies clinical factors for predicting intra-cranial lesions in adult

patients with MTBI: GCS < 15 at 2 hours post-injury, suspected open or depressed skull fracture, any sign of basilar skull fracture, vomiting two or more times, age > 65 years, retrograde amnesia > 30 minutes and dangerous mechanism of injury. These were found to be 98.4% sensitive (95% CI: 96–99%) and 49.6% specific (95% CI: 48–51%) with a 99.7% negative predictive value (95% CI: 99.3–99.9%) for predicting the need for neurosurgical intervention.

With regard to children, a 1999 practice parameter developed by the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP) concluded that, based upon two studies of children with minor head injury, head CT scans could be foregone in children meeting the following criteria: normal neurologic examination, no loss of consciousness and no amnesia, vomiting, headache or mental status abnormalities. Otherwise, paediatric patients with any of these findings should undergo brain imaging [24].

There is no consensus regarding the frequency or need to awaken patients after discharge from the ED [25]. Ingebrigtsen et al. [16] recommend that the patient sent home from the ED be awakened twice during the first night. Their in-hospital observation recommendations are to awaken the patient every 15 minutes the first 2 hours and thereafter every hour until at least 12 hours after injury. The AAP/AAFP guidelines endorse observation in a variety of settings under the care of a competent caregiver [24]. Livingston et al. [26] stated that the negative predictive power of a CT scan is 99.7%, suggesting that a patient with a negative head CT and no other signs or symptoms may be discharged without observation. Monitoring may be crucial, however, since deterioration may occur minutes to hours after a head injury. Out of 834 subjects in the in-home monitoring study arm of Fabbri et al. [27], 5.3% (44 out of 834) returned to the ED after a median of 27 hours and six were found to have had a post-traumatic lesion, although none required surgical intervention. Servadei et al. [20] showed that 22 of 27 cases of extradural haematoma clinically deteriorated within 7 hours post-injury, with a mean of 3 hours. However, there is no evidence in any of these studies that waking the patient resulted in more rapid recognition of the factors associated with cerebral haemorrhage.

In summary, although there is considerable research on factors associated with neurologic complications following mild brain injury there is no true consensus on which factors are most predictive. That being said, the factors most consistently associated with the presence of haemorrhage or intra-cranial pathology (such as cerebral oedema) following a mild brain injury are: (1) vomiting, (2) headache

(especially a worsening headache), (3) developing amnesia or evidence of short-term memory loss, (4) worsening mental status, (5) neurologic signs such as loss of motor function, vision or speech and (6) seizure. Parents and other family members who are watching over individuals with MTBI should be informed of these factors and the best means to inform family members is with a discharge instruction form.

## **Objective**

Most emergency departments (EDs) provide discharge information forms or brochures to patients with head injuries. The discharge instruction forms generally present a list of symptoms that patients may experience after a concussion. Patients are likely to regard these information forms as official and endorsed by the hospital and physicians. However, there are no standards or guidelines for these information forms. Further, it is possible that critical information for monitoring the patient may be left out. The purpose of the present study was to examine a sample of discharge information forms from a sample of hospitals and compare them to the critical signs and symptoms of haemorrhage that the best evidence in the literature says should be observed. Information forms for family members should also be readable and understandable and, therefore, this review evaluated reading levels of existing discharge forms. Finally, an information form was proposed that captures all of the known factors associated with haemorrhage that is readable at a grade six level.

## **Methods**

### *Study design*

Based on the review of the literature, the head injury discharge instructions were rated on the number of evidence-based predictors of intra-cranial lesions/haemorrhage. The literature review identified 11 risk factors that were considered to be predictive of intra-cranial haemorrhage or lesions post-MTBI: GCS < 15, vomiting, headache, amnesia, age, trauma, drug/alcohol intoxication, seizure, high energy mechanism of injury, neurological deficit and historical factors (coagulopathy, hydrocephalus with shunt, pre-existing neurological disease). These were condensed into six factors that had at least two research investigations to support their predictive relationship with neurologic complications: GCS < 15, amnesia, headache, vomiting, neurologic deficit and seizure.

The rating of each discharge instruction sheet was conducted by two of the authors and simply looked at whether the instruction sheet mentioned the need to observe any of the six factors associated with neurologic complications. On the rare occasion when the reviewers disagreed they discussed the information presented and reached consensus. The instruction forms were also evaluated for readability with the Flesch-Kincaid grade and reading ease formulae [28–30]. The two Flesch-Kincaid formula scores are based on the average number of syllables per word and words per sentence. The Flesch-Kincaid Grade Level score rates text based on the US academic level system. The Flesch Reading Ease score is on a spectrum of 0–100; the higher the score, the easier it is to comprehend.

### *Study setting*

Five hospitals from Southern Ontario, Canada and 10 hospitals in the Western New York, USA region were contacted in order to obtain the discharge instructions form given to patients who were discharged home after MTBI. Hospitals varied from local community hospitals to major trauma centres.

### *Population*

Fifteen hospital ED head injury discharge information forms from Canada and the USA.

### *Outcomes*

This study compares a sample of information forms available to patients after MTBI against the best available scientific evidence for the signs and symptoms of haemorrhage. The study also provides a sample information form that is evidence-based and readable.

## **Results**

Various signs and symptoms were included in the 15 discharge instruction forms (Table I). A multitude of formats were employed to present the information. Some information forms were narrative and lengthy while others were exceedingly brief. The Flesch-Kincaid formula grade level reading ranged from 5.8–12.0 with a mean of 8.2. The Flesch-Kincaid Ease formula ranged from 39.0–72.3% with a mean of 59.9%.

Of the 15 discharge instruction forms reviewed, only one contained all six items in the recommended list of risk factors for neurologic complications. The remainder of the discharge instruction forms' conformity to these six chosen items ranged from 50–83%. Only two of the selected six items were listed in every discharge instruction form: GCS < 15

Table I. Discharge instruction form conformity with six evidence-based risk factors.

Hospital #	Risk factors						Percentage conformity*	Range from baseline**
	GCS < 15	Vomiting	Headache	Amnesia	Seizure	Neurologic deficit		
1	•	•	•		•	•	83%	2.5×
2	•	•			•	•	67%	1.8×
3	•	•	•		•	•	83%	1.8×
4	•	•	•		•		67%	1.3×
5	•	•	•				50%	1.7×
6	•	•			•	•	67%	1.7×
7	•	•	•		•	•	83%	1.8×
8	•	•	•		•	•	83%	1.7×
9	•	•	•		•		67%	1.7×
10	•	•	•	•	•		83%	1.7×
11	•	•	•				50%	0.7×
12	•	•	•		•	•	83%	1×
13	•	•	•				50%	0.8×
14	•	•	•	•	•	•	100%	2×
15	•	•	•	•		•	83%	1.3×

• denotes risk factor addressed in the institution's discharge instruction sheet; \* calculated from number of identified risk factors on institution's discharge instruction sheet divided by total number of evidence-based risk factors (6); \*\* calculated from total number of elements on institution's discharge instruction sheet divided by total number of evidence-based risk factors (6).

and vomiting. The least frequently cited item was amnesia, with only four discharge instruction forms having included this variable.

## Discussion

Patient discharge instruction forms for MTBI are important because of the potential for neurologic deterioration after seemingly minor brain injury. Instructions to caregivers should be simple, precise and relevant. The written word is superior to verbal explanations, both in terms of compliance with instructions and for retaining the information [16]. Therefore, a simple and evidence-based discharge instruction form for mild head injuries may help caregivers to properly monitor post-MTBI patients after discharge from the ED.

The discharge instruction forms reviewed in this study varied a great deal in terms of the information given to families, the reading grade level for understanding the information and the type of information included. Wording on most of the discharge forms was vague. 'Mental confusion' and 'neurologic deficit' were terms often used but absent any clarifying statements. If the instruction forms were intended to instruct family members on what to look for in case the injured person had developed a haemorrhage, then virtually all of the instructions forms were inadequate. None of the instruction forms specifically mentioned this as the primary reason for continuing observation.

There was wide variation for inclusion of the six evidence-based risk factors. Only one discharge instruction form listed all six criteria; from an

institution, interestingly, that is not a major trauma centre. This may reflect the fact that major trauma centres see the more severely injured patients and may not be as concerned with the instructions given to patients with MTBI discharged to home.

The only children's hospital discharge instruction sheet in the sample scored an 83% compliance rate with the selected risk factors, but at a cost of including a lot of extraneous information (2.5-fold greater). The evidence-based risk factors were distilled from adult studies; therefore, these criteria need to be re-evaluated with respect to paediatric MTBI patients. More study of factors associated with haemorrhage in children is required.

According to the Flesch-Kincaid readability formulae, a high education level is required to interpret the discharge instructions reviewed. The optimal readability for the general population is recommended to be a grade 6 level [30, 31]. The 15 handouts reviewed had a mean 8.2 grade level. The reading ease score varied widely as well, ranging from 39.0–72.3%. Standard documents aim for a score of 60–70%. Print sizes and formats also varied considerably. A minimum font size of 12 is recommended. A discharge instruction form (Figure 1) that is easy to read and understand is proposed. The Flesch-Kincaid reading ease is 78.4% and the grade level is 6.5. These scores were altered as a result of including the words 'tylenol' and 'aspirin'. By removing these two words, the Flesch-Kincaid reading ease becomes 84.9% with a grade level of 5.4. Nonetheless, it is believed that this information is important to include in the discharge form and that these two words will be understood as they are in common usage. The proposed form

**Head Injury Care**

You had a head injury and must be watched closely by another person for 24 hours.

- If you show any of these symptoms or signs after your head injury, you or the person watching you should call your doctor or go to the Emergency Room:
- Any fainting or sleepiness
- Increased confusion
- Change in behaviour (acting strange, saying things that do not make sense)
- A constant headache, mainly a worsening headache
- Any vomiting or throwing up
- Cannot remember new events
- Cannot move parts of your body
- Seizure (any jerking of the body or limbs)
- You may use Tylenol, but do not take any strong pain pills or aspirin for the first 24 hours
- You must not do any sports until a doctor says it is safe to do so

Figure 1. Proposed patient discharge instruction sheet for MTBI.

has the font size 14 Arial with 1.5 line spacing with a simple format to account for visually impaired individuals (those with diabetic retinopathy, cataracts, glaucoma, scotoma, etc).

Results of the research on the significance of clinical risk factors for predicting structural intracranial lesions after MTBI are occasionally contradictory and some are plagued by methodological issues [22]. Other problems include the lack of a uniform definition of MTBI. Nevertheless, there is enough evidence that certain clinical factors have sufficient sensitivity and predictive value to alter the index of suspicion for the risk of intra-cranial lesions in adult patients with MTBI. Until more research has been conducted it is assumed that all factors are important to observe for and that no factor is more important than another. It is critical that information forms distributed by hospitals use current and relevant information to instruct family members on signs and symptoms after MTBI. This review has attempted to improve the quality of information and guidance given to family members by providing a sample information form that is readable at a grade six level and that includes only those factors that are evidence-based and related to the possibility of intracranial hemorrhage or cerebral oedema after MTBI.

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### HOCKEY CANADA RETURN TO PLAY

\_\_\_\_\_  
Name of Player

is able to return to play following injuries sustained on

\_\_\_\_\_  
Date

Considerations /restrictions with respect to return to play:

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\_\_\_\_\_  
Name of Treating Physician

\_\_\_\_\_  
Signature

Date: \_\_\_\_\_

***This information is strictly confidential and will only be used to assist in the player's safe return to play. All records will be returned to the player.***

***Disclaimer: Personal information used, disclosed, secured or retained by Hockey Canada will be held solely for the purposes for which we collected it and in accordance with the National Privacy Principles contained in the Personal Information Protection and Electronic Documents Act as well as Hockey Canada's own Privacy Policy.***

# KMHA Concussion Management Protocol

