Cognitive Impairments in mTBI and Mental Health: Myths and realities

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Overview

- Review of mTBI and Post Concussive Syndrome (PCS) Concepts
- Critical review of PCS symptoms as “unitary”
- Importance of Ontario Neurotrauma Foundation Guidelines in mTBI management
- Managing cognitive sequelae
- Literature support for cognitive impairments in psychological/somatic conditions
- Differential diagnosis of organic versus “non-organic” cognitive pathology
Common Symptoms of mTBI/PCS

Physical
- Headache
- Nausea
- Vomiting
- Blurred or double vision
- Seeing stars or lights
- Balance problems
- Dizziness
- Sensitivity to light or noise
- Tinnitus
Common Symptoms of mTBI/PCS

**Behavioural/Emotional**
- Drowsiness
- Fatigue/lethargy
- Irritability
- Depression
- Anxiety
- Sleeping more than usual
- Difficulty falling asleep
Common Symptoms of mTBI/PCS

Cognitive
- Feeling “slowed down”
- Feeling “in a fog” or “dazed”
- Difficulty concentrating
- Difficulty remembering
Conventional Wisdom

- Symptom arise from:
  - Unitary mTBI concepts
  - Unitary PCS concept

But do they?
A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of brain function, as manifested by one or more of the following:

- Any period of loss of consciousness for up to 30 minutes
- Any loss of memory for events immediately before or after the accident for as much as 24 hours
- Any alteration of mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused)
- Focal neurological deficit(s) that may or may not be transient
Diagnostic Criteria for Mild Traumatic Brain Injury by the American Congress of Rehabilitation Medicine (ACRM)

- But where the severity of the injury does not exceed the following:
  - Loss of consciousness exceeding 30 minutes
  - Post-traumatic amnesia longer than 24 hours
  - A Glasgow Coma Scale (GCS) score falling below 13 after 30 minutes

- **Premise**: Brain trauma has occurred
Diagnostic Criteria for Post-Concussion Syndrome (ICD-10)

- **A.** History of head trauma with loss of consciousness preceding symptom onset by a maximum of 4 weeks.

- **B.** Symptoms in 3 or more of the following symptom categories:
  - Headache, dizziness, malaise, fatigue, noise tolerance
  - Irritability, depression, anxiety, emotional lability
  - Subjective concentration, memory, or intellectual difficulties without neuropsychological evidence of marked impairment
  - Insomnia
  - Reduced alcohol tolerance
  - Preoccupation with above symptoms and fear of brain damage with hypochondriacal concern and adoption of sick role

*Premise:* Brain trauma has occurred
Diagnostic Criteria for Postconcussional Disorder (DSM-IV)

A. A history of head trauma that has caused significant cerebral concussion.
   Note: The manifestations of concussion include loss of consciousness, posttraumatic amnesia, and less commonly, posttraumatic onset of seizures. The specific method of defining this criterion needs to be established by further research.

B. Evidence from neuropsychological testing or quantified cognitive assessment of difficulty in attention (concentrating, shifting focus of attention, performing simultaneous cognitive tasks) or memory (learning or recall of information).

C. Three (or more) of the following occur shortly after the trauma and last at least 3 months:
   1. Becoming fatigued easily
   2. Disordered sleep
   3. Headache
   4. Vertigo or dizziness
5. Irritability or aggression on little or no provocation
6. Anxiety, depression, or affective instability
7. Changes in personality (e.g., social or sexual inappropriateness)
8. Apathy or lack of spontaneity
D. The symptoms in criteria B and C have their onset following head trauma or else represent a substantial worsening of preexisting symptoms.
E. The disturbance causes significant impairment in social or occupational functioning and represents a significant decline from a previous level of functioning. In school-age children, the impairment may be manifested by a significant

Premise: Brain trauma has occurred
Is brain trauma a necessary or sufficient condition for mTBI/PCS symptoms?
Alternate Conceptualization

- Similar to chronic pain views, much current literature and related theory postulate that CNS related organic factors are responsible for the initial presentation of mTBI/PCS while the longer-term maintenance of such symptoms (reflecting chronic conditions), is dependent on psychological/psychosocial processes (Lishman, 1988).
Opposing Thesis

- Not to take issue with this traditional view as primary objective rather, to document that mTBI/PCS symptoms not related solely to brain trauma.

- A broader perspective postulates that “concussion” is not required for the emergence of “post concussive symptoms”

- This approach supports the notion that each respective symptom present in post mTBI, must be evaluated/treated in its own right
Studies Supporting Thesis

- To support the thesis, a comparative symptom study of roughly balanced TBI groups from mild to very severe brain trauma would be presented.
- A study that is consistent with the literature reflecting the inverse nature of psychopathology and brain trauma severity.
- A comparative symptom study of concussed and non-concussed rehabilitation populations.
- A comparative symptom study of rehabilitation versus non-clinical unemployed and employed individuals.
Study I: PCS Symptoms Across Concussed and Non-Concussed Head Injured

- Balanced groups of WSIB patients:
  - I: 0 PTA (N=13)
  - II: PTA < 1 hr (N=17)
  - III: 1 hr < PTA < 24 hrs (N=12)
  - IV: PTA > 24 hrs (N=12)

- No group differences re PCS symptoms representation nor symptom rankings
PCS Symptoms Similarly Distributed Across Non/Concussed and Head Injured

<table>
<thead>
<tr>
<th>PTA</th>
<th>I (N = 13)</th>
<th>II (N = 17)</th>
<th>III (N = 12)</th>
<th>IV (N = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Headaches</td>
<td>4.4 (1.0)</td>
<td>3.8 (1.0)</td>
<td>2.9 (1.5)</td>
<td>3.2 (1.0)</td>
</tr>
<tr>
<td>2. Dizziness</td>
<td>3.5 (2.0)</td>
<td>2.5 (4.0)</td>
<td>2.9 (1.5)</td>
<td>1.3 (5.0)</td>
</tr>
<tr>
<td>3. Physical Limitations</td>
<td>2.6 (3.0)</td>
<td>2.8 (3.0)</td>
<td>2.2 (3.0)</td>
<td>3.1 (2.0)</td>
</tr>
<tr>
<td>4. Other Pain</td>
<td>2.2 (5.0)</td>
<td>3.4 (2.0)</td>
<td>2.0 (4.0)</td>
<td>1.7 (3.5)</td>
</tr>
<tr>
<td>5. Memory</td>
<td>2.1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.2 (3.5)</td>
</tr>
<tr>
<td>6. Concentration</td>
<td>1.3</td>
<td>1.2</td>
<td>1.2 (5.0)</td>
<td>1.3</td>
</tr>
<tr>
<td>7. Difficulty Sleeping</td>
<td>2.3 (4.0)</td>
<td>1.0</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>8. Fear of Reinjury</td>
<td>1.6</td>
<td>1.2 (5.0)</td>
<td>1.0</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Note: Mean rank order presented in parentheses per group.

Study II: Inverse Relationship Between Psychopathology and TBI Severity

- 570 WSIB patients:
  - I: 0 PTA (N=247)
  - II: 0<PTA<7 days (N=323)
  - III: PTA>7 days (N=70)

- Consistent with literature psychopathology inversely related to brain trauma severity
Study II: Inverse Relationship Between Psychopathology and TBI Severity
Next Studies Derived During R-SOPAC Validation

- R-SOPAC evolved from a concussive symptom approach with:
  - Emotional, Cognitive, Physical domains
  - Intensity and Coping dimensions
  - Symptoms expanded over other “PCS” measures
  - Ability to consider “base rates” in the population at large, thereby addressing criticisms directed at prior measures
  - Likert scale format allows for considered distinction beyond symptom presence-absence
## Rehabilitation Survey of Problems and Coping

**by J. Douglas Salmon, Jr., Ph.D. and Marek Celinski, Ph.D.**

### Part 1: Survey of Problems

**Name:**

**Date:**

**Instructions:** Below is a list of items. Circle the number, ranging from 0-Not a Problem to 6-Extreme Problem, beside the item that best describes **how much of a problem** each one is for you. **Please note:** The higher the number, the more of a problem it is for you.

Please indicate the degree to which you are able to cope with your condition or problem overall:

<table>
<thead>
<tr>
<th>Cannot Cope At All</th>
<th>Can Cope Satisfactorily</th>
<th>Can Cope Very Well</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Sleep
   - Not a Problem
   - Moderate Problem
   - Extreme Problem
   - A: 0, B: 1, C: 2

2. Balance
   - A: 0, B: 1

3. Concentration
   - A: 0, B: 1

4. Dizziness
   - A: 0, B: 1

5. Self-confidence
   - A: 0, B: 1

6. Noise in ears
   - A: 0, B: 1

7. Sexual activity
   - A: 0, B: 1

8. Reading
   - A: 0, B: 1

9. Nightmares
   - A: 0, B: 1

10. Pain (other than headache)
    - A: 0, B: 1

11. Hand co-ordination
    - A: 0, B: 1

12. Memory
    - A: 0, B: 1

13. Depression/Sadness
    - A: 0, B: 1

14. Headaches
    - A: 0, B: 1

15. Epileptic Seizures
    - A: 0, B: 1

16. Anger/Irritability
    - A: 0, B: 1

17. Decision making
    - A: 0, B: 1

18. Tired/Low energy
    - A: 0, B: 1

19. Nervous/Worried
    - A: 0, B: 1

20. Planning/Organizing
    - A: 0, B: 1

21. Feeling helpless
    - A: 0, B: 1

22. Upsetting memories
    - A: 0, B: 1

23. Muscle tension
    - A: 0, B: 1

24. Fear of Driving/ of being a passenger
    - A: 0, B: 1

25. Embarrassed of my appearance
    - A: 0, B: 1
Rehabilitation Survey of Problems and Coping
by J. Douglas Salmon, Jr., Ph.D. and Marek Celinski, Ph.D.

Part 2: Survey of Coping

Name: ____________________________ Date: __________/________/________

Instructions: Below is a list of items. Circle the number, ranging from 0-Cannot Cope at All to 6-Can Cope Very Well, beside the item that best describes how well you can cope and manage in terms of living your normal life in spite of each problem. Please note: The higher the number, the better you are able to cope.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cannot Cope At All</th>
<th>Can Cope Satisfactorily</th>
<th>Can Cope Very Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sleep</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Balance</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Concentration</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Dizziness</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Self-confidence</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Noise in ears</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Sexual activity</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Reading</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Nightmares</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Pain (other than headache)</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Hand co-ordination</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Memory</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Depression/Sadness</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Headaches</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Epileptic Seizures</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Anger/Irritability</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Decision making</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Tired/Low energy</td>
<td>0 1 2 3 4 5 6</td>
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<td></td>
</tr>
<tr>
<td>19. Nervous/Worried</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Planning/Organizing</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Feeling helpless</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Upsetting memories</td>
<td>0 1 2 3 4 5 6</td>
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<td>0 1 2 3 4 5 6</td>
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<td></td>
</tr>
<tr>
<td>24. Fear of Driving/ of being a passenger</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Embarrassed of my appearance</td>
<td>0 1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please indicate how disabled you feel overall: _________ _________ _________ _________ _________
Study III: PCS Symptoms Across Non/Head Injured Rehab Populations

- WSIB patients:
  - I: Back Injured \( (N=79) \)
  - II: HI with PTA=0 \( (N=194) \)
  - III: 1hr<PTA<24 hrs \( (N=38) \)
  - IV: 24 hrs<PTA<7 days \( (N=30) \)
  - V: PTA>7 days \( (N=47) \)

- No group differences re Cognitive, Psychological, Physical Intensity subscales

- Most severe TBI group trend towards lowest intensity subscales across all groups
## Face Validity Support of Symptom Means by Clinical Groups

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive (I)</td>
<td>4.7</td>
<td>5.2</td>
<td>4.9</td>
<td>5.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Physical (I)</td>
<td>5.3</td>
<td>5.1</td>
<td>5.4</td>
<td>5.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Emotional (I)</td>
<td>5.4</td>
<td>5.4</td>
<td>5.8</td>
<td>5.7</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Source: J. Douglas Salmon, Jr., PhD, and Marek Celinski, PhD, 2002. Rehabilitation Survey of Problems and Coping, MHS
Table 7.19
Employed, Unemployed, Clinical R–SOPAC Means Comparison.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Age</th>
<th>Intensity – Total (Mean)</th>
<th>Coping – Total (Mean)</th>
<th>Overall Total (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>88</td>
<td>43.7</td>
<td>24.4</td>
<td>20.5</td>
<td>44.9</td>
</tr>
<tr>
<td>Unemployed</td>
<td>102</td>
<td>36.2</td>
<td>37.0</td>
<td>34.3</td>
<td>71.3</td>
</tr>
<tr>
<td>Clinical</td>
<td>194</td>
<td>40.8</td>
<td>77.9</td>
<td>68.0</td>
<td>145.8</td>
</tr>
</tbody>
</table>

Table 7.20
Employed, Unemployed, Clinical R–SOPAC Test Results.

<table>
<thead>
<tr>
<th>Group</th>
<th>Intensity – Total (Mean)</th>
<th>Coping – Total (Mean)</th>
<th>Overall Total (Mean)</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed vs. Unemployed</td>
<td>&lt;.001</td>
<td>&lt;.0001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unemployed vs. Clinical</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.005</td>
</tr>
<tr>
<td>Clinical vs. Employed</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td>ns</td>
</tr>
</tbody>
</table>
Summary of Un/Employed-Clinical Comparison

- All groups show presence of “PCS” like symptoms across physical, cognitive and emotional dimensions

- Unemployment alone presents a substantial risk over employed for increased “PCS” like symptoms across all 3 domains

- Relative to un/employed, heterogeneous clinical group shows increased PCS-like symptom intensity, and poorer symptom coping i.e. quantitative not qualitative difference
Literature review cognitive effects of:

- TBI severity vs. litigation & “malingering”
- mTBI recovery curve vs. drug use
- mTBI vs. mental health disorders

Figure 1. Effects of traumatic brain injuries, litigation, and malingering on neuropsychological functioning.

Effect sizes typically are expressed in pooled, weighted standard deviation units. However, across studies, there are some minor variations in the methods of calculation. By convention, effect sizes of .2 are considered small, .5 medium, and .8 large. This is from a statistical, not necessarily clinical, perspective. For this figure, the overall effect on cognitive or neuropsychological functioning is reported. Effect sizes less than .3 should be considered very small and difficult.

Figure 2. Effects of MTBIs and drug use on neuropsychological functioning.

MTBI (Binder et al., 1997), 11 studies, N = 314 MTBI, N = 308 controls; Cannabis (Grant, Gonzalez, Carey, Natarajan, & Wolfson, 2003), long-term regular use, 11 studies, N = 623 users, N = 409 non or minimal users; Cocaine (Jovanovski, Erb, & Zaksanis, 2005) dependence/abuse (including some concurrent alcohol abuse), 15 studies, N = 481 users, N = 586 healthy normal controls, median (not mean) effect size reported; Benzodiazepine withdrawal (Barker, Greenwood, Jackson, & Crowe, 2004b), 10 studies, long-term follow-up, 44 comparisons; Chronic benzodiazepine use (Barker, Greenwood, Jackson, & Crowe, 2004a), 13 studies, N = 384, 61 comparisons;

Figure 3. Effects of MTBIs and various psychiatric conditions on neuropsychological functioning.

Figure 3. Effects of MTBIs and various psychiatric conditions on neuropsychological functioning.

MTBI (Binder et al., 1997), 11 studies, N = 314 MTBI, N = 308 controls; Dysthymia, Depression, & Bipolar Disorder (Christensen, Griffiths, Mackinnon, & Jacob, 1997), 3 comparisons for dysthymia, 97 comparisons for depression, and 15 comparisons for bipolar disorder; ADHD (Frazier, Demaree, & Youngstrom, 2004), based on Full Scale IQ, 123 studies.

Conclusions re “PCS”/mTBI Symptoms

- “PCS”/mTBI like symptoms are common in the general population

- There appears to be a quantitative and not qualitative difference between the non-rehab and rehab populations

- The presence of psychopathology is inversely related to degree of brain trauma sustained

- Beyond unemployment as a major contributing stressor, the following likely better accounts for higher intensity PCS symptoms in rehab patients than does brain trauma: physical limitations, pain, sleep disturbance, related emotional/social adjustment difficulties, medication side effects, etc.
Conclusions cont…

- A high degree of overlap exists between the employed, unemployed, general rehab and TBI populations.

- As such, each symptom must be evaluated/treated in its own right and considered relative to premorbid baseline e.g. is “dizziness” vestibular, ataxic, anxiety, &/or medications related, etc.

- We gain nothing clinically by viewing “PCS”/mTBI as a unitary concept, which it clearly is not.

- Viewing PCS as unitary, discourages more thorough investigation of each distinct symptom thus diagnostically and therapeutically disadvantaging the patient.
Non-Specificity of Symptoms: Literature Support

“One source of controversy has been the observation that the symptoms found to persist following mTBI are not specific to this condition. They may also occur in other diagnostic groups, including those with chronic pain (Gasquoine, 2000; Iverson & McCracken, 1997; Radanov, Dvorak & Valach, 1992; Smith-Seemiller, Fow, Kant & Franzen, 2003), depression (Iverson, 2006), post-traumatic stress disorder (Foa, Cashman, Jaycox & Perry, 1997), and are observed to varying extent among healthy individuals (Iverson & Lange, 2003, Mittenberg, DiGiulio, Perrin & Bass, 1992; Sawchyn, Brulot & Strauss, 2000).”

*Ontario Neurofoundation Guidelines, p. 3.*
Guidelines for Mild Traumatic Brain Injury and Persistent Symptoms
Early diagnosis and management of mTBI will improve a patient’s outcome and reduce the impact of persistent symptoms. The present guidelines offer recommendations for the assessment and management of this patient group. Clinicians should assess, interpret and subsequently manage symptoms, taking into consideration other potential pre-injury, injury and post-injury bio-psychosocial factors and conditions that may have contributed to an individual’s symptoms. Because of the overlap of symptoms with other clinical disorders, there is a necessity to carefully pursue differential diagnoses.
Focus & Process of mTBI Guidelines

The format of this guideline is arranged so that in the first part of each of the following sections, an introduction to the topic is provided followed by a table presenting the specific recommendations to be implemented. Also, tables presenting resources (e.g., criteria for diagnosis of mTBI and post-concussion disorder) and indexing tools that can aid assessment and management of symptoms (e.g., patient advice sheet, standardized questionnaires, therapeutic options tables) are also included.
Focus & Process of mTBI Guidelines

Clinicians are encouraged to prioritize treatments in a hierarchical fashion (see Table 4). It is recommended that treatment be first targeted at specific difficulties that have both readily available interventions, as well as the potential to yield significant symptomatic and functional improvement. That is, treat those symptoms that can be more easily managed and/or could delay recovery first, before focusing on more complex and/or difficult to treat symptoms.
Focus & Process of mTBI Guidelines

It is assumed that some postconcussive symptoms, such as cognitive difficulties, are more difficult to treat at least in part because they are multifactorial in origin and reflect the interactions between physiological and psychological factors, premorbid vulnerabilities and coping style, as well as post-injury stressors. For example, if a patient is experiencing sleep disturbance, depression, cognitive dysfunction, and fatigue, by targeting and successfully treating the sleep problems and depression first, improvement in other symptom domains, such as fatigue and cognitive dysfunction may occur as well.
Symptom Treatment Hierarchy

**Primary Symptoms (to be addressed early)**
- Depression/Anxiety/Irritability
- Sleep Disorder
- Post Traumatic Headache

**Secondary Symptoms (recommend addressed secondarily)**
- Balance
- Dizziness/Vertigo
- Cognitive Impairment
- Fatigue
- Tinnitus/Noise Intolerance

Secondary Gain/Malingering Issues

While there is consistent evidence of an association between seeking/receiving financial compensation (i.e., via disability benefits or litigation) and the persistence of postconcussive symptoms, this relationship is complex and it must not be assumed that the initiation of a compensation claim arises solely from the pursuit of secondary gain. The *intentional* exaggeration or manufacturing of symptoms (i.e., malingering) is relatively rare; whereas there are many potential factors which can contribute to symptom expression and accentuation, including levels of emotional distress, fatigue, pain, as well as pre- and post-injury coping/adaptation (Martelli et al., 2007; Stulemeijer et al., 2007).
Guideline Methodology

1. Identify a Clinical Area to promote Best Practice
2. Establish an interdisciplinary guideline evaluation group
3. Establish a Guideline Appraisal Process
4. Search and retrieve guidelines
5. Guidelines Assessment
6. Adaptation of guidelines for local use
7. External Review – Practitioner and policy maker feedback; expert peer review
8. Finalize local guideline
9. Official endorsement and adoption of local guideline
10. Scheduled review and revision of local guideline

(Evidence Based Nursing. 2005;8:68-72; reproduced with permission from the BMJ Publishing Group)
Establishment of the mTBI Expert Consensus Group

Following identification of the priority area, the mTBI Expert Consensus Group was formed. The members of this group were recruited so as to ensure adequate representation of:

1. the various health care professions servicing the mTBI patient population,
2. domain of expertise, and
3. geographic location.

**Disciplines:** emergency medicine, neurology, physical medicine and rehabilitation, radiology, psychiatry, psychology, physical therapy, and occupational therapy
Establishment of the mTBI Expert Consensus Group

Representatives from:

- Ontario Neurotrauma Foundation (sponsoring organization),
- the Ontario Brain Injury Association
- International Brain Injury Association
- A consumer who has experienced persistent symptoms following mTBI were also included in the expert consensus group.

With regards to domain of expertise, individuals recognized as experts in treatment of the different spheres of symptoms (i.e., physical, behavioural, and cognitive) were involved in the project.
Establishment of the mTBI Expert Consensus Group

Experts on objective evidence of mTBI, quality of life, and outcomes or knowledge translation took part in the expert consensus group.

In terms of the variety of injuries associated with mTBI, individuals with expertise in sports-related, motor vehicle accident, and military and Veteran health were all represented as well.

The members forming the expert consensus group were recruited from Ontario, across Canada, and abroad. A formal schema identifying these factors was created prior to the meeting to assist in establishing balanced representation.
Levels of Evidence

The experts voted independently on the 152 recommendations that had been developed by the working groups using a modified Delphi voting technique (Linstone & Turoff, 1975) to narrow them down to the most important and relevant recommendations.

The results of the vote were compiled and circulated to the expert consensus group and they were asked to endorse those recommendations they supported including in the final guideline document.
Levels of Evidence

- If a recommendation met at least one of the following criteria, it was retained for inclusion in the guideline:
  1) based on level A evidence,
  2) received either a minimum of 10 votes or 75% endorsement by the expert consensus group, or
  3) represented an important care issue (i.e., addressed a topic relevant to a large proportion of the mTBI population and clearly represented a current gap in treatment guidance).

- After applying these criteria, 77 recommendations remained and these comprise the current guideline.

- Fifty-six of the recommendations were adapted from recommendations found in existing guidelines and 21 were generated from either evidence identified from our systematic review of the literature or the opinion/experience of the expert consensus group.
Levels of Evidence

The level of evidence used by each of the existing guidelines varied depending on the individual methodology followed. To achieve consistency among the recommendations, whether adapted from existing guidelines or generated by the expert consensus group, the level of evidence for each recommendation included in the current guideline was reviewed and assigned a grade according to the scheme outlined below.

Levels of Evidence:
A. At least one randomized controlled trial, meta-analysis, or systematic review.
B. At least one cohort comparison, case studies or other type of experimental study.
C. Expert opinion, experience of a consensus panel.

External Review, Ongoing Update and Review

- A draft of the guideline was circulated to recognized experts in the field and stakeholders who did not participate in the development process.
- The external reviewers were requested to provide input about the validity and relevance of the guideline. This feedback was incorporated into the final draft.

Ongoing Update and Review

- The guideline recommendations will be undergoing pilot testing.
- The feedback from frontline clinicians and their patients during the pilot implementation phase as well as findings from an ongoing literature review will inform the update of these recommendations scheduled for 2012.
Recommendation 1.1
mTBI in the setting of closed head injury should be diagnosed early as early recognition will positively impact on health outcomes for patients.

Recommendation 1.2
Diagnosis of mTBI should be performed through a combined assessment of clinical factors and symptoms.

Several other recommendations made re acute management & distinct management of sports versus other mTBI
Guidelines Management Approach

There is frequently an interplay of symptoms, social circumstances and subsequent development of complications such as depression that can complicate and negatively influence recovery. In addition, the particular cluster of presenting symptoms will vary among patients, necessitating an individualized approach to management. One of the primary aims of the guidelines is to assist in providing recommendations for management of these patients at risk using a symptom-based approach.
GENERAL RECOMMENDATIONS REGARDING
DIAGNOSIS/ASSESSMENT OF PERSISTENT
SYMPTOMS

Recommendation 4.1
Clinicians should assess and monitor persisting somatic, cognitive and emotional/behavioural symptoms following mTBI.

Recommendation 4.2
A standardized scale, such as the Rivermead Post Concussion Symptoms Questionnaire, should be used to monitor symptoms.


GENERAL RECOMMENDATIONS REGARDING DIAGNOSIS/ASSESSMENT OF PERSISTENT SYMPTOMS

Recommendation 4.3
Persistent symptoms following mTBI can be nonspecific. Therefore, careful and thorough differential diagnoses should be considered as similar symptoms are common in chronic pain, depression, anxiety disorders, and other medical and psychiatric disorders.


Differential Diagnoses Related to mTBI

- Major Depressive Disorder
- Generalized Anxiety Disorder
- Post Traumatic Stress Disorder (PTSD)
- Chronic Pain Syndrome
- Cervical Strain/Whiplash Associated Disorder
- Substance Abuse or Polypharmacy
- Somatoform Disorder/Factitious Disorder
- Malingering
- Post Traumatic Headache
- Fibromyalgia syndrome (secondary)
- Primary Sleep Disorder: e.g., Obstructive Sleep Apnea
Symptom Based Guidelines

Each symptom guideline includes assessment, management & accompanying resource recommendations re:

- Headache
- Sleep
- Mental health
- Cognitive
- Balance
- Vision
- Fatigue
- Return to work considerations
ASSESSMENT OF POST TRAUMATIC HEADACHE

Recommendation 6.1
Take a focused headache history identifying the headache frequency, duration, location, intensity and associated symptoms (e.g., nausea/vomiting, etc.) to try to determine which primary headache type it most closely resembles (i.e., episodic or chronic migraine, episodic or chronic tension-type, primary stabbing headache, occipital neuralgia, etc.). Unfortunately, some post-traumatic headaches are unclassifiable. Grade C.

Recommendation 6.2
Perform a neurologic exam and musculoskeletal exam including cervical spine examination. Grade C.
ASSESSMENT OF POST TRAUMATIC HEADACHE

Recommendation 6.3
Management of post-traumatic headache should be tailored to the class of non-traumatic headache it most closely resembles (e.g., chronic tension, migraine, etc.). Refer to the treatment algorithms specific to the appropriate class of headache taken from the Institute for Clinical Systems Improvement (ICSI) guideline for treatment guidance.
MANAGEMENT OF PERSISTENT SLEEP DISTURBANCES

Recommendation 7.1
Advise patients that the goal of treatment is to improve the continuity and restorative quality of sleep, not to make them "8 hour sleepers". More often than not the total sleep time will be less than 8 hours per night.

Recommendation 7.2
Provide the sleep hygiene advice.

Recommendation 7.3
Relaxation training is effective and recommended therapy in the treatment of chronic insomnia.
Recommendation 7.4
Pharmacotherapy is generally recommended at the lowest effective dose as short-term treatment lasting less than 7 days. Although long-term use of hypnotic agents is discouraged due to the potential for tolerance and dependence, there are specific situations and circumstances under which long term use of hypnotics may be appropriate. Grade C.

Recommendation 7.5
Some insomnia patients spend excessive time in bed trying to attain more sleep. Sleep consolidation is accomplished by compressing the total time in bed to match the total sleep need of the patient. This improves the sleep efficiency. Grade C.
"Currently, it remains unclear whether persistent cognitive symptoms result from the pathophysiological effects of the injury or are related to the impact of a variety of additional factors that can influence cognitive functioning such as pain, fatigue, medications, sleep, pre-morbid personality factors, litigation, psychological factors and emotional disturbance (i.e., anxiety and depression).

Additionally, cognitive symptoms do not typically worsen over time as a sole and direct function of the traumatic injury. When such a pattern of complaints is observed, the relative impact of these additional factors should be considered.”

Guidelines, p 36
Recommendation 9.1
When there are persistent cognitive complaints, the Health Care Provider should make efforts to formally screen for cognitive deficits. Objective measures of those domains most commonly affected post-mTBI (i.e., attention and concentration, information processing speed, memory) should be used. Although there currently is no screening measure specific to cognitive difficulties following mTBI, the Rivermead Post Concussion Symptoms Questionnaire includes items assessing cognition.

Recommendation 9.2
Consideration should be given to potential co-morbid diagnoses that could be present and have the potential to influence cognition such as anxiety, depression, PTSD, pain, fatigue, sleep disturbance, or acute stress disorder.
Recommendation 9.3
If evidence of cognitive dysfunction is obtained upon screening that is likely attributable to the mTBI itself or if cognitive symptoms are reported to persist at 3 months, then consideration for more formal assessment should be given and referral made. If available, refer to a neuropsychologist (ideally with experience with TBI). When a local neuropsychologist is not available or known, referral to a TBI centre can be made. For systems with long wait times, practitioners should consider referral earlier than 3 months.
MANAGEMENT OF PERSISTENT COGNITIVE DIFFICULTIES

Recommendation 9.4
Following mTBI, acute cognitive deficits are common, and spontaneous cognitive improvement is expected in the majority of injured individuals. Rehabilitation of cognitive impairments should be initiated if:

i. The individual exhibits persistent cognitive impairments on formal evaluation

ii. The learning of compensatory strategies is necessary in order to facilitate the resumption of functional activities and work and/or there are safety issues in question (i.e., possible harm to self or others).

Recommendation 9.5
For cognitive sequelae following mTBI, the cognitive rehabilitation strategies that should be considered include compensatory strategies and restorative approaches.

Recommendation 9.6
Electronic external memory devices such as computers, paging systems or portable voice organizers have been shown to be effective aids for improving TBI patients' everyday activities.
Literature Support for Cognitive Deficits in Psychological Conditions

- Major Depression
- Schizophrenia
- PTSD
- Bipolar Disorder
- DSM recognizes cognitive disturbance in all major disorders
Major Depressive Disorder (MDD)

- Cognitive impairment in the acute phase of illness frequently reported.
- Diverse cognitive domains: executive functions, attention, memory and psychomotor speed.
- Fewer reports have investigated cognitive functioning in MDD in longitudinal studies.
- Some longitudinal reports show potential “scarring effects” i.e. ongoing despite symptom resolution.
- Overall findings re cognitive functioning in depression are divergent.
- Potential factors for divergence: depression subtype, severity and comorbidity.

Hammar & Ardal, Front Hum Neurosci. 2009 – literature summary
Schizophrenia

- Significant cognitive impairment common - up to 75% of patients
- Wide range of cognitive functions are affected, especially memory, attention, motor skills, executive function and intelligence
- Cognitive impairment often pre-dates illness onset
- Intrinsic part of illness and observed in young and pre-meds
- Specific neuropsychological abnormalities do not explain core features
- Cognitive impairment is related to social and functional outcome
- The evidence is mixed regarding the efficacy of newer atypical antipsychotics in improving cognitive functioning in schizophrenia
- Although some laboratory-based studies of cognitive rehabilitation have provided promising results, convincing evidence regarding generalisation to lasting improvements in day-to-day functioning is, as yet, lacking

PTSD

- Early studies identified varied cognitive and brain markers (mainly hippocampal volume reduction)
- Recent meta-analyses have established:
  - Verbal memory consistently impaired (Johnsen & Asbjørnsen, J Affect Disord., 2008)
Bipolar Disorder

- Cognitive deficits involving attention, executive function, and verbal memory evident across all phases of bipolar disorder.
- Some studies suggest waxing/waning course parallels cognitive dysfunction.
- Circumscribed cognitive deficits may be both iatrogenic and intrinsic to bipolar disorder.
- Differentiating medication- from illness-induced cognitive dysfunction requires comprehensive assessment with an appreciation for the cognitive domains most affected by specific medications.
- No current pharmacotherapies substantially improve cognition in bipolar disorder, although adjunctive stimulants such as modafinil hold promise.
- Optimal management hinges on a knowledge of illness-specific cognitive domains as well as of the beneficial or adverse cognitive profiles of common psychotropic medications.

*Goldberg & Chegappa, Bipol Disorder, June 2009*
Differential Diagnosis and Cognitive Intervention

Similar to mTBI, psychiatric populations have different but potentially confounding concerns:

- Potentially underlying organic/neurophysiological influences
- Primary and secondary symptoms/concerns
  - Distraction/rumination → attentional fluctuations
  - Sleep disturbance common
  - Headaches/chronic pain common
  - Family/relationship issues/social support
  - Work/financial distress
Factors Impacting Testing

Full engagement may be precluded by:

- Amotivational syndrome (MDE, Schizophrenia) may reduce full engagement
- Lethargy/psychomotor retardation (above + sleep disorders)
- Medication effects
- Test anxiety
- Potential secondary gain
Factors Impacting Testing cont...

Attentional focus may be precluded by:

- Hypomania
- Anxiety
- Obsessions/compulsions
- Psychosis
Ramifications

- Important to gauge influence of factors on testing (effort measures, observation, recording, client feedback)

- Factors influencing testing often generalize to daily functional barriers
Summary Differential Diagnosis & Intervention Considerations

Differential diagnosis (mTBI, psychiatric)

- Very challenging, may never clearly establish
- Largely that of ruling out confounds:
  - Attentional focus (internal/external)
  - Engagement (amotivational syndrome)
  - Waxing/waning primary condition
  - Counter motivation
  - Medication side effects
Diagnostic cont…

- Looking for neurodiagnostic markers: Lateralization (rare), & correlating with neuroimaging
- More challenging in absence of neuroimaging findings
- Longitudinal assessment data (time series) – neuropsych reassst if cognitive disturbance persists once the emotional, somatic, factors reduce
Cognitive Intervention Guidance

- Parallels that of Neurofoundation Guidelines
  - Careful differential diagnosis
  - Identify primary pathologies involved
  - Identify contributing factors
  - Identify primary rehabilitation barriers relative to client/family perception
- On-site functional cognitive assessment/observation important
- Intervene when safety concerns
- Intervene when intersection between:
  - Prioritized rehab barriers
  - Functional cognitive deficits
  - Team coordination/patient tolerance
Thank you!
Persistent Mental Health Disorders

Early post-concussive symptoms following mTBI can include:
• Irritability
• Anxiety
• Emotional lability
• Depressed mood
• Apathy.

Thereafter a significant proportion of individuals may develop persistent mental health disorders, with major depression and anxiety disorders observed most frequently.

Depressive disorders following TBI are commonly associated with increased irritability and are often comorbid with anxiety syndromes.
Persistent Mental Health Disorders

The latter include generalized anxiety, panic attacks, phobic disorders, and posttraumatic stress disorder (PTSD).

These disorders comprise both new-onset conditions that develop de novo post-injury, as well as those reflecting an exacerbation of pre-injury conditions or vulnerabilities (Whelan-Goodinson et al., 2009).
Recommendation 8.1
Given their prevalence and potential impact, all patients with persistent symptoms following an mTBI should be screened for mental health symptoms and disorders, including:

• Depressive disorders
• Anxiety disorders, including PTSD
• Irritability or other personality changes
• Substance use disorders
• Somatoform disorders

The use of self-report questionnaires can aid in the assessment and monitoring of common mental health disorders…
MANAGEMENT OF PERSISTENT MENTAL HEALTH DISORDERS

Recommendation 8.1
Referral to a psychiatrist/mental health team (ideally with experience in treating individuals with persistent symptoms following mTBI, if available) should be obtained if:

- the presentation is complex or severe
- psychosis or bipolar disorder is suspected
- the risk of suicide is judged significant
- initial treatment is not effective within two months
- failure or contraindication of medication strategies that are familiar
- presence of risk factors known to potentially affect the course of recovery

Recommendation 8.2
While awaiting specialist referral, the initial steps of treatment should not be delayed, nor symptoms left unmanaged. General measures can be instituted and common symptoms such as headache, sleep disturbance, dizziness, and pain addressed in an ongoing manner. Grade C.
Recommendation 8.3
For medication trials, a ‘start low and go slow’ approach is recommended. Nonetheless, dose optimization may be required before an antidepressant response is observed, or a trial of medication abandoned.

Recommendation 8.4
For medication trials, a ‘start low and go slow’ approach is recommended. Nonetheless, dose optimization may be required before an antidepressant response is observed, or a trial of medication abandoned.
Recommendation 8.5
A selective serotonin reuptake inhibitor is recommended as the first-line treatment for mood and anxiety syndromes after mTBI. However, in some cases the combination of sedative, analgesic, or anti-migraine effects from a tricyclic (TCA) may be particularly desirable, although these agents may generally be considered second-line. Grade C.

Recommendation 8.6
Follow-up should occur at regular intervals: initially every 1 - 2 weeks, while increasing medication to monitor tolerability and efficacy. Thereafter, every 2-4 weeks may be sufficient. Grade C.
MANAGEMENT OF PERSISTENT MENTAL HEALTH DISORDERS

Recommendation 8.7
Cognitive behavioural therapy (CBT) has well-established efficacy for treatment of primary depression; as such it is appropriate in the treatment of mood symptoms following mTBI. Grade C.

Recommendation 8.8
Individuals with PTSD following mTBI should be offered a trial of trauma-focused CBT therapy. The need for concurrent pharmacotherapy should also be assessed, depending upon symptom severity, and the nature of comorbid difficulties (for example, major depression, prominent somatic symptoms, severe hyperarousal and sleeplessness, which all may limit psychological treatment). Grade C.
General Considerations Regarding Pharmacotherapy after mTBI

• Prior to starting treatment, ensure that significant psychosocial difficulties are being addressed (e.g., ongoing domestic abuse, major family/ caregiver conflict, other environmental issues).

• Before prescribing a new treatment, review current medications - including over-the-counter medicines and supplements. If possible, minimize or stop agents that may potentially exacerbate or maintain symptoms.

• Drug therapy should target specific symptoms to be monitored during the course of treatment (e.g., dysphoria, anxiety, mood lability, irritability, as well as fatigue, sleep, headaches, and pain).

• In choosing amongst therapies, aim to minimize the impact of adverse effects upon arousal, cognition, sleep, and motor coordination, as well as seizure threshold - domains in which mTBI patients may already be compromised.

Adapted from Silver, Arciniegas & Yudofsky, 2005
ASSESSMENT OF PERSISTENT BALANCE DISORDERS

Recommendation 10.1
Clinicians should screen for balance deficits (see Figure 4) for assessment of postural stability because clinical testing of balance offers additional information about the presence of ongoing symptoms and assists in the subsequent management of patients who have sustained mTBI. Grade C.

Recommendation 10.2
If symptoms of benign positional vertigo are present the Dix-Hallpike Maneuver should be used. Grade A.
MANAGEMENT OF PERSISTENT BALANCE DISORDERS

Recommendation 10.3
For persons with functional balance impairments and screening positive on a balance measure, consideration for further balance assessment and treatment by physiotherapy may be warranted pending clinical course. Grade C.

Recommendation 10.4
A canalith repositioning maneuver should be used to treat Benign Positional Vertigo if the Dix-Hallpike Maneuver is positive. Grade A.

Recommendation 10.5
Vestibular rehabilitation therapy is recommended for unilateral peripheral vestibular dysfunction. Grade A.
Recommendation 12.1
Determine whether fatigue is a significant symptom by taking a personal history, reviewing the relevant items from the Rivermead Post Concussion Symptoms Questionnaire or by administering the Fatigue Severity Scale. Grade C.
Recommendation 12.2
Characterize the dimensions of fatigue and identify alternative, treatable causes that may not be directly related to the injury. To do so, complete the following: Grade C.
• Complete medical history, review medications (see Appendix 12.2 for a list of medications associated with fatigue, asthenia, somnolence, and lethargy), and review systems, with particular attention to iatrogenic (medication) causes for comorbid medical conditions associated with fatigue (e.g., metabolic disorders - thyroid screen, CBC, enemic, low CA, malnourishment).
• Obtain sleep history to help identify primary or secondary sleep disorders
• Evaluate for depression (that is, loss of interest in activities; feelings of sadness, worthlessness, or guilt; changes in appetite or sleep; or suicidal ideation), anxiety, stress or other psychological distress.
• Conduct a general medical examination and a focused neurologic exam.
MANAGEMENT OF PERSISTENT FATIGUE

Recommendation 12.3
If identified as a significant symptom, some key considerations that may aid in the management of persistent fatigue can include:
- aiming for a gradual increase in activity levels that will parallel improvement in energy levels.
- reinforce that pacing activities across the day will help patients to achieve more and to avoid exceeding tolerance levels.
- encouraging good sleep practices (especially regularity of sleep time, and avoidance of stimulants and alcohol), and proper relaxation times.
- using a notebook to plan meaningful goals, record activity achievement and identify patterns of fatigue.
- acknowledging that fatigue can be exacerbated by low mood.
MANAGEMENT OF PERSISTENT FATIGUE

Provide patients with a pamphlet containing advice on coping strategies for fatigue. Grade C.

Recommendation 12.4
If fatigue is persistent then refer to a brain injury specialist for consideration of a medication trial. Grade C.
RETURN TO WORK/SCHOOL CONSIDERATIONS

Recommendation 13.1
When managing a patient's return to work/study, the Family Physician should consider patient-related and contextual variables. These include physical difficulties arising from the injury, psychosocial issues, cognitive impairment, cultural or work-related contextual factors (e.g., workload and responsibilities, workplace environment, transport or driving issues, hours/shifts/rest breaks). Grade C.

Recommendation 13.2
For individuals who experience persistent deficits following mTBI, or who have difficulty once back at work, a return to work program should occur which requires a carefully designed and managed plan. Specifically, referral to an occupational therapist to review return to work is recommended. Grade C.