



# Guidelines for Mild Traumatic Brain Injury and Persistent Symptoms



Ontario Neurotrauma Foundation  
Fondation ontarienne de neurotraumatologie



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## Overview

The Ontario Neurotrauma Foundation (ONF) initiated this project with the overall objective to create a set of guidelines that can be used by healthcare professionals to implement evidence-based, best practice care of individuals who incur a mild traumatic brain injury (mTBI) and experience persistent symptoms. Persistent symptoms are not an uncommon complication of mTBI; 10 to 15% of individuals who incur mTBI will continue to experience significant symptoms beyond the normal recovery period of three months (Iverson, 2005), which can include post-traumatic headache, sleep disturbance, disorders of balance, cognitive impairments, fatigue, and mood or affective disorders. With the high incidence of mTBI this potentially translates to a significant number of individuals who may experience associated disability.

Currently, the best practice for treatment of those who do not experience spontaneous recovery is not clearly defined. Therefore, the following clinical questions needed to be addressed -- Can an approach be devised to screen for and identify patients that are at high-risk of persistent symptoms and, once identified, can a management plan be developed to treat the symptoms commonly associated with the disorder? Hence the purpose of developing the clinical guidelines is to improve patient care by creating a framework that can be implemented by health professionals to effectively identify and treat individuals who manifest persistent symptoms following mTBI.

## Scope

The present guidelines are appropriate for use with adults ( $\geq 18$  years) who have experienced mTBI. The present guideline is not appropriate for use with patients who have incurred penetrating brain injuries, birth injuries, brain damage from stroke or other cerebrovascular accidents, shaken baby syndrome, or moderate to severe closed head injuries. The guideline addresses early management to only a limited extent because the purpose of this document is to provide guidance on the assessment and treatment of persistent symptoms. Nonetheless, because early management can influence the development and maintenance of persistent symptoms, the most critical issues regarding early management have been incorporated. For more comprehensive guidance on pre-hospital and acute care, readers are directed to the Motor Accidents Authority of NSW 'Guidelines for Mild Traumatic Brain Injury following a Closed Head Injury' (MAA NSW, 2008, <http://www.maa.nsw.gov.au/default.aspx?MenuID=148>). The present document targets healthcare professionals providing service to individuals who have experienced mTBI, including health care providers, neurologists, physiatrists, psychiatrists, psychologists, counselors, physiotherapists, occupational therapists, and nurses.

## Background Information on mTBI and Persistent Symptoms

Over the years various terms have been used synonymously with mild TBI, such as mild head injury and concussion. In this document the term mild TBI is used, and denotes the acute neurophysiological effects of blunt impact or other mechanical energy applied to the head, such as from sudden acceleration, deceleration or rotational forces (Bigler, 2008; MAA NSW, 2008). mTBI is among the most common neurological conditions with an estimated annual incidence of 200/100,000 in the United States (Kraus et al., 1996). A recent Canadian study examining both hospital-treated cases as well as those presenting to a family physician calculated the incidence of mTBI in Ontario to lie between 493/100,000 and 653/100,000, depending on whether diagnosis was made by primary care physicians or a secondary reviewer (Ryu, Feinstein, Colantonio, Streiner & Dawson, 2009).



The acute symptoms that may follow mTBI are often categorized according to the following domains: 1) physical, 2) behavioural/emotional, and 3) cognitive. Some of the more common representatives of each symptom category are presented in Table 1. Computed Axial Tomography (CAT) and conventional Magnetic Resonance Imaging (MRI) usually fail to detect evidence of structural brain abnormalities in mTBI. However, reviews of recent advances in the biomechanical modeling of mTBI in humans and animals conclude that mTBI leads to functional neuronal disruption, and at times structural damage (Bigler, 2008; Giza & Hovda, 2001; Son et al., 2000).

There are several criteria commonly used to index severity of traumatic brain injuries. One is the Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974), which assesses a patient's level of consciousness. GCS scores can range from 3 to 15; mild TBI is defined as a GCS score of 13-15, typically measured at 30 minutes post-injury or 'on admission'. Post traumatic amnesia (PTA), measured as the time from when the trauma occurred until the patient regains continuous memory, is another criteria used to define injury severity and the cut-off for mild injuries is usually placed at 24 hours or less. Finally, a loss of consciousness of less than 30 minutes has also served as an index of mild TBI (von Holst & Cassidy, 2004). However, it should be noted that mTBI can occur in the absence of any loss of consciousness. Disparities exist in the definitions used for mTBI and several organizations have created formal diagnostic criteria in order to try and overcome inconsistencies. The diagnostic criteria developed by the American Congress of Rehabilitation Medicine (ACRM) have been widely recognized and are presented in Table 2.

Table 1. Common Symptoms of mTBI
<b>Physical</b> Headache Nausea Vomiting Blurred or double vision Seeing stars or lights Balance problems Dizziness Sensitivity to light or noise Tinnitus
<b>Behavioural/Emotional</b> Drowsiness Fatigue/lethargy Irritability Depression Anxiety Sleeping more than usual Difficulty falling asleep
<b>Cognitive</b> Feeling "slowed down" Feeling "in a fog" or "dazed" Difficulty concentrating Difficulty remembering

Adapted from Willer & Leddy, 2006<sup>1</sup>

Table 2. Diagnostic Criteria for Mild Traumatic Brain Injury by the American Congress of Rehabilitation Medicine (ACRM)
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: <ul style="list-style-type: none"> <li>• Any period of loss of consciousness for up to 30 minutes</li> <li>• Any loss of memory for events immediately before or after the accident for as much as 24 hours</li> <li>• Any alteration of mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused)</li> <li>• Focal neurological deficit(s) that may or may not be transient</li> </ul>
But where the severity of the injury does not exceed the following: <ul style="list-style-type: none"> <li>• Loss of consciousness exceeding 30 minutes</li> <li>• Post-traumatic amnesia longer than 24 hours</li> <li>• A Glasgow Coma Scale (GCS) score falling below 13 after 30 minutes</li> </ul>

Adapted from McCrea, 2008 and Ruff, 2005

In most cases, patients who experience mTBI will recover fully, typically within days to months. The concern is that, as the Centre for Disease Control (CDC) notes, "up to 15% of patients diagnosed with mTBI may have experienced persistent disabling problems" (CDC, p.3). The consequences for these individuals may include reduced functional ability, heightened emotional distress, and delayed return to work or school (MAA NSW, 2008). When symptoms persist beyond the typical recovery period of three months the term post-concussion syndrome or disorder may be applied. Just as there is confusion surrounding the definition of mTBI, this is also the case with the definition of post-concussion disorder. Diagnostic criteria have been offered by the International Classification of Diseases (World Health Organization, 1992) tenth edition (ICD-10) and the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994) fourth edition (DSM-IV)<sup>2</sup>. These criteria are presented in Table 3 and require the presence of a number of the same symptoms noted to occur acutely following mTBI (Table 1).

<sup>1</sup> Adapted from Willer B, Leddy JJ. Management of concussion and post-concussion syndrome. *Current Treatment Options in Neurology*. 2006;8:415-426; with kind permission from Springer Science and Business Media.

<sup>2</sup> Note: The DSM-IV describes Postconcussional Disorder as a provisional category requiring further study.

**Table 3a. 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

**Table 3b. 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 worsening in school or academic performance dating from the trauma.
- F. The symptoms do not meet criteria for Dementia Due to Head Trauma and are not better accounted for by another mental disorder (e.g., Amnesic Disorder Due to Head Trauma, Personality Change Due to Head Trauma).

*Adapted from APA, 1994; McCrea, 2008, & WHO, 1992*

There has been debate as to whether persistent symptoms are best attributed to biological or psychological factors. It now appears that a variety of interacting neuropathological and psychological contributors both underlie and maintain postconcussive symptoms (Ryan & Warden, 2003; Wood, 2004). 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 (Gasquoin, 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).

Another area of controversy is the potential influence of related litigation and financial compensation on the presentation and outcome for persons who have sustained mTBI. 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). The focus within the health care provider-patient interaction must be upon the development of a collaborative therapeutic alliance, as it is from this vantage point that an accurate understanding of the patient's beliefs and experience of symptoms can arise, and in turn, form the basis for an appropriate treatment plan.

Directives for Use

The consequences of mTBI can result in adverse physical, behavioural/emotional and cognitive symptomatology which, in turn, can impact an individual’s activities of daily living and participation in life roles. 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. Acute assessment should include standardized assessment of Post Traumatic Amnesia (PTA) and immediate complications of traumatic brain injury such as intracranial bleeding and potential neurologic deterioration; while subsequent management of the patient should include assessment and monitoring of symptoms, education, and reassurance that the symptoms are common and generally resolve within days to weeks. Furthermore, guidance should be provided on the gradual resumption of usual activities and life roles.

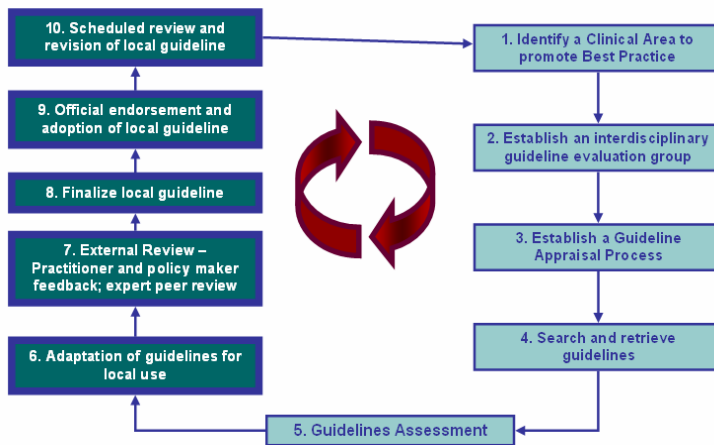
The format of this guideline is arranged so that in the first part of each of the following sections, an introduction to the topic is provided followed by a table presenting the specific recommendations to be implemented. Also, tables presenting resources (e.g., criteria for diagnosis of mTBI and post-concussion 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.

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. 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.

Table 4. Symptom Treatment Hierarchy
<b>Primary Symptoms (to be addressed early)</b> Depression/Anxiety/Irritability Sleep Disorder Post Traumatic Headache
<b>Secondary Symptoms (recommend addressed secondarily)</b> Balance Dizziness/Vertigo Cognition Impairment Fatigue Tinnitus/Noise Intolerance



## Identification of Clinical Area of Interest



**Figure 1.** Practice Guidelines Evaluation and Adaptation Cycle

*(Evidence Based Nursing, 2005;8:68-72; reproduced with permission from the BMJ Publishing Group)*

The Guidelines Adaptation Cycle process (Graham & Harrison, 2005) was used to guide the development of the current guideline. Figure 1 illustrates the elements involved in this process. In the first step, the mTBI Project Team identified there was a need for evidence-based treatment guidelines for the assessment and management of symptoms persisting after mTBI. Although some guidance for the acute care of mild injuries is available, the mTBI project team identified the specific area of persistent symptoms as a priority due to a lack of guidance for health care professionals for the assessment and management of those individuals who do not spontaneously recover.

## Establishment of the mTBI Expert Consensus Group

Following identification of the priority area, the mTBI Expert Consensus Group was formed (see Appendix A). 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. With regards to health care professions, a wide range of disciplines including emergency medicine, neurology, physical medicine and rehabilitation, radiology, psychiatry, psychology, physical therapy, and occupational therapy were represented. In addition, representatives of relevant organizations, such as the Ontario Neurotrauma Foundation (sponsoring organization), the Ontario Brain Injury Association, and the International Brain Injury Association, and 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. Also, 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. Lastly, 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 (Appendix B).

## Search and Retrieval of Existing Guidelines and New Evidence

As suggested in the Guidelines Adaptation Cycle model, the mTBI project team first searched for and reviewed existing guidelines addressing mTBI in order to identify quality recommendations that could be adapted to minimize repetition of previously completed work. A comprehensive search for existing clinical practice guidelines (CPGs) published in English or French within the last 10 years (1998-2008) that were relevant to traumatic brain injury (TBI) and that included recommendations for the care of individuals with mild injuries was undertaken. This was conducted using bibliographic databases (e.g., The Cochrane Library, National Guidelines Clearing House), MEDLINE and PsycINFO, a general web search, as well as searches of websites of relevant organizations (e.g., Canadian Medical Association, National Institute of Clinical Excellence). The following key words were used alone and in combination for both the database and Internet searches: brain injuries, head injuries, traumatic brain injury, guidelines, practice guidelines, and best practice. In addition, articles related to mTBI were reviewed for citations of CPGs addressing mTBI. Documents obtained via the search were excluded from further review if: 1) they were more than ten years old, (2) did not address mild TBI, (3) they were found to be reviews only and did not include practice recommendations, (4) they only addressed pre-hospital and/or acute care, or (5) they only addressed pediatric care. Twenty-four guideline documents were identified (Appendix F) by the search. After applying the exclusion criteria, 7 CPGs remained (see Table 5).

Table 5. Existing TBI Guidelines Evaluated in the Process of Developing the Current Guideline			
Abbreviation	Group	Guideline Title	Year
NSW	Motor Accidents Authority of NSW	Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	2008
DVBIC	Defense and Veterans Brain Injury Centre	Updated Mild Traumatic Brain Injury (mTBI) Clinical Guidance	2008
NZGG	New Zealand Guidelines Group	Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	2006
CLE	State of Colorado Department of Labor and Employment	Traumatic Brain Injury Medical Treatment Guidelines	2005
WSIB	Workplace Safety and Insurance Board of Ontario	Mild Traumatic Brain Injury Program of Care	2006
NICE	National Institute for Clinical Excellence	Head Injury: Triage, Assessment, Investigation and Early Management of Head Injury in Infants, Children and Adults	2003
CIS	Concussion in Sport Group	Summary and Agreement Statement of the 2 <sup>nd</sup> International Conference on Concussion in Sport, Prague 2004	2005

Next, an extensive search of the literature was conducted to capture all published research evaluating the effectiveness of treatments or interventions intended to either prevent or manage persistent symptoms following mTBI. The MEDLINE and PsycINFO databases were searched from 2001-2008. The decision to begin the search at 2001 was made because a comprehensive search of the mTBI literature had already been conducted up to this point (Borg et al., 2004). Specific subject headings related to acquired brain injury were used as the search terms for each database. Using the specific database's subject heading allowed for all other terms in the database's subject heading hierarchy related to persistent post-concussive symptoms and mTBI to also be included in order to broaden the search. The MEDLINE database subject headings "brain injuries", "head injuries", and "brain concussion" and the PsycINFO subject headings "brain injuries" and "traumatic brain injury" were used as search terms. In addition, the keywords "concussion", "postconcussion", "post-concussion", "mild head injury", "minor head injury", and "minor brain injury" were used as search terms for all fields. Results were included for further review if they were published in English or French and if at least 50% of the sample was composed of patients with mild injuries/persistent symptoms following mTBI or statistical analyses for studies of mixed samples were performed according to level of TBI severity. Studies examining penetrating brain injuries, birth injuries, brain damage incurred from stroke or other cerebrovascular accidents, shaken baby syndrome or moderate to severe closed head injuries that did not meet the above inclusion criteria were excluded from further review. Also, studies examining only acute symptoms (i.e., not persistent) resulting from mTBI, non-systematic review papers (i.e., narrative reviews), clinical review papers, letters to the editor and editorials without data, studies using non-human subjects, and unpublished studies or data also were not reviewed. However, the reference lists of review papers were examined to ensure all relevant literature was included.

The number of results obtained from the MEDLINE database was 9435. After screening the titles and eliminating those which did not meet criteria (e.g., animal models, pediatrics), 394 results were retained. Sixty-one results were retained after abstracts were screened for relevancy by two independent reviewers and the number of results retained after relevance was confirmed by screening full text and, thus, from which data was extracted was 36. PsychInfo yielded 8342 results but after screening titles only 105 remained and after screening abstracts only 17 remained. A review of the full-text articles for relevance did not yield any results that were judged to be consistent with the above described inclusion and exclusion criteria.

Because very few guidelines on the management of symptoms following mTBI were found, it was decided that a search for CPGs and systematic reviews addressing management of the most common persistent symptoms would also be undertaken. Although these guidelines do not include recommendations specific to managing symptoms within a mild TBI population, it was considered that they may provide some general direction on how to best treat the more common symptoms found to persist post-mTBI. The procedures used to identify these CPGs and reviews were similar to those described above. The specific symptoms that were searched for were based on the diagnostic criteria for mTBI and post-concussion disorder available from WHO, ICD-10, and DSM-IV. The MEDLINE database subject headings "headache disorders", "sleep disorders", "vision disorders", "vestibulo-cochlear nerve diseases", "delirium, dementia, amnesic, cognitive disorders", "fatigue", "mood disorders" and

“anxiety disorders” and the PsycINFO subject headings “headache”, “sleep disorders”, “vision disorders”, “vertigo”, “cognitive impairment”, “fatigue”, “affective disorders”, and “behavior disorders” were used as search terms. In addition, keywords representing common terminology for the above symptom categories were used as search terms for all fields as well as search terms for the bibliographic databases, general web, and websites of relevant organizations search. The criteria for including particular CPGs from outside of the TBI literature for review were: 1) they were recently published (within the last 5 years), (2) they were supported by a Canadian or national organization, and (3) they addressed symptoms found to commonly persist following mTBI. The categories of symptoms for which CPGs from outside of the TBI field were identified and from which recommendations were extracted (with the number identified in brackets) were cognitive dysfunction (1), fatigue (1), mood disorders (4), and sleep disorders (4).

## Assessment of Existing Guidelines

Each TBI CPG that was retained (see Table 5) was independently evaluated using the Appraisal of Guidelines for Research and Evaluation (AGREE; <http://www.agreecollaboration.org/instrument/>) instrument by at least four individuals from the expert consensus group. The AGREE instrument assesses the quality of a CPG across 6 domains: (1) Scope and purpose, (2) Stakeholder involvement, (3) Rigour of development, (4) Clarity of presentation, (5) Applicability, and (6) Editorial independence. Each guideline was given a standardized score ranging from 1-100 (100 representing a strong score) by the reviewing expert.

The Motor Accidents Authority of NSW, New Zealand Guidelines Group, and National Institute of Clinical Excellence CPGs consistently scored well across the various domains. One of the most important domains evaluated using the AGREE tool is Rigour of Development, which evaluates characteristics such as whether systematic methods were used in the development process, the explicit link between recommendations and the supporting evidence, whether external review has taken place, etc. The scores obtained on this domain by the CPGs reviewed are presented in Figure 2.

Because the AGREE instrument does not evaluate the clinical content of the recommendations made by each guideline, recommendations and their levels of evidence were extracted and organized in a spreadsheet according to common categories. The spreadsheet was created to simplify comparison of the specific recommendations on the same topic made by each existing guideline in terms of content and the level of evidence.

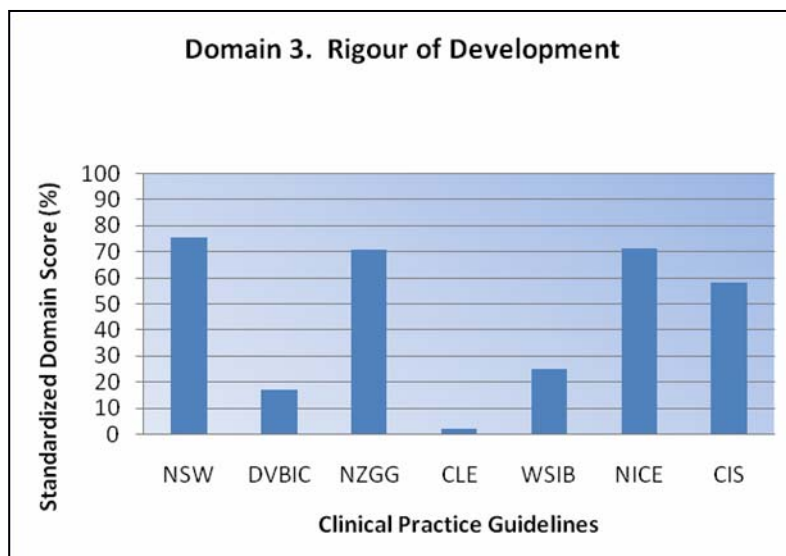


Figure 2. AGREE Ratings for Rigour of Development Domain

## Adaptation of Existing Recommendations and Development of Novel Recommendations

The expert consensus group convened at a conference that was held over the course of two days in November 2008 in Toronto, Ontario. Presentations about the methodological factors critical to the development of evidence-based best practice care, AGREE instrument scores, results of the systematic reviews of the literature, and the summary of recommendations and levels of evidence extracted from existing guidelines were delivered. In addition, the topics of definition, prognosis, and risk factors were also discussed.

The consensus group members broke out into three smaller groups; each given specific categories of recommendations suitable to their area of expertise to review. The groups worked to adapt quality recommendations extracted from existing guidelines. Recommendations were either adopted with the original wording or revised based on current evidence/consensus. New recommendations were also generated by consensus based on current research and clinical expertise in areas of practice for which no recommendations were available.

All of the recommendations that had been adapted/generated by the working groups were compiled and presented. Everyone then participated in a plenary session to arrive at a consensus on the final recommendations.

For the final exercise of the conference, 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. After the conference, 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. 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.

After identifying the recommendations to retain for the guideline, the Project Team reviewed them and modified the phrasing of many of the recommendations in order to achieve standardized terminology or to clarify the intent of the specific recommendations. Care was taken not to alter the meaning of the recommendations that had been adapted from existing guidelines. Additional recommendations made by the expert consensus group that went beyond the original context have been referenced with the appropriate level 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 in Table 6.

Table 6. 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

A draft of the guideline was circulated to recognized experts in the field and stakeholders (see Appendix A) 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.

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# GUIDELINES

## 1. DIAGNOSIS/ASSESSMENT OF mTBI

Diagnosis of mild TBI (Table 2) is the first critical step in successful management. Patients may present to the Emergency Department or Health Care Provider's office following trauma and may be unaware that they have sustained mTBI. A high level of suspicion is required particularly when there is evidence of direct trauma to the head or mechanism of injury that is frequently associated with mTBI such as motor vehicle collision. Patients may in fact present in a post traumatic amnesic state (PTA) where they may have a GCS score of 15/15, however, they may be variably oriented and not able to form continuous memories. Formal evaluation with a standardized tool is often key to documenting confusion or disorientation particularly when a patient is denying or minimizing symptoms. The initial purpose of establishing the diagnosis of mTBI is to monitor for and rule out acute, life threatening complications such as intracranial hemorrhage, as well as prepare the patient and family for possible subsequent delayed complications by providing both verbal and written information.

Although acute complications of mTBI remain the priority concern, the reality is that the vast majority of patients will not experience these complications. However, the majority of patients will be symptomatic acutely post mTBI and education about anticipated symptoms and duration is a key component to assisting patients in recovery. Provision of information regarding mTBI symptoms as well as instructions for follow up have been shown to be one of the more effective strategies in preventing the development of persistent symptoms post mild TBI. Regular follow up by the family physician can monitor progress and assure that patient symptoms are dealt with promptly and arrangements for specialty referral can be made if indicated. In both the initial assessment and follow up period, the Health Care Provider should attempt to explore and document risk factors (Table 7) that may potentially delay recovery following mTBI and consider closer monitoring of recovery or an acceleration of intervention strategies.

**Table 7. Risk Factors Influencing Recovery Post mTBI**

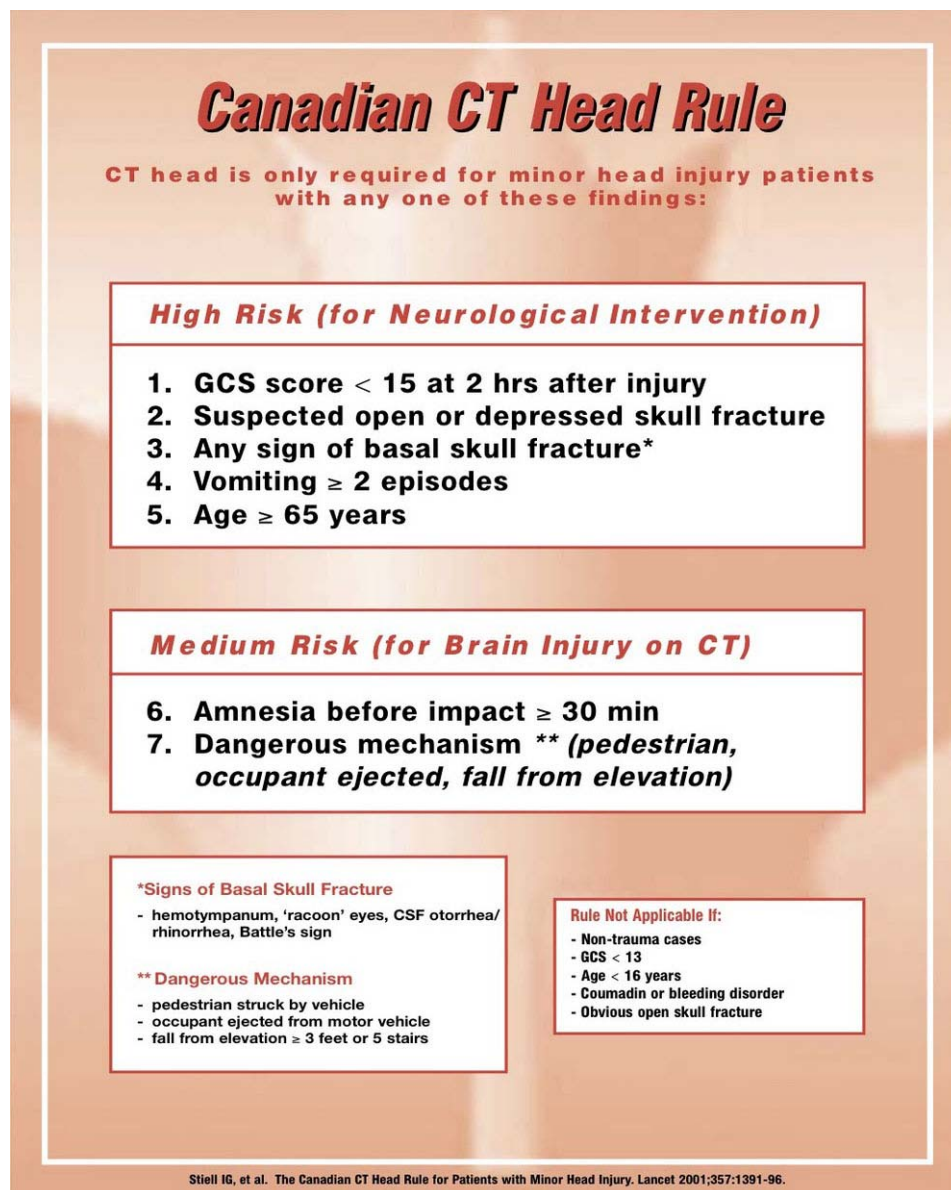
<b>Medical Factors (red flags):</b> Pre-existing medical conditions or post injury symptoms that are associated with poor outcomes post mTBI	<ul style="list-style-type: none"> <li>• Post-traumatic amnesia (PTA)</li> <li>• History of previous traumatic brain injury</li> <li>• History of previous physical limitations</li> <li>• History of previous neurological or psychiatric problems</li> <li>• High number of symptoms reported early after injury</li> <li>• Skull fracture</li> <li>• Early onset of pain and in particular headache within 24 hours after injury</li> <li>• Reduced balance or dizziness during acute stage</li> <li>• Confounding effects of other health related issues, e.g., pain medications, disabling effects of associated injuries, emotional distress</li> <li>• Presence of nausea after injury</li> <li>• Presence of memory problems after injury</li> </ul>
<b>Contextual Factors (yellow flags):</b> Personal, psychosocial, or environmental factors that may negatively influence recovery post mTBI	<ul style="list-style-type: none"> <li>• Injury sustained in a motor vehicle accident</li> <li>• The potential influence of secondary gain issues related to litigation and compensation</li> <li>• Not returning to work or significant delays in returning to work following the injury</li> <li>• Being a student</li> <li>• Presence of life stressors at the time of the injury</li> <li>• Higher levels of symptom reporting is associated with mood symptoms and heightened self awareness of deficits</li> <li>• Older age</li> <li>• Lack of social supports</li> <li>• Less education/lower social economic status</li> </ul>

*Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following a Closed Head Injury (MAA NSW, 2008)*

GENERAL RECOMMENDATIONS FOR DIAGNOSIS/ASSESSMENT OF mTBI		
RECOMMENDATION		GRADE
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. <sup>1</sup>	A
1.2	Diagnosis of mTBI should be performed through a combined assessment of clinical factors and symptoms. <sup>1</sup>	A
1.3	Standardized measurement of post traumatic amnesia should be routinely performed to assist with the monitoring, diagnosis, early management and prognosis of patients who have experienced mTBI. The Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS; see Appendix 1.1) is a standardized tool that can be used to monitor post traumatic amnesia. <sup>1</sup>	A
1.4	Medical assessment should include screening for health and contextual factors (flags) to identify patients for increased risk of persistent symptoms and urgent complications, such as subdural hematoma. Refer to Table 7 outlining health factors and contextual risk factors (flags). <sup>1</sup>	B
<b>Resources</b> 1. The Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS) is a standardized tool that can be used to evaluate post traumatic amnesia. This tool has the advantage of being used with non-English speaking patients - Appendix 1.1 2. Risk Factors Influencing Recovery post mTBI - Table 7		

RECOMMENDATIONS FOR EMERGENCY DEPARTMENT CLINICIANS		
RECOMMENDATION		GRADE
1.5	Hourly clinical observation should occur until at least four hours post injury. If the patient meets recommended discharge criteria at four hours post time of injury, they should be considered for discharge. <sup>2</sup>	C
1.6	At four hours post injury, if the patient has a Glasgow Coma Scale score of 15, is clinically improving and has a normal CT scan or there is no indication for CT based on the Canadian CT Head Rule (Figure 3) but their A-WPTAS score is < 18, then clinical judgment is required to determine whether the patient should be discharged home before a normal score for this measure is obtained. <sup>1</sup>	C
1.7	If CT is not indicated on the basis of history and examination the clinician may conclude that the risk to the patient is low enough to warrant discharge to own care or to home, as long as no other factors that would warrant a hospital admission are present (for example, drug or alcohol intoxication, other injuries, shock, suspected nonaccidental injury, meningism, cerebrospinal fluid leak) and there are appropriate support structures for safe discharge and for subsequent care (for example, competent supervision at home).	C
1.8	All patients with any degree of brain injury who are deemed safe for appropriate discharge from an emergency department or the observation ward should receive verbal advice and a written brain injury advice card (see Appendix 1.2). The details of the card should be discussed with the patient and their care providers. When necessary, communication in languages other than English or by other means should be used to communicate the information.	C
1.9	If the patient re-presents to the emergency department with symptoms related to the initial injury, the following should be conducted: <ul style="list-style-type: none"> <li>- Full re-assessment</li> <li>- A-WPTAS assessment</li> <li>- CT scan, if indicated,</li> <li>- Emphasis and encouragement to the patients to attend their family physician for follow-up after discharge.<sup>1</sup></li> </ul>	C
<b>Resources</b> 1. Brain Injury Advice Card (Long and Short Versions) - Appendix 1.2 2. Canadian CT Head Rule - Figure 3 3. Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS) - Appendix 1.1		

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)  
<sup>2</sup> Taken from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)



**Figure 3. Canadian CT Head Rule**  
(reproduced with permission)

RECOMMENDATIONS FOR HEALTH CARE PROVIDERS		
RECOMMENDATION		GRADE
1.10	On presentation, the Health Care Provider should conduct a comprehensive review of every patient who has sustained mTBI. The assessment should include taking a history, examination, cognitive screen, post concussive symptom assessment and review of mental health. <sup>1</sup>	A
1.11	An appraisal of the severity and impact of post concussive symptoms should be made. A standardized tool such as the Rivermead Post Concussion Symptoms Questionnaire (see Appendix 1.3) can aid in this.	C
1.12	The clinician should consider that one type of symptom an individual who has sustained a mTBI is likely to experience is reduced cognitive functioning post injury which may resolve in a few days or continue for months before resolving, and can include problems with recall of material, speed of information processing, concentration and attention. <sup>1</sup>	A
Resources		
1. Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3		

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)

## 2. MANAGEMENT OF mTBI

### General Recommendations for the Management of mTBI

Whether a patient first presents to the Emergency Department or to the Health Care Provider's office, ruling out injury that requires emergency intervention is the initial priority. However, the majority of patients will be discharged home. Acutely following injury it is essential that a management plan be initiated for each patient that includes information regarding monitoring for potential acute complications requiring reassessment, education regarding expected symptoms and course of recovery (see following section) and recommendations for health care follow up post mTBI. Pre-injury or current psychiatric difficulties, such as depression or anxiety, may place a patient at increased risk for persistence of symptoms. Referral to specialist services and/or multidisciplinary treatment may be required early on for these patients (Ghaffar, McCullagh, Ouchterlony & Feinstein, 2006). By applying the strategies outlined above consistently, both the acute and chronic complications of mTBI can be mitigated.

GENERAL RECOMMENDATIONS FOR THE MANAGEMENT OF mTBI		
RECOMMENDATION		GRADE
2.1	Because a variety of factors, including biopsychosocial, contextual, and temporal preinjury, injury and postinjury factors can impact on the outcomes of patients who have sustained mTBI, clinicians should consider these factors when planning and implementing the management of patients. <sup>1</sup>	A
2.2	Minor problems should be managed symptomatically and the person should be offered reassurance and information on symptom management strategies.	C
2.3	All people who have sustained a possible or definite mTBI should receive information about common symptoms and reassurance that recovery over a short period of time (days to a few weeks) is anticipated.	B
2.4	A person who sustains mTBI should not drive for at least 24 hours and may require medical re-assessment. An extension of the recommended 24 hour time period is advised if there are symptoms or complications that result in loss of good judgment, decreased intellectual capacity (including slowed thinking), post traumatic seizures, visual impairment or loss of motor skills. If there are complications, a medical assessment is required before an individual returns to driving. <sup>1</sup>	C
2.5	Symptomatic patients should be followed every two to four weeks from the time of initial contact until no longer symptomatic or until another re-assessment procedure has been put in place.	C
2.6	A patient experiencing reduced cognitive functioning in the first few days following injury, with education and support, should be expected, in the majority of cases, to have these symptoms resolve and preinjury cognitive functioning return within days, up to three months. However, for patients who have 1) comorbidities or identified health or contextual risk factors (Table 7) and do not improve by one month, or 2) persistent symptoms at 3 months, it is recommended that these patients be referred for more comprehensive evaluation to a specialized brain injury environment (see Appendix 2.1). <sup>1</sup>	A
2.7	Patients with preinjury psychiatric difficulties should be provided with multidisciplinary treatment.	A
<b>Resources</b> 1. Risk Factors Influencing Recovery post mTBI - Table 7 2. List of Specialized Brain Injury Clinics/Centres in Ontario - Appendix 2.1		

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)



RECOMMENDATIONS FOR PRIMARY CARE PROVIDERS		
RECOMMENDATION		GRADE
2.8	Management of patients who have had mTBI by primary care providers should involve guidance on strategies to minimize the impact of symptoms and to gradually resume activity and participation in life roles. <sup>1</sup>	A
2.9	The primary care provider should consider referral of a patient who has had mTBI to specialist services when symptoms and concerns persist and fail to respond to standard treatments for any of the three spheres of Physical, Behavioural/Emotional and Cognitive Symptoms. <sup>1</sup>	C
2.10	The primary care provider should consider the risk of depression or other mental health disorders in patients who have experienced mTBI and that the emergence and maintenance of symptoms may be influenced by maladaptive psychological responses to the injury.	B

## Providing Education After mTBI

Although research on interventions delivered post-mTBI is scant, there is consistent evidence to support the effectiveness of patient education interventions (Borg et al., 2004; Comper et al., 2005). Several studies have demonstrated that providing brief, single session education-oriented treatment is superior to standard procedures (Alves et al., 1993; Mittenberg et al., 1996; Wade et al., 1997, 1998) and even as effective as more intensive interventions (e.g., Paniak et al., 1998; Paniak et al., 2000). There is also evidence to support that reassurance, in addition to education about symptoms, is more effective for lowering risk of persistent symptoms than education alone (Alves et al., 1993). In addition to providing verbal information and reassurance to patients it is also advised that written patient information sheets are delivered as well (Ponsford et al., 2002).

RECOMMENDATIONS FOR PROVIDING EDUCATION		
RECOMMENDATION		GRADE
2.11	Education about symptoms, including an advice card (Appendix 1.2), and reassurance should be provided to all patients who have experienced mTBI. Education should ideally be delivered at the time of initial assessment or minimally within one week of injury/first assessment.	A
2.12	Elements that can be included in the education session are: 1) information about common symptoms, 2) reassurance that it is normal to experience some symptoms and that a positive outcome is expected, 3) typical time (allowing for individual differences) and course of recovery, 4) advice about how to manage or cope with symptoms, 5) advice about gradual reintegration to regular activities, 6) information on how to access further support if needed, 7) advice on stress management.	C
Resources		
1. Brain Injury Advice Card (Long and Short versions) - Appendix 1.2		

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)

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### 3. SPORT-RELATED mTBI

In the sports literature, the effects of traumatic biomechanical forces on the brain have traditionally been referred to as a concussion. **In this guideline, the terms concussion and mTBI are considered to be interchangeable.** Sport-related injury is an important cause of mTBI and the subject of recent investigations into the nature of mTBI (McCrea, 2008). Such injuries tend to lie on the milder end of the mTBI spectrum and are less often associated with concurrent extracranial injuries. They typically occur in a population with unique characteristics: individuals tend to be younger, healthy, highly motivated, and are often anticipating the blow or impact. As a consequence, differences in outcome have been noted with only a minority of individuals (1-3%) experiencing persistent symptoms in contrast to higher estimates (10-15%) among the broad range of mTBI patients of varying etiologies.

It is estimated that contact sport results in 300,000 mTBIs every year in the United States (Canadian Academy of Sport Medicine (CASM) Concussion Committee, 2000). Diagnosis of sport-related mTBI should include assessment of several different domains such as clinical symptoms, physical signs, behaviour, balance, sleep and cognition (McCrory et al., 2009). If a player shows any of the signs or symptoms of a concussion/mTBI outlined in Table 8, mTBI should be suspected and appropriate management initiated. Once a medical evaluation has been conducted and any necessary first aid measures implemented, an assessment of mTBI symptoms should be done. The Concussion in Sport Group has created a revised Sports Concussion Assessment Tool (SCAT2 and Pocket SCAT2; McCrory et al., 2009) to aid with this; these tools can be used during sideline evaluation and are presented in Appendix 3.1 and Appendix 3.2 and also include information that can be given to the athlete.

**Table 8. Signs of Possible Sport-Related mTBI**

- Loss of/impaired consciousness
- Any seizure
- Amnesia: unaware of period, opposition, score of game; or unaware of time, date, place
- Headache
- Nausea/vomiting
- Unsteadiness/loss of balance and/or poor coordination
- Dizziness
- Feeling stunned or 'dazed'
- Seeing stars or flashing lights
- Ringing in the ears
- Double vision
- Vacant stare/glassy eyed
- Slurred speech
- Inappropriate playing behaviour - for example, running in the wrong direction
- Appreciably decreased play ability
- Confusion, such as being slow to answer questions or follow directions
- Easily distracted, poor concentration
- Other symptoms, such as sleepiness, sleep disturbance and a subjective feeling of slowness and fatigue in the setting of an impact
- Displaying unusual or inappropriate emotions, such as laughing or crying
- Personality changes

*Adapted from the New Zealand Guidelines Group Guideline 'Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation' (NZGG, 2006)*

Experts unanimously agree that any player suspected of having experienced mTBI should not be allowed to return to play in the same game/day of play. Another point of consensus in the management of sport-related mTBI is that physical and cognitive rest should be followed until symptoms resolve (McCrory et al., 2009). Once symptoms have appeared to remit, a graded return to play strategy should be followed; see Recommendation 3.4 and Appendix 3.3 for information on guiding this step-wise process. If any symptoms occur during the stepwise return to play, the athlete should return to the last step that could be completed while asymptomatic and then an attempt to progress to the next level can be made after 24 hours.

It should be noted that sport-related injuries represent one area of study in the mTBI field that has received substantial focus and multiple attempts to develop treatment guidance. Because the current guideline is not specific to sports-related injuries, the information and guidance included herein is limited. Thus, it is recommended that those readers interested in more thorough guidance on the assessment and management of this specific patient group consult the latest Consensus Statement on Concussion in Sport: the Third International Conference on Concussion in Sport held in Zurich, November 2008 (McCrory et al., 2009). As discussed above, differences exist between the nature of injuries incurred due to sport compared with other types of injuries and research regarding how these guidelines apply to non-sport-related mTBI has not been done. Therefore, the application of clinical guidance for sport-related mTBI may not be appropriate for patients who sustained other types of injuries.

RECOMMENDATIONS FOR ASSESSMENT AND MANAGEMENT OF SPORT-RELATED mTBI*		
RECOMMENDATION		GRADE
3.1	Patients with sport-related mTBI may present acutely or sub-acutely. If any one of the signs/symptoms outlined in Table 8 are observed at any point following a blow to or jarring of the head, mTBI should be suspected and appropriate management instituted.	C
3.2	When a player shows any symptoms or signs of mTBI: <ul style="list-style-type: none"> <li>- the player should not be allowed to return to play in the current game or practice</li> <li>- the player should not be left alone and should be regularly monitored for deterioration</li> <li>- the player should receive a medical evaluation including evaluation of reported complaints [e.g., somatic symptoms (Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3), balance, and cognition]</li> <li>- return to play must follow a medically supervised stepwise process</li> <li>- a player should not be returned to play until asymptomatic at rest and with exertion.</li> </ul>	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Sport Concussion Assessment Tool (SCAT2) - Appendix 3.1</li> <li>2. Pocket-Sport Concussion Assessment Tool (Pocket-Scat2) - Appendix 3.2</li> <li>3. Signs of Possible Sport-related mTBI - Table 8</li> <li>4. Consensus Statement on Concussion in Sport: the Third International Conference on Concussion in Sport held in Zurich, November 2008 (McCrory et al., 2009)</li> </ol>		

RECOMMENDATIONS FOR RETURN TO PLAY DECISIONS		
RECOMMENDATION		GRADE
3.3	A player should never return to play while symptomatic. "If in doubt, sit them out".	C
3.4	Return to play after mTBI should follow a stepwise process, proceeding to the next level only if asymptomatic. If any symptoms occur after mTBI, the person should revert to the previous asymptomatic level and try to progress again after 24 hours. <ol style="list-style-type: none"> <li>1. No activity. When asymptomatic, proceed to level 2.</li> <li>2. Light aerobic exercise such as walking or stationary cycling, no resistance training.</li> <li>3. Sport-specific training (e.g., skating in hockey, running in soccer).</li> <li>4. Non-contact training drills.</li> <li>5. Full contact training after medical clearance.</li> <li>6. Game play.</li> </ol> See the "Safe Steps to Return to Play After a Possible Traumatic Brain Injury: algorithm from the NZGG guideline (Appendix 3.3).	C
3.5	An additional consideration on return to play is that athletes who have experienced mTBI should not only be symptom free but also should not be taking any pharmacological agents/medications that may affect or modify the symptoms of concussion.	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Safe Steps to Return to Play After a Possible Traumatic Brain Injury algorithm from the NZGG guideline - Appendix 3.3</li> </ol>		

\* Please keep in mind that the guideline recommendations were developed for and are appropriate for use with adults ( $\geq 18$  years) who have experienced mTBI.

## References

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## 4. GENERAL RECOMMENDATIONS REGARDING DIAGNOSIS/ASSESSMENT OF PERSISTENT SYMPTOMS FOLLOWING mTBI

While full recovery is expected within 3 months (King, 1997, Van der Naalt, 2001) after mTBI or concussion, not all patients experience such rapid recovery. A number of factors will influence the rate of recovery such as the mechanism and setting for the initial injury, where only 1-3% of sport related mTBI may have persistent symptoms in contrast with up to 10 to 15% following mTBI in other settings. Other potential risk factors (Table 7) may signal the need to monitor patient recovery more closely, since these individuals are at higher risk for persistent symptoms and poorer outcome. Our protocol recommends that for persons with persistent symptoms at 1 month post-injury, referral for specialized assessment may be indicated.

**Table 9. Differential Diagnoses Related to mTBI**

<ul style="list-style-type: none"> <li>• Major Depressive Disorder</li> <li>• Generalized Anxiety Disorder</li> <li>• Post Traumatic Stress Disorder (PTSD)</li> <li>• Chronic Pain Syndrome</li> <li>• Cervical Strain/Whiplash Associated Disorder</li> <li>• Substance Abuse or Polypharmacy</li> <li>• Somatoform Disorder/Factitious Disorder</li> <li>• Malingering</li> <li>• Post Traumatic Headache</li> <li>• Fibromyalgia syndrome (secondary)</li> <li>• Primary Sleep Disorder: e.g., Obstructive Sleep Apnea</li> </ul>
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The assessment and monitoring of symptoms following mTBI may be facilitated using the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3). Although formal diagnosis of Postconcussional disorder (Table 3) is not made until 3 months post-injury, the primary emphasis remains on identifying and managing symptoms to prevent potential delay in recovery. There is controversy regarding the diagnosis of Post Concussion Syndrome since there is significant symptom overlap with other diagnoses that can result as a consequence of a traumatic experience including depression, anxiety, post traumatic stress disorder as

well as the sequelae of pain related to post traumatic headache or whiplash associated disorder (Table 9, Appendix 4.1). The key approach supported by the Expert Consensus team is that regardless of formal diagnosis (e.g., post concussion disorder versus depression), symptoms following mTBI have the potential to cause functional limitations and need to be addressed in a coordinated and directed fashion to assist recovery. 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		GRADE
4.1	Clinicians should assess and monitor persisting somatic, cognitive and emotional/behavioural symptoms following mTBI. <sup>1</sup>	A
4.2	A standardized scale, such as the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3), should be used to monitor symptoms. <sup>1</sup>	C
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 (see Table 9 and Appendix 4.1).	C

#### Resources

1. Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3
2. List of potential differential diagnoses - Table 9
3. ICD-10 definitions of each differential diagnosis mentioned in above list - Appendix 4.1

## References

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Van der Naalt J. Prediction of outcome in mild to moderate head injury: A review. *Journal of Clinical and Experimental Neuropsychology*. 2001;23:837-851.

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)

## 5. GENERAL RECOMMENDATIONS REGARDING MANAGEMENT OF PERSISTENT SYMPTOMS FOLLOWING mTBI

Consistent with general expectations of both patients and health care personnel, symptoms following mTBI are anticipated to resolve in a timely fashion in the large majority (85-90%) of cases. The use of early education regarding mTBI has been shown to be effective at reducing associated morbidity. However, these guidelines have been developed to assist in managing those individuals who may continue to have persistent symptoms or delayed recovery following mTBI.

Unlike sport related mTBI where recovery rates from symptoms post mTBI have been shown to be very high, mTBI due to other causes such as falls, assault or motor vehicle collisions have a higher likelihood of persistent symptoms. This may be related to increased risk factors for poorer recovery among the latter individuals when compared to athletes or to differences in the traumatic experience itself, where the trauma is often unexpected, emotionally charged, or associated with multiple or even life threatening injuries.

While providing education and reassurance that symptoms are expected to recover following mTBI, this must be balanced with careful monitoring for those who do not follow the anticipated pattern of recovery. For those who have had complete symptom resolution, no intervention apart from the provision of injury prevention strategies is required. However, for those with persistent symptoms or decline in function, emphasis needs to be placed on regular monitoring and identification of potentially treatable symptoms. Timely intervention for symptoms often should be initiated as well as consideration for referral to specialist care if available. Development of complications post mTBI such as depression, possibly as a response to the effects of mTBI, can occur and further alter the course or pattern of recovery.

The Diagnosis of Post Concussion Syndrome (Table 3) is based on a constellation of symptoms commonly experienced following mTBI. These symptoms are not specific to mTBI, however, and show substantial overlap with other conditions such as depression, pain and chronic fatigue. Symptoms associated with Post Concussion Syndrome are also common in normal populations (Iverson, 2003). Nonetheless, patients are often functionally affected by these symptoms which clearly need to be addressed. This guideline has been designed to highlight a symptomatic approach to management of persistent symptoms following mTBI. By addressing symptoms in a coordinated manner, improvement in outcome can be achieved.

GENERAL RECOMMENDATIONS REGARDING MANAGEMENT OF PERSISTENT SYMPTOMS		
RECOMMENDATION		GRADE
5.1	Patients should be advised that they are likely to experience one or more persistent symptoms as a consequence of the mTBI for a short period and that this is expected (normal). <sup>1</sup>	A
5.2	The patient should be advised that a full recovery of symptoms is expected. <sup>2</sup>	A
5.3	Where there are prolonged and significant complaints after mTBI, Primary Care Providers should rule out other contributing or confounding factors (see Table 7). <sup>1</sup>	A
5.4	Persons with mTBI and pre-injury mental health conditions, or any other health or contextual risk factors, should be considered for early referral to a multidisciplinary treatment clinic capable of managing post concussive symptoms because these factors have been associated with poorer outcomes.	C
<b>Resources</b> 1. Risk Factors Influencing Recovery post mTBI - Table 7 2. List of Specialized Brain Injury Clinics/Centres in Ontario - Appendix 2.1		

### References

Iverson GL, Lange RT. Examination of "Postconcussion-Like" symptoms in a healthy sample. *Applied Neuropsychology*. 2003;10:137-144.

<sup>1</sup> Adapted from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)

<sup>2</sup> Taken from the Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury (MAA NSW, 2008)

## 6. POST-TRAUMATIC HEADACHE

Headache is a very common symptom following mTBI with estimates ranging between 30-90% of patients who suffer from headaches (Bazarian, Wong & Harris, 1999). Notably, several researchers have noted that post-traumatic headache is more common after mild TBI than after severe TBI (Bazarian, Wong & Harris, 1999; Cartlidge & Shaw, 1981; Evans, 1994; Hass, 1996; Jensen & Nielsen, 1990; Keidel & Ramadan, 2000; Minderhoud, Boelens, Huizenga & Saan, 1980; Packard, 1994; Yamaguchi, 1992). Post-traumatic headache has been noted to be associated with a high degree of disability (Gladstone, 2009). The International Classification of Headache Disorders (ICHD-II; Headache Classification Subcommittee of the International Headache Society, 2004) includes diagnostic criteria for both acute (Appendix 6.1) and chronic post-traumatic headache following mTBI (Appendix 6.2).

The management of persistent post-traumatic headache can often be difficult as there is a paucity of research in the area and there are no evidence-based treatment guidelines available. Accordingly, the management of post-traumatic headache is based upon clinical experience and expert opinion. As such, the typical strategy utilized by headache specialists is (i) to recommend implementation of basic lifestyle strategies to try to mitigate headache occurrence and (ii) to determine the primary headache disorder that most closely resembles the patient's symptoms and then implement treatment strategies aimed at treating that headache subtype (Baandrup & Jensen, 2005). In line with this, guidance on determining what primary headache type a patient's symptoms resemble is provided in Appendix 6.3 and individual treatment algorithms for these classes of primary headache can be found in Appendices 6.7-6.9. A systematic review of the literature reported that tension-type headache and migraine headaches were the most common phenotypes reported followed by unclassified, other, and mixed headaches (Lew et al., 2006). More investigators have reported post-traumatic headache symptoms resembling chronic tension-type headache for most individuals (Baandrup & Jensen, 2005; Bettucci et al., 1998; Haas, 1996; Radanov, Di Stefano & Augustiny, 2001) but some investigators have found migraine to be the most common phenotype (Bekkelund & Salvesen, 2003; Weiss, Stern & Goldberg, 1991). Also headaches resembling chronic tension-type headache may coexist with episodic migraine or migraine headache (Baandrup & Jensen, 2005).

Unfortunately, too frequent use of acute headache medications is a common potential problem in many individuals suffering from persistent post-traumatic headaches (Baandrup & Jensen, 2005; Haas, 1996). It is well known that too frequent use of analgesics/acute headache medications can, in some, exacerbate, perpetuate and chronify headaches via the phenomenon of medication overuse ("rebound") headache. Accordingly, it is important to accurately ascertain the frequency and quantity of the patient's acute headache medication use. It can be very challenging to determine whether an individual's persistent post-traumatic headaches are secondary to the severity of their post-traumatic headache disorder or whether they are secondary to medication overuse (rebound) headache. In order to try to determine whether the individual's headaches may be perpetuated by the medication overuse (rebound), it is important to ascertain at what point too frequent use of analgesics/acute headache medications was initiated, to establish whether adequate attempts have been made to withdraw from the potentially-offending medications and, if not, to withdraw the individual from the offending medication(s) for a 6-8 week period (Gladstone, 2009). The ICHD-II criteria for Medication Overuse in Headache is presented in Appendix 6.4.

ASSESSMENT OF POST TRAUMATIC HEADACHE		
RECOMMENDATION		GRADE
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. To aid in determining the specific phenotype of headache disorder present, refer to the ICHD-II classification criteria in Appendix 6.3. Refer to the advice regarding assessment of post-traumatic headache provided in Appendix 6.6.	C
6.2	Perform a neurologic exam and musculoskeletal exam including cervical spine examination (refer to Appendix 6.5).	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Diagnostic criteria from the International Classification of Headache Disorders (ICHD-II) for acute post-traumatic headache following mild head injury - Appendix 6.1</li> <li>2. Diagnostic criteria provided from the International Classification of Headache Disorders (ICHD-II) for chronic post-traumatic headache following mild head injury - Appendix 6.2</li> <li>3. Diagnostic Criteria for Selected Primary Headache Types from the International Classification of Headache Disorders (ICHD-II) - Appendix 6.3</li> <li>4. Diagnostic Criteria from the International Classification of Headache Disorders (ICHD-II) for medication overuse headache - Appendix 6.4</li> <li>5. Important components to include in the neurological and musculoskeletal exam - Appendix 6.5</li> <li>6. Advice on the Assessment and Management of Post-Traumatic Headache - Appendix 6.6</li> </ol>		

MANAGEMENT OF POST-TRAUMATIC HEADACHE		
RECOMMENDATION		GRADE
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 ICSI guideline (see Appendix 6.7-6.9) for treatment guidance. Refer to the advice regarding management of post-traumatic headache in Appendix 6.6.	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Guidance on treatment according to what primary headache type the post-traumatic headache most closely resembles: Treatment algorithms from the Institute for Clinical Systems Improvement (ICSI) Health Care Guideline: Diagnosis and Treatment of Headache - Appendices 6.7-6.9</li> <li>2. Information on diagnosis and management of occipital neuralgia headache - Appendix 6.10</li> </ol>		

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## 7. PERSISTENT SLEEP DISTURBANCES

A recent review on sleep disturbance associated with TBI noted the contradiction that although sleep disturbance is one of the most common symptoms following TBI, it is the least studied of the sequelae (Orff, Ayalon & Drummond, 2009). In their review of the literature, the authors found that sleep disturbance is most common following mild TBI, not severe TBI. Insomnia is the most common form of sleep disturbance following TBI characterized by problems with sleep initiation and/or sleep maintenance (Ouellet, Beaulieu-Bonneau & Morin, 2006). Research has shown that insomnia in this group leads to increases in daytime sleepiness and fatigue. Although the research shows a discrepancy between subjective sleep complaints and objective evidence of sleep disturbance, this is a common finding in the insomnia literature in general and the largest studies on the topic do report finding objective evidence of sleep disturbance following mTBI (Orff, Ayalon & Drummond, 2009). For example, Schreiber and colleagues (2008) found a group of post-acute mTBI patients spent a longer proportion of time in the light sleep phase and had a much shorter proportion of REM sleep as well as a significantly lower total sleep time compared with a control group using polysomnography. Furthermore, mTBI patients exhibited a prominent daytime tendency to fall asleep compared with controls based on results of a multiple sleep latency test.

Recent work by Ayalon and colleagues (2007) suggests that aside from insomnia patients may experience circadian rhythm sleep disorders, specifically delayed sleep phase syndrome and irregular sleep-wake pattern, following mTBI. The authors observed these circadian rhythm disorders to be associated with altered patterns of melatonin secretion and body temperature. Although these results are consistent with the findings of other studies employing mixed TBI samples, still others have found no evidence of circadian rhythm disorders so clear conclusions cannot be drawn at this point (Orff, Ayalon & Drummond, 2009).

Patients experiencing sleep disturbance after mTBI commonly find these symptoms to interfere with mood, mental capacities, social or leisure activities, or principal occupation (Ouellet, Beaulieu-Bonneau & Morin, 2006) and it has been suggested that sleep disturbance among this population may be associated with impairment on neuropsychological testing (Orff, Ayalon & Drummond, 2009). As is the case with many persistent symptoms following mTBI, it could be the case that sleep disturbances are secondary to other symptoms such as depression or anxiety (Steele, Ponsford, Rajaratnam & Redman, 2006; Parcell, Ponsford, Redman & Rajaratnam, 2008). Management strategies should take this potential interaction of symptoms into account. Treatment of sleep disorders within the mTBI population has taken the form of both non-pharmacologic and pharmacologic methods.

MANAGEMENT OF PERSISTENT SLEEP DISTURBANCES		
RECOMMENDATION		GRADE
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.	C
7.2	Provide the sleep hygiene advice included in Appendix 7.1.	C
7.3	Relaxation training is effective and recommended therapy in the treatment of chronic insomnia.	C
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. Refer to the Therapeutic Options Table taken from the Alberta TOP guideline. See Appendix 7.2 for suggestions on useful medications.	C
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. See Appendix 7.3 for advice on achieving sleep consolidation.	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. A sleep hygiene guide for patients and sleep diary developed by the British Columbia Guidelines and Protocols Advisory Committee (<a href="http://www.bcguidelines.ca/gpac/pdf/sleepcomp.pdf">http://www.bcguidelines.ca/gpac/pdf/sleepcomp.pdf</a>) - Appendix 7.1</li> <li>2. Suggestions on medications useful for treatment of insomnia: Therapeutic Options table from the Alberta TOP Clinical Practice Guideline for Adult Primary Insomnia: Diagnosis to Management (<a href="http://www.topalbertadoctors.org/informed_practice/clinical_practice_guidelines/complete%20set/Insomnia/insomnia_management_guideline.pdf">http://www.topalbertadoctors.org/informed_practice/clinical_practice_guidelines/complete%20set/Insomnia/insomnia_management_guideline.pdf</a>) - Appendix 7.2</li> <li>3. Advice on Sleep Consolidation - Appendix 7.3</li> </ol>		

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## 8. PERSISTENT MENTAL HEALTH DISORDERS

### Assessment

Early post-concussive symptoms following mTBI can include irritability, anxiety, emotional lability, depressed mood, and 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. 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).

Regardless of whether they are considered directly attributable to brain injury, these disorders require prompt recognition, given their frequency and potential to impede the resolution of post-concussive symptoms in other domains (Fann et al., 2001; Rapoport et al., 2003). Certain pre-existing difficulties, such as substance use disorders and poor psychosocial adjustment also place patients at risk for a slowed recovery (Wood, 2004). Delays in returning to social and vocational roles can in turn produce demoralization and worsened emotional symptoms (Pagulayan et al., 2008).

The assessment of mental health disorders can be challenging, given the overlap in symptoms between mood and anxiety disorders, sleep disorders, pain syndromes, and other post-concussive cognitive difficulties. “Subthreshold” variants of certain conditions such as PTSD are also observed, in which a symptom cluster falls short of meeting formal diagnostic criteria yet remains a source of substantial morbidity. In general, it is recommended that DSM-IV diagnostic criteria be applied in an “inclusive” manner: for example, counting all relevant symptoms toward a potential diagnosis of depression, regardless of whether the mTBI alone could have caused the symptom (Bombardier et al., 2006; Silver et al., 2009). The presence of contributing medical conditions should also be assessed, such as anemia, thyroid dysfunction, B12 deficiency, and so forth. In situations of diagnostic uncertainty, a mental health referral should be sought.

The use of self-report questionnaires can aid in the assessment and monitoring of common mental health disorders, such as the depression module of the Patient Health Questionnaire (PHQ-9; Appendix 8.2) and the PTSD Checklist - Civilian Version (PCL-CV; Appendix 8.3). Other symptoms may be screened using the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3).

Several brief self-report questionnaires can aid the clinician in assessing mental health disorders. The instruments described below have the advantage of yielding both criterion-based diagnoses and severity ratings to monitor progress, such as the depression module of the Patient Health Questionnaire (PHQ-9; Appendix 8.2) and the PTSD Checklist - Civilian Version (PCL-CV; Appendix 8.3).

#### ASSESSMENT OF PERSISTENT MENTAL HEALTH DISORDERS

RECOMMENDATION		GRADE
8.1	<p>Given their prevalence and potential impact, all patients with persistent symptoms following an mTBI should be screened for mental health symptoms and disorders, including:</p> <ul style="list-style-type: none"><li>• Depressive disorders</li><li>• Anxiety disorders, including PTSD</li><li>• Irritability or other personality changes</li><li>• Substance use disorders</li><li>• Somatoform disorders</li></ul> <p>The use of self-report questionnaires can aid in the assessment and monitoring of common mental health disorders, such as the depression module of the Patient Health Questionnaire (PHQ-9; Appendix 8.2) and the PTSD Checklist – Civilian Version (PCL-CV; Appendix 8.3). Other symptoms may be screened using the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3).</p>	C

#### Resources

1. Guidance on the assessment of anxiety: Initial Screening and Assessment recommendations from the MAA NSW Guidelines for the Management of Anxiety Following Motor Vehicle Accidents - Appendix 8.1
2. Screening tool for depression: Patient Health Questionnaire (PHQ-9) - Appendix 8.2
3. PTSD screening tool: PTSD Checklist-Civilian Version (PCL-C) - Appendix 8.3
4. Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3

## Management

Comorbid mental health disorders warrant treatment whenever symptoms impact on functional status or impede recovery as psychiatric and other post-concussive symptoms often negatively interact (Fann et al., 2001). Once identified, appropriate psychological and pharmacological treatment should be started. For more complex cases, consultation with a psychiatrist or a mental health team should be sought; although the initial steps of treatment should not be delayed. General measures can be initiated and symptoms such as headaches, sleep disturbance, dizziness, and comorbid pain addressed. General measures include the provision of support, validation, and reassurance, as well as education regarding mTBI and positive expectations for recovery. Involvement of the family can be very helpful at this stage. Education about sleep hygiene and regular light exercise (e.g., walking or stationary cycling, depending on physical limitations) should be offered. The latter can improve mood, perceived fatigue and well-being, and counteract deconditioning.

Medication treatment may be required for those with persistently depressed mood, anxiety, and prominent irritability or emotional lability (i.e., even in the absence of a clear-cut depression). Selective serotonin reuptake inhibitors (SSRIs) are recommended as first-line treatments for these conditions following mTBI, based upon their favorable side effect profile and potentially broader utility when compared to agents from other classes, such as tricyclic antidepressants (TCAs). While a robust evidence base supports their use in primary depressive and anxiety syndromes, evidence for use after mTBI is based upon a limited clinical literature, comprising uncontrolled/open studies and case reports, and a recent RCT in a group with mixed TBI severity (Ashman et al., 2009). This literature as well as expert opinion (Silver et al., 2009; McAllister 2009; Warden et al., 2006) support the utility of SSRIs in treating depression, reducing anxiety and irritability, and in some reports, improving cognition, somatic symptoms, and psychosocial function. The available literature supports the efficacy and tolerability of both sertraline (starting at 25mg; aiming for 50-200mg/day) and citalopram (starting at 10mg; aiming for 20-50mg/day) (Silver et al., 2009). Other SSRIs, “dual action” antidepressants (e.g., venlafaxine, mirtazepine), and other new agents may be useful, yet there is virtually no published literature within the TBI population to direct clinical decision-making.

In the absence of compelling data specific to TBI, the use of treatment algorithms developed for primary psychiatric disorders may be appropriate (such as CANMAT [Depressive Disorders: Journal of Affective Disorders, 2009, Vol 117, Suppl 1], CPA [Anxiety, 2006: <http://publications.cpa-apc.org/browse/documents/213&xwm=true>], NICE [Depression, 2009: <http://guidance.nice.org.uk/CG90>; PTSD, 2005: <http://guidance.nice.org.uk/CG26>], or MAA NSW [Anxiety, 2003: <http://www.maa.nsw.gov.au/default.aspx?MenuID=141>]), **albeit with some qualifications**. The mTBI population may be more sensitive to adverse medication effects upon cognition (alertness, attention, memory); balance and dizziness; sleep and fatigue; and headaches. Anticholinergic effects of certain tricyclic medications (e.g., amitriptyline, imipramine, doxepin) should be carefully monitored. Although uncommon, the risk of posttraumatic seizures after mTBI remains elevated at about 1.5 times the rate for the healthy population 1-4 years after injury (Annegers et al., 1998). Medications with potentially greater impact upon the seizure threshold, such as clomipramine (and perhaps other tricyclics at full doses) and the immediate-release formulation of bupropion, should be avoided in favor of SSRIs and other newer agents (Montgomery, 2005).

Expert opinion generally advises against the use of benzodiazepines as first-line therapy for anxiety after mTBI due to the potential impact on arousal, cognition, and motor coordination (McAllister, 2009). TBI patients may also be more susceptible to the abuse/dependency issues associated with these agents, given the elevated rates of pre-injury substance use disorders observed (Graham & Cardon, 2008). Nonetheless, short-term use of these agents may be helpful during periods of crisis or acute distress.

Psychological interventions are critical in the management of primary mental health disorders, and include supportive counseling, problem-solving strategies, as well as formal psychotherapies. One example of the latter is cognitive behavioral therapy (CBT), which refers to a combination of symptom-focused strategies aimed at improving emotional status and coping ability by altering maladaptive thought patterns and behavior. Although research in the TBI population remains at an early stage, CBT is recommended for persistent symptoms after mTBI, given (1) the comprehensive evidence base supporting its use for a range of conditions in the non-TBI population; and (2) preliminary support in TBI for its efficacy in alleviating emotional distress (Tiersky et al., 2005; Bradbury et al., 2008) and post-concussive symptoms in general (Miller & Mittenberg, 1998); in mitigating the development of PTSD (Bryant et al., 2003); and in improving coping skills post-TBI (Anson & Ponsford, 2006). In addition, its problem-focused, structured format offers particular advantages in the setting of TBI. It can be tailored to accommodate specific patient needs and symptoms and its intensity varied from guided self-help via written materials based on CBT principals to a more formal program of individualized therapy. CBT treatment typically includes education, behavioral activation, training in problem solving and emotion regulation, cognitive restructuring, and graded exposure to anxiety triggers. Strategies to manage pain, insomnia, fatigue, as well as excessive health anxiety/maladaptive illness behaviour can be incorporated.

The decision to recommend psychological intervention will depend on factors such as patient preference and motivation, symptom severity and comorbidity, skills and experience of the treating clinician, and the ease of access to such resources. Primary care physicians may be well-suited to provide supportive counseling, along with low-intensity interventions based on CBT principles. For more difficult cases, such as moderate to severe depression or anxiety, persistent PTSD, or the presence of complex comorbidities, referral for specialist treatment should be sought. The latter presentations may likely also require pharmacotherapy.

Limited data address the issue of duration for continuation of medication therapy. Although a recent report suggests that mTBI patients remain at a high risk for relapse in the year following successful medication treatment, the report also found no differences in relapse between those who remained on the antidepressant compared to the placebo group (Rapoport et al., 2010). Nonetheless, in the absence of strong reasons for early termination (for example, related to tolerance issues), successful pharmacotherapy should be continued for at least 6 months before a trial of slow tapering is considered. Relapse prevention strategies should also be included within psychological treatment approaches.

MANAGEMENT OF PERSISTENT MENTAL HEALTH DISORDERS		
RECOMMENDATION		GRADE
8.2	Referral to a psychiatrist/mental health team (ideally with experience in treating individuals with persistent symptoms following mTBI, if available) should be obtained if: <ul style="list-style-type: none"> <li>the presentation is complex or severe</li> <li>psychosis or bipolar disorder is suspected</li> <li>the risk of suicide is judged significant</li> <li>initial treatment is not effective within two months</li> <li>failure or contraindication of medication strategies that are familiar</li> <li>presence of risk factors known to potentially affect the course of recovery (see Table 7)</li> </ul>	C
8.3	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.	C
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.	C
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.	C
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.	C
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.	C
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).	C
Resources		
1. General Considerations Regarding Pharmacotherapy after mTBI - Table 10		

**Table 10. 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.
- A specific selective serotonin reuptake inhibitor (SSRI) is recommended as first-line treatment for mood and anxiety syndromes after mTBI. The use of benzodiazepines as first-line therapy for anxiety after mTBI is not encouraged.
- Start at the lowest effective dose and titrate slowly upwards, monitoring tolerability and clinical response; yet also aim for adequate dosing and trial duration. Inadequacies of either are frequent causes of treatment failure. At times the maximum tolerated doses may be required.
- Use of a single agent to alleviate several symptoms is ideal (e.g., a TCA for depression, sleep disruption, and headache relief). However, as individual post-concussive symptoms do not necessarily show a coupled response to treatment, a combination of strategies may be ultimately required (e.g., SSRI plus low-dose TCA for mood and headache treatment).
- Limited quantities of medications should be offered to those at an elevated risk for suicide.
- To prevent relapse, consider continuing successful pharmacotherapy for at least 6 months prior to a trial of slowly tapering medication.

*Adapted from Silver, Arciniegas & Yudofsky, 2005*

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## 9. PERSISTENT COGNITIVE DIFFICULTIES

The presence and persistence of cognitive symptoms following mTBI does impact successful reintegration into work, academic and social activities following such injuries (Vanderploeg, Curtiss, Luis & Salazar, 2007). mTBI is associated with disruptions in cognitive skills that include difficulties with attention/concentration, speed of information processing, memory and aspects of executive cognitive skills (Frenchman, Fox & Mayberry, 2005; Silver, McAllister & Arciniegas, 2009). In the acute phase of injury there are changes in cerebral metabolic activity and perfusion particularly in the frontal lobes associated with cognitive changes (Metting, Rodiger, Stewart, Oudkerk, DeKeyser, & vanderNaalt, 2009; Bartnik, Hovda & Lee, 2007). Generally, the expected recovery from cognitive based symptoms following mTBI ranges from 1 week to 6 months, with more rapid rates of recovery found in young athletes (Iverson, Lange, Brooks & Rennison, 2010). However, a small percentage of individuals experience persistent cognitive symptoms beyond the acute phase of recovery which significantly disrupts their capacity to resume many premorbid activities.

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) (Bigler, 2008; Etherton, Bianchini, Heinly & Greve, 2006; Wood, 2004; Mittenberg & Strauman, 2000). 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.

Attempts should be made to document cognitive symptoms in order to characterize the nature of these symptoms and to track progress over time. Worsening of cognitive symptoms over time runs contrary to the normal recovery pattern and may suggest the contribution of other factors such as mood disorders, sleep disturbances, etc. When evidence for cognitive dysfunction is obtained with screening and does not resolve with treatment of potentially contributing factors or if cognitive symptoms persist at 3 months, practitioners should consider referral for neuropsychological assessment. Impairments identified on neuropsychological assessment may be amenable to specific rehabilitation strategies or noted below. The inclusion of symptom validity/effort testing during neuropsychological assessment may provide valuable information regarding the validity of the test data, which can in turn inform treatment recommendations.

With regard to intervention, there is good evidence that early education intervention is associated with a significant reduction in the persistence and misattribution of symptoms. Related interventions include education about the mechanisms of brain injury, reassurance, early management strategies that include graduated reintegration into physical activity, work and school, as well as the understanding that symptoms should typically resolve within a 3 to 6 month time frame (Mittenberg, 2001; Borg, Holm, Peloso, Cassidy, Carroll, vonHolst, Paniak & Yates, 2004; Ponsford, 2005). Therefore, attempts should be made to document the specific cognitive complaints/symptoms in conjunction with other symptoms as early as possible, provide or refer to educational material and track recovery or reported worsening of symptoms over time. If cognitive symptoms continue to be reported following 3 to 6 months post-injury, practitioners should consider referral for psychological treatment with the provision of cognitive-behavioural strategies focused on education about the commonality of symptom presentation, facilitation of more effective coping strategies as well as the integration of cognitive compensatory strategies. This combination has demonstrated reductions in the presence of persistent symptoms (Tiersky, Anselmi, Johnston, Kurtyka, Roosen, Schwartz & Deluca, 2005). Where cognitive symptoms appear both persistent and complex, referral to a neuropsychologist may further facilitate the disentangling of noted factors that contribute to symptom persistence and recommendations for treatment that may also include more intensive cognitive remediation or integration of compensatory strategies.

ASSESSMENT OF PERSISTENT COGNITIVE DIFFICULTIES		
RECOMMENDATION		GRADE
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 (Appendix 1.3) includes items assessing cognition.	C
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.	C
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 (see Appendix 2.1 for a list of TBI centres in Ontario). For systems with long wait times, practitioners should consider referral earlier than 3 months.	C
<b>Resources</b> 1. Cognitive screening tool: Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3 2. List of specialized TBI clinics/centres in Ontario to aid with referrals - Appendix 2.1		

MANAGEMENT OF PERSISTENT COGNITIVE DIFFICULTIES		
RECOMMENDATION		GRADE
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).	C
9.5	For cognitive sequelae following mTBI, the cognitive rehabilitation strategies that should be considered include compensatory strategies and restorative approaches.	C
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.	B

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## 10. PERSISTENT BALANCE DISORDERS

Impairment of the vestibular system is a common problem experienced post mild TBI with complaints ranging from vertigo to problems with dizziness, balance, vision as well as mobility (Hillier & Hollohan, 2007). Vestibular deficits can be of peripheral origin where the inner ear is affected or can also be of central/ brain origin. Benign Paroxysmal Positional Vertigo (BPPV) is a specific common cause of balance impairment where patients experience vertigo and often nausea with sudden movements or changes in position such as rolling over in bed or looking up (Parnes, Agrawal & Atlas, 2003); typically the duration of symptoms is less than 30 seconds but can occur multiple times per day and has the potential to disrupt activities.

Assessment for balance impairment and BPPV is important following mild TBI since treatment interventions can be effective for alleviating these symptoms. Evaluation should minimally include balance testing with reference to normal values to document impairment (see Figure 4) as well as performing the Dix-Hall Pike Maneuver (see Appendix 10.1) to assess for BPPV where patient history suggests this problem. A more thorough assessment of balance can be done using the Balance Error Scoring System (BESS; Guskiewicz, 2001; see Iverson, Kaarto & Koehle, 2008, for normative data).

**Figure 4. Clinical Assessment of Balance**

Instructions	<p><i>The 10 Second Balance Screen:</i></p> <p><u>Age 49 and Under:</u> Ask the subject to stand on one leg, arms free to move. He or she can choose which leg they want to stand on and are allowed to alternate between legs in between trials. Patients perform the tests with eyes closed (EC). A subject who requests help to assume a testing position is allowed to use the investigator's arm to steady him or herself prior to starting the timed trials. No instructions are given regarding the subject's knee position. Timing starts when the subject assumes the proper position and indicates that he or she is ready to begin the test. Timing stops when the subject disengages from the starting position or reaches the 30-second time limit. The best of three trials is taken for the result.</p> <p><u>Age 69 and Under:</u> Ask the subject to stand with one foot just in front of the other with arms free to move (Tandem Romberg). He or she can choose which leg they wanted to be in front and could change position in between trials. Patients perform the tests with eyes closed (EC). A subject who requests help to assume a testing position is allowed to use the investigator's arm to steady him or herself prior to starting the timed trials. Timing starts when the subject assumes the proper position and indicates that he or she is ready to begin the test. Timing stops when the subject disengages from the starting position or reaches the 30-second time limit. The best of three trials is taken for the result.</p> <p><u>Age 70 and Older:</u> Ask the subject to stand on one leg, arms free to move. He or she can choose which leg they want to stand on and are allowed to alternate between legs in between trials. Patients perform the tests with eyes open (EO). A subject who requests help to assume a testing position is allowed to use the investigator's arm to steady him or herself prior to starting the timed trials. No instructions are given regarding the subject's knee position or visual fixation. Timing starts when the subject assumes the proper position and indicates that he or she is ready to begin the test. Timing stops when the subject disengages from the starting position or reaches the 30-second time limit. The best of three trials is taken for the result.</p> <p><b>**Any test score of 10 seconds or less suggests balance impairment.</b></p>																																																																															
	<p><i>One leg standing (eyes open)</i></p> <table><tr><th>Decade</th><th>Mean</th><th>SD</th><th>Median</th><th>Perc 05</th><th>Interquartile range</th><th>Perc 95</th><th>Valid N</th><th>% 30 s</th><th>% 10 s</th></tr><tr><td>3</td><td>30.00</td><td>.00</td><td>30.00</td><td>30.00</td><td>30.00 - 30.00</td><td>30.00</td><td>N = 74</td><td>100</td><td>100</td></tr><tr><td>4</td><td>30.00</td><td>.00</td><td>30.00</td><td>30.00</td><td>30.00 - 30.00</td><td>30.00</td><td>N = 43</td><td>100</td><td>100</td></tr><tr><td>5</td><td>29.64</td><td>2.06</td><td>30.00</td><td>25.91</td><td>30.00 - 30.00</td><td>30.00</td><td>N = 32</td><td>97</td><td>100</td></tr><tr><td>6</td><td>30.00</td><td>.00</td><td>30.00</td><td>30.00</td><td>30.00 - 30.00</td><td>30.00</td><td>N = 30</td><td>100</td><td>100</td></tr><tr><td>7</td><td>27.74</td><td>5.25</td><td>30.00</td><td>11.59</td><td>30.00 - 30.00</td><td>30.00</td><td>N = 56</td><td>80</td><td>95</td></tr><tr><td>8</td><td>21.43</td><td>10.08</td><td>26.33</td><td>2.05</td><td>13.04 - 30.00</td><td>30.00</td><td>N = 56</td><td>48</td><td>86</td></tr></table>										Decade	Mean	SD	Median	Perc 05	Interquartile range	Perc 95	Valid N	% 30 s	% 10 s	3	30.00	.00	30.00	30.00	30.00 - 30.00	30.00	N = 74	100	100	4	30.00	.00	30.00	30.00	30.00 - 30.00	30.00	N = 43	100	100	5	29.64	2.06	30.00	25.91	30.00 - 30.00	30.00	N = 32	97	100	6	30.00	.00	30.00	30.00	30.00 - 30.00	30.00	N = 30	100	100	7	27.74	5.25	30.00	11.59	30.00 - 30.00	30.00	N = 56	80	95	8	21.43	10.08	26.33	2.05	13.04 - 30.00	30.00	N = 56	48	86
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Content based on Vereeck, Wuyts, Truijen & Van de Heyning (2008) with normative data tables taken from the paper. © 2008 Informa Healthcare, International Journal of Audiology (<http://informahealthcare.com/loi/ija>). Reproduced with permission.

ASSESSMENT OF PERSISTENT BALANCE DISORDERS		
RECOMMENDATION		GRADE
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.	C
10.2	If symptoms of benign positional vertigo are present the Dix-Hallpike Maneuver (see Appendix 10.1) should be used.	A
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Balance screening tool accompanied by normative data: information sheet describing eyes open and eyes closed quasi-static balance tests and presenting normative data from Vereeck, Wuyts, Truijen, &amp; Van de Heyning (2008) - Figure 4</li> <li>2. Information sheet on performing the Dix-Hallpike Manoeuvre based on Parnes, Agrawal, &amp; Atlas (2003) - Appendix 10.1</li> </ol>		

Once balance impairment has been established through history and physical examination then consideration for management techniques can be made. Although historically medications have been used to suppress the vestibular system as well as associated symptoms such as nausea, existing evidence does not appear to support this approach. A Cochrane review performed by Hillier and Holohan (2007) identifies vestibular rehabilitation as an effective intervention for unilateral peripheral vestibular dysfunction. This approach primarily consists of exercises targeted at maximizing compensation and adaptation for the vestibular dysfunction and these are typically provided by a physiotherapist experienced in treating this condition. However, for the specific condition of Benign Paroxysmal Positional Vertigo (BPPV), canalith/ particle repositioning maneuvers are more effective than vestibular rehabilitation techniques.

MANAGEMENT OF PERSISTENT BALANCE DISORDERS		
RECOMMENDATION		GRADE
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.	C
10.4	A canalith repositioning maneuver should be used to treat Benign Positional Vertigo if the Dix-Hallpike Maneuver is positive.	A
10.5	Vestibular rehabilitation therapy is recommended for unilateral peripheral vestibular dysfunction.	A
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Information sheet on performing the particle repositioning manoeuvre (PRM) based on Parnes, Agrawal, &amp; Atlas (2003) - Appendix 10.1</li> <li>2. Information sheet on performing vestibular rehabilitation techniques; Hain TC. <a href="http://www.dizziness-and-balance.com/treatment/rehab.html">http://www.dizziness-and-balance.com/treatment/rehab.html</a></li> </ol>		

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## 11. PERSISTENT VISION DISORDERS

The types of vision disorders that people who have sustained mTBI may experience range from ambient vision disturbances to diplopia, inability to visually fixate, poor convergence, scanning deficits, poor visual acuity, accommodative dysfunction, oculomotor dysfunction, and photosensitivity (Radomski, Davidson, Voydetich & Erickson, 2009). Practitioners should take a history of vision symptoms and perform examinations to detect potentially unrecognized visual deficits or to take note of the specific type of visual disorder the patient is experiencing. If abnormalities are observed upon examination, referral to an ophthalmologist should be made.

ASSESSMENT OF PERSISTENT VISION DISORDERS		
RECOMMENDATION		GRADE
11.1	A) Take an appropriate history relevant to visual symptoms. B) Perform fundoscopic exam, and exams of visual acuity, visual fields and extraocular movements for symptoms of visual disturbance including visual field, blurring, diplopia, and photosensitivity.	C
11.2	If visual abnormalities are observed, refer to an ophthalmologist, ideally a neuro-ophthalmologist or one specializing in brain injury.	C

### References

Radomski MV, Davidson L, Voydetich D, Erickson MW. Occupational therapy for service members with mild traumatic brain injury. *American Journal of Occupational Therapy*. 2009;63:646-655.

## 12. PERSISTENT FATIGUE

Fatigue has been conceptualized as an experience of weariness or tiredness following mental or physical exertion often resulting in a reduced capacity for work and limited efficiency to respond to stimuli. Fatigue is one of the most pervasive symptoms following TBI and it can actually be out of proportion to exertion or may even occur without any exertion (Dijkers & Bushnik, 2008). Fatigue is multidimensional and can affect physical, cognitive, and subjective aspects. Fatigue following TBI has been found to significantly impact well-being and quality of life (Cantor et al., 2008). Due to its prevalence and effects, it is recommended that all patients be assessed for fatigue through a personal history and review of the relevant items from the Rivermead Post Concussion Symptoms Questionnaire and/or a specific measure of fatigue, such as the Fatigue Severity Scale (Krupp et al., 1989; Appendix 12.1). It should be noted, however, that the Fatigue Severity Scale was not specifically designed for use with individuals who have experienced mTBI. Nonetheless, because no TBI-specific measures of fatigue are known of, the Fatigue Severity Scale may offer some utility with patients following mTBI. Because certain medications can cause fatigue, the practitioner should also review a patient's medication use. If a patient has been prescribed a medication that is associated with fatigue, alternatives that produce the same treatment effect without inducing fatigue should be considered. A list of medications commonly associated with fatigue can be found in Appendix 12.2. Patients should be provided with advice on how to cope with fatigue (Appendix 12.3). If debilitating fatigue persists, consider referral to a brain injury specialist.

ASSESSMENT OF PERSISTENT FATIGUE		
RECOMMENDATION		GRADE
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 (Appendix 1.3) or by administering the Fatigue Severity Scale (FSS, see Appendix 12.1)	C
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: <ul style="list-style-type: none"> <li>• 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).</li> <li>• Obtain sleep history to help identify primary or secondary sleep disorders (see optional self-report sleep questionnaire in Appendix 7.1)</li> <li>• 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.</li> <li>• Conduct a general medical examination and a focused neurologic exam.</li> </ul>	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Fatigue screening tool: the Fatigue Severity Scale (FSS) - Appendix 12.1.</li> <li>2. List of medications associated with fatigue: Based on the list presented in the Multiple Sclerosis Council Clinical Practice Guidelines: Fatigue and Multiple Sclerosis - Appendix 12.2</li> </ol>		

MANAGEMENT OF PERSISTENT FATIGUE		
RECOMMENDATION		GRADE
12.3	If identified as a significant symptom, some key considerations that may aid in the management of persistent fatigue can include: <ul style="list-style-type: none"> <li>- aiming for a gradual increase in activity levels that will parallel improvement in energy levels.</li> <li>- reinforce that pacing activities across the day will help patients to achieve more and to avoid exceeding tolerance levels.</li> <li>- encouraging good sleep practices (especially regularity of sleep time, and avoidance of stimulants and alcohol), and proper relaxation times.</li> <li>- using a notebook to plan meaningful goals, record activity achievement and identify patterns of fatigue.</li> <li>- acknowledging that fatigue can be exacerbated by low mood.</li> </ul> Provide patients with a pamphlet containing advice on coping strategies for fatigue (see Appendix 12.3).	C
12.4	If fatigue is persistent then refer to a brain injury specialist for consideration of a medication trial.	C
<b>Resources</b> <ol style="list-style-type: none"> <li>1. Rivermead Post Concussion Symptoms Questionnaire - Appendix 1.3</li> <li>2. Pamphlet for patients containing advice on coping strategies for fatigue - Appendix 12.3</li> </ol>		

## References

Cantor JB, Ashman T, Gordon W et al. Fatigue After Traumatic Brain Injury and Its Impact on Participation and Quality of Life. *Journal of Head Trauma Rehabilitation*. 2008;23:41-51.

Dijkers MPJM, Bushnik T. Assessing Fatigue After Traumatic Brain Injury: An Evaluation of the Barroso Fatigue Scale. *Journal of Head Trauma Rehabilitation*. 2008;23:3-16.

Krupp LB, Larocca NG, Muir-Nash J, et al. The Fatigue Severity Scale: application to patients with Multiple Sclerosis and Systemic Lupus Erythematosus. *Archives of Neurology*. 1989;46:1121-1123.

### 13. RETURN TO WORK/SCHOOL CONSIDERATIONS

The majority of individuals (estimates range from 73-88%) who experience mTBI are able to return to their principal occupation within a year of the injury (Dikmen et al., 1994, Nolin & Heroux, 2006, Stambrook, Moore, Peters, Deviaene & Hawryluk, 1990, Van der Naalt, van Zomeren, Sluiter & Minderhoud, 1999). It should be noted though that even when individuals return to work or school they may still be experiencing symptoms and resumption of these activities can be complicated and stressful. When interviewed about work-related expectations and experiences, a group of workers in the UK who had sustained mild to moderate TBIs reported that some of the important issues they faced were the invisibility of their injury, continuing symptoms affecting their ability to do their job, and lack of advice and guidance on returning to work. In addition, return to work support systems were considered to be poorly coordinated and managed (Gilworth, Eyres, Carey, Bhakta & Tennant, 2008). This is not so surprising given that research on the management of return to work following mTBI is limited. Although management strategies have not been specifically studied, there is evidence regarding predictors and factors influencing the outcome of return to one's principal occupation. Factors associated with poor functional outcomes are shown below in Table 11.

When managing a patient's return to principal occupation, the practitioner should take these factors into consideration. Furthermore, prescription of guidance should also take into consideration contextual work-related factors such as number of hours per work day/shift, opportunity for rest breaks, shift times (morning/afternoon/ evening), pace of work, nature of work tasks (cognitive or physical, routine or variable, responsibility, support from supervisors or colleagues, operation of machinery), productivity demands, work environment (exposure to light, noise), and transport to and from work.

**Table 11. Factors Associated with Poor Functional Outcomes**

- Dizziness (Chamelian, & Feinstein, 2004)
- Number of symptoms reported at follow-up (Nolin & Heroux, 2006)
- Posttraumatic stress (Friedland & Dawson, 2001; Nolin & Heroux, 2006)
- Cognitive impairments on tests of memory and executive functioning (Drake, Gray, Yoder, Pramuka, Llewellyn, 2000)
- Reduced social interaction (compared to pre-injury; Ruffolo, Friedland, Dawson, Colantonio & Lindsay, 1999)
- Financial compensation-seeking (Reynolds, Paniak, Toller-Lobe, & Nagy, 2003)
- Loss of consciousness (Vanderploeg, Curtiss, Duchnick, & Luis, 2003)
- Pre-existing mental health difficulties (i.e., anxiety, depression, mania, psychotic symptoms; Vanderploeg, Curtiss, Duchnick, & Luis, 2003)
- Lower pre-morbid intelligence/cognitive ability (Vanderploeg, Curtiss, Duchnick, & Luis, 2003)
- Pre-injury work history (i.e., prior work stability, earnings; Machamer, Temkin, Fraser, Doctor, & Dikment, 2005)

For those individuals continuing to experience symptoms at the time of their return to principal occupation or who experience difficulty upon their return, strategies such as graduated or modified return to work/study may be considered and negotiated with the patient and their employer or educational institution. Variables that may be modified in order to improve return to work outcome include hours worked in the course of a day, shift, or week; intensity, quantity, or nature of tasks; and increased rest breaks. For those individuals returning to school, factors such as fewer assignments, defer or delay of exams, extended exam time, use of a note taker or audio recorder for lectures, or change of class timetable may be negotiated to help ease students' return (MAA NSW, 2008).

RETURN TO WORK/SCHOOL CONSIDERATIONS		
RECOMMENDATION		GRADE
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). Refer to Appendix 13.1 for guidance on return to work/study considerations.	C
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.	C
<b>Resources</b> 1. Guidance for care providers on advising patients about return to work/study: General Practitioner Guide - Return to Work/Study Considerations from the MAA NSW Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury - Appendix 13.1		

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# APPENDIX A

## PROJECT MEMBERS

### mTBI PROJECT TEAM MEMBERS

**Shawn Marshall, MD, MSc, FRCPC**  
University of Ottawa

**Mark Bayley, MD, FRCPC**  
Toronto Rehabilitation Institute

**Scott McCullagh, MD, FRCPC**  
University of Toronto

**Diana Velikonja, PhD, CPsych**  
Hamilton Health Sciences

**Lindsay Berrigan, PhD (Candidate)**  
Ottawa Hospital Research Institute

### mTBI EXPERT CONSENSUS GROUP

**Markus Besseman, MD, FRCPC, Dip. Sport Med., LCol.**  
HQ Health Services Delivery, Canadian Forces

**Angela Colantonio, PhD, OT**  
Toronto Rehabilitation Institute

**Paul Comper, PhD, CPsych**  
Toronto Rehabilitation Institute

**Nora Cullen, MD, MSc, FRCPC**  
Toronto Rehabilitation Institute

**Anne Forrest, PhD**  
mTBI Survivor

**Jane Gillett, MD, FRCPC**  
Hamilton Health Sciences

**John Gladstone, MD, FRCPC**  
University of Toronto

**Wayne Gordon, MD, PhD, ABPP/Cn, FACRM**  
Mount Sinai School of Medicine

**Elizabeth Inness, BSc (PT), MSc**  
Toronto Rehabilitation Institute

**Grant Iverson, PhD, CPsych**  
University of British Columbia

**Corinne Kagan**  
Ontario Neurotrauma Foundation

**Vicki Kristman, PhD**  
University Health Network, Toronto Western Hospital

**John Kumpf**  
Ontario Brain Injury Association

**Andrea LaBorde, MD**  
Hospital of the University of Pennsylvania, Co-Chair of the Mild TBI Task Force for the American Congress of Rehabilitation Medicine

**Shayne Ladak, MD**  
McMaster University, Team Physician Canadian Soccer Association & Federation Internationale de Football Association (FIFA)

**Sue Lukersmith, OT**  
Lukersmith & Associates, Author of MAA NSW mTBI Guideline

**Willie Miller, MD, FRCPC**  
The Ottawa Hospital, University of Ottawa

**Alain Ptito, PhD, CPsych**  
Montreal Neurological Institute and Hospital, McGill University

**Laura Rees, PhD, CPsych**  
The Ottawa Hospital Rehabilitation Centre, University of Ottawa

**Jim Thompson, MD, CCFP (EM), FCFP**  
Veterans Affairs Canada

**Rob van Reekum, MD, FRCPC**  
University of Toronto and Laval University

### EXTERNAL REVIEWERS

**Erin Bigler, PhD**  
Brigham Young University

**Anthony Feinstein, M.B.B.Ch., M.R.C.Psych., M.Phil., PhD, FRCPC**  
Sunnybrook Health Sciences Centre, University of Toronto

**Paul Mendella, PhD, CPsych**  
The Ottawa Hospital, University of Ottawa

**Jennie Ponsford, PhD**  
Monash University

**Mark Rapoport, MD, FRCPC**  
Sunnybrook Health Sciences Centre, University of Toronto

**Andree Tellier, PhD, CPsych**  
The Ottawa Hospital, University of Ottawa

## APPENDIX B

### FORMAL SCHEMA USED IN THE ESTABLISHMENT OF THE mTBI EXPERT CONSENSUS GROUP

Domain of Expertise							Health Discipline Background							Stakeholder Group					Geographic Location																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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#### Abbreviations

ONF	Ontario Neurotrauma Foundation
OBIA	Ontario Brain Injury Association
IBIA	International Brain Injury Association
ACRM	American Congress of Rehabilitation Medicine
VAC	Veterans Affairs Canada



## APPENDIX C

### CONFLICTS OF INTEREST

At the beginning of the guideline development process, members of the guideline development team and the expert consensus group were asked to declare any possible conflicts of interest. One member of the expert consensus group reported they have received honorariums for speaking engagements regarding mTBI, they are a member of a U.S. Department of Defence Health Board subcommittee focused on TBI, they have received funding to act as an investigator for proprietary tools that may be used with TBI patients and that they are involved in multiple on-going research projects examining mild TBI and sports, civilians, active duty soldiers, and veterans.

Another member of the expert consensus group reported they are a primary investigator with an externally funded mild TBI research program and they are a paid consultant with the National Hockey League Players' Association.

One of the other expert consensus group members stated they are an investigator on research projects focused on treatment relating to TBI and they have been a paid consultant for medical legal examinations.

Five over members of the expert consensus group declared they are involved as investigators on research projects examining treatments relating to mild TBI.

# APPENDIX 1.1

## THE ABBREVIATED WESTMEAD POST TRAUMATIC AMNESIA SCALE (A-WPTAS)

### ABBREVIATED WESTMEAD PTA SCALE (A-WPTAS)

#### GCS & PTA testing of patients with MTBI following mild head injury

Abbreviated Westmead PTA Scale (A-WPTAS)  
incorporating Glasgow Coma Scale (GCS)

MRN sticker here

Date:		T1	T2	T3	T4	T5
Time						
Motor	Obeys commands	6	6	6	6	6
	Localises	5	5	5	5	5
	Abnormal flexion	4	4	4	4	4
	Withdraws	3	3	3	3	3
	Extension	2	2	2	2	2
	None	1	1	1	1	1
Eye Opening	Spontaneously	4	4	4	4	4
	To speech	3	3	3	3	3
	To pain	2	2	2	2	2
	None	1	1	1	1	1
Verbal	Oriented ** (tick if correct)	5	5	5	5	5
	Name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Why are you here	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Month	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Confused	4	4	4	4	4
	Inappropriate words	3	3	3	3	3
	Incomprehensible sounds	2	2	2	2	2
	None	1	1	1	1	1
<b>GCS</b>	<b>Score out of 15</b>	<b>/15</b>	<b>/15</b>	<b>/15</b>	<b>/15</b>	<b>/15</b>
	Picture 1	Show pictures (see over)				
	Picture 2					
	Picture 3					
<b>A-WPTAS</b>	<b>Score out of 18</b>		<b>/18</b>	<b>/18</b>	<b>/18</b>	<b>/18</b>

\*\* must have all 5 orientation questions correct to score 5 on verbal score for GCS, otherwise the score is 4 (or less).

#### Use of A-WPTAS and GCS for patients with MTBI

The A-WPTAS combined with a standardised GCS assessment is an objective measure of post traumatic amnesia (PTA).  
Only for patients with **current GCS of 13-15 (<24hrs post injury)** with impact to the head resulting in confusion, disorientation, anterograde or retrograde amnesia, or brief LOC. **Administer both tests at hourly intervals** to gauge patient's capacity for full orientation and ability to retain new information. Also, **note the following:** poor motivation, depression, pre-morbid intellectual handicap or possible medication, drug or alcohol effects. **NB: This is a screening device, so exercise clinical judgement. In cases where doubt exists, more thorough assessment may be necessary.**

#### Admission and Discharge Criteria:

A patient is considered to be out of PTA when they score 18/18.  
Both the GCS and A-WPTAS should be used in conjunction with clinical judgement.  
Patients scoring 18/18 can be considered for discharge.  
For patients who do not obtain 18/18 re-assess after a further hour.  
Patients with persistent score <18/18 at 4 hours post time of injury should be considered for admission.  
Clinical judgement and consideration of pre-existing conditions should be used where the memory component of A-WPTAS is abnormal but the GCS is normal (15/15).  
Referral to GP on discharge if abnormal PTA was present, provide patient advice sheet.

#### Target set of picture cards



PUPIL ASSESSMENT	T1	T2	T3	T4	T5	+	=	REACTS BRISKLY
	R L	R L	R L	R L	R L	SL	=	SLUGGISH
Size						C	=	CLOSED
Reaction						-	=	NIL

#### Comments

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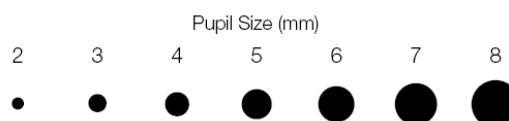
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Shores & Lammell (2007) - further copies of this score sheet can be downloaded from <http://www.psy.mq.edu.au/GCS>

## GLASGOW COMA SCALE (GCS) AND ABBREVIATED WESTMEAD PTA SCALE (A-WPTAS)

### Administration and Scoring

#### 1. Orientation Questions

**Question 1: WHAT IS YOUR NAME?**

The patient must provide their full name.

**Question 2: WHAT IS THE NAME OF THIS PLACE?**

The patient has to be able to give the name of the hospital. For example: Westmead Hospital. (NB: The patient does not get any points for just saying 'hospital'.) If the patient can not name the hospital, give them a choice of 3 options. To do this, pick 2 other similar sized hospitals in your local area or neighbouring region. In Westmead Hospital's case the 3 choices are 'Nepean Hospital, Westmead Hospital or Liverpool Hospital'.

**Question 3: WHY ARE YOU HERE?**

The patient must know why they were brought into hospital. e.g. they were injured in a car accident, fell, assaulted or injured playing sport. If the patient does not know, give them three options, including the correct reason.

**Question 4: WHAT MONTH ARE WE IN?**

For emphasis the examiner can ask what month are we in now? The patient must name the month. For example, if the patient answers 'the 6th month', the examiner must ask the further question 'What is the 6th month called?'.

**Question 5: WHAT YEAR ARE WE IN?**

It is considered correct for patients to answer in the short form '08', instead of '2008'. Also, an acceptable alternative prompt (for the rest of the 2000's) is 'The year is 2000 and what?'

#### 2. Picture recognition

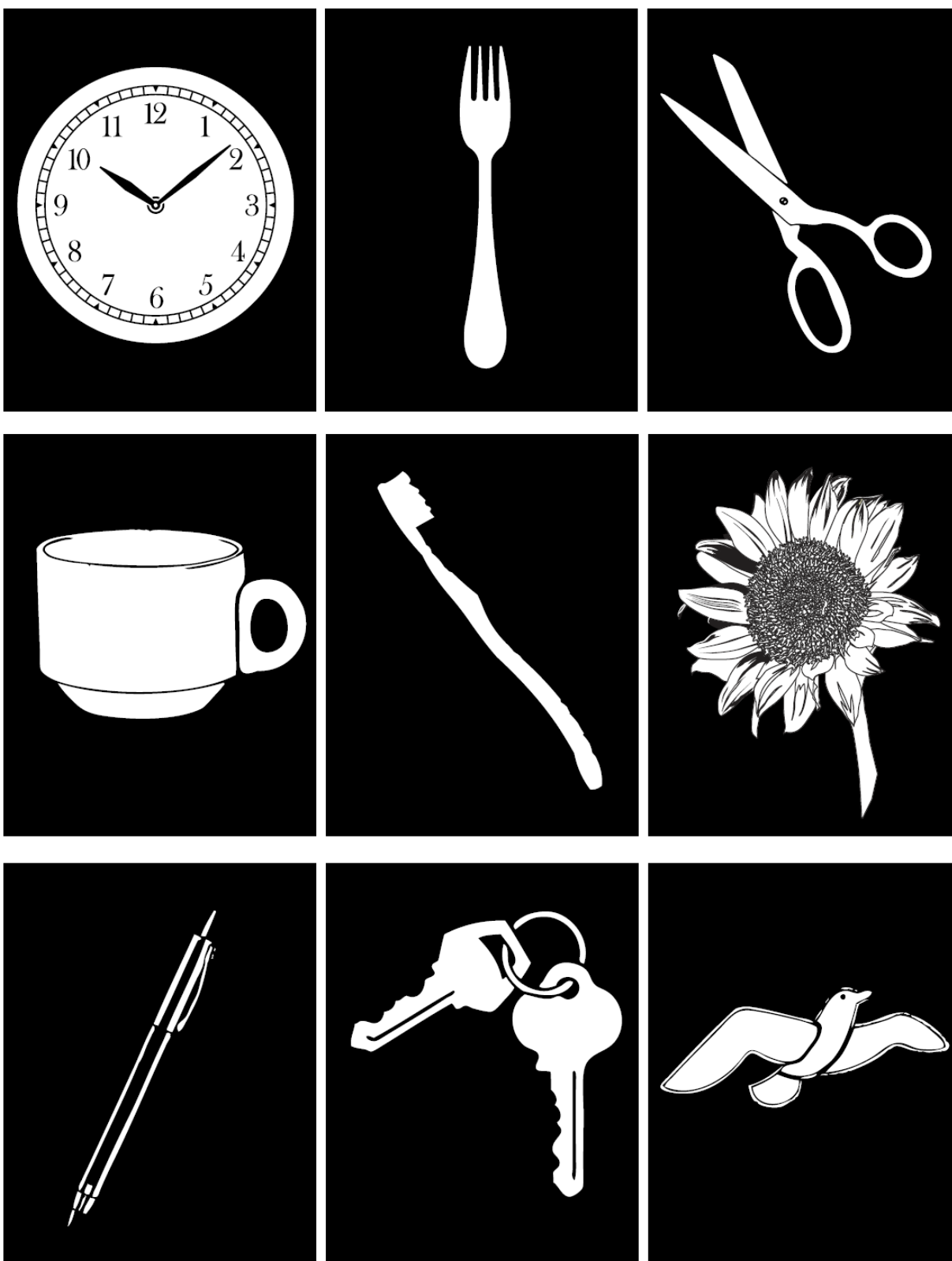
Straight after administering the GCS (standardised questions), administer the A-WPTAS by presenting the 3 Westmead PTA cards. Picture Cards the first time - T1 : Show patients the target set of picture cards for about 5 seconds and ensure that they can repeat the names of each card. Tell the patient to remember the pictures for the next testing in about one hour. Picture Cards at each subsequent time T2-T5: Ask patient, "What were the three pictures that I showed you earlier?" Scoring:

- For patients who free recall all 3 pictures correctly, assign a score of 1 per picture and add up the patient's GCS (out of 15) and A-WPTAS memory component to give the A-WPTAS score (total = 18). Present the 3 target pictures again and re-test in 1 hour.
- For patients who can not free recall, or only partially free recall, the 3 correct pictures, present the 9-object recognition chart. If patient can recognise any correctly, score 1 per correct item and record their GCS and A-WPTAS score (total = 18). Present the target set of pictures again and re-test in 1 hour.
- For patients who neither remember any pictures by free call nor recognition, show the patient the target set of 3 picture cards again for re-test in 1 hour.



Shores & Lammell (2007) - further copies of this score sheet can be downloaded from <http://www.psy.mq.edu.au/GCS>

Research and development of the A-WPTAS supported by the Motor Accidents Authority NSW



Shores & Lammell (2007) - further copies of this score sheet can be downloaded from <http://www.psy.mq.edu.au/GCS>

### BRAIN INJURY ADVICE CARD (LONG VERSION)

#### Important Points about Mild Brain Injury

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

#### Warning Signs

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

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

#### The First 24-48 Hours after Injury

- Warning Signs: **You should be observed and return to hospital if you develop any of the above warning signs.**
- Rest/Sleeping: Rest (both physical and mental) and avoid strenuous activity for at least 24 hours. It is alright for you to sleep tonight but you should be checked every four hours by someone to make sure you are alright.
- Driving: Do not drive for at least 24 hours. You should not drive until you feel much better and can concentrate properly. Talk to your doctor.
- Drinking/Drugs: Do not drink alcohol or take sleeping pills or recreational drugs in the next 48 hours. All of these can make you feel worse. They also make it hard for other people to tell whether the injury is affecting you or not.
- Pain Relief: Use **acetaminophen** or **acetaminophen/codeine** for headaches. **Do not use aspirin or anti inflammatory pain relievers** such as ibuprofen or naproxen (NSAIDs), which may increase the risk of complications.
- Sports: Do not play sports for at least 24 hours.

**See your local doctor if you are not starting to feel better within a few days of your injury.**

### The First 4 Weeks after Injury

You may have some common effects from the brain injury which usually resolve in several weeks to three months. These are called **post concussion symptoms** (see below). Tiredness can exaggerate the symptoms. Return to your normal activities gradually (not all at once) during the first weeks or months.

**You can help yourself get better by:**

- **Rest/Sleeping:** Your brain needs time to recover. It is important to get adequate amounts of sleep as you may feel more tired than normal and you need to get adequate amounts of both physical and mental rest.
- **Driving:** Do not drive or operate machinery until you feel much better and can concentrate properly. Talk to your doctor.
- **Drinking/Drugs:** Do not drink alcohol or use recreational drugs until you are fully recovered. They will make you feel much worse. Do not take medication unless advised by your doctor.
- **Work/Study:** You may need to take time off work or study until you can concentrate better. Most people need a day or two off work but are back full time in less than 2 weeks. How much time you need off work or study will depend on the type of job you do. See your doctor and let your employer or teachers know if you are having problems at work or with study. You may need to return to study or work gradually.
- **Sport/Lifestyle:** It is dangerous for the brain to be injured again if it has not recovered from the first injury. Talk to your doctor about the steps you need to take to gradually increase sports activity and return to play. **If in doubt, sit out.**
- **Relationships:** Sometimes your symptoms will affect your relationship with family and friends. You may suffer irritability and mood swings. See your doctor if you or your family are worried.

### Recovery

- You should start to feel better within a few days and be 'back to normal' within about 4 weeks. See your local doctor if you are not starting to feel better.
- Your doctor will monitor these symptoms and may refer you to a specialist if you do not improve over 4 weeks up to 3 months.

### Post Concussion Symptoms

There are common symptoms after a mild brain injury. **They usually go away within a few days or weeks.** Sometimes you may not be aware of them until sometime after your injury like when you return to work.

#### ❖ Mild headaches (that won't go away)

Headaches are a common problem after a mild brain injury. They can be made worse by fatigue and stress. Sleeping, resting or taking a break from activities requiring concentration or effort will usually relieve headaches. Pain relievers may help to break a cycle of headaches - use acetaminophen or acetaminophen/**codeine**, **not aspirin or anti inflammatory pain relievers** such as ibuprofen or naproxen (NSAIDs) as these may increase risk of complications. If your headache gets worse, or cannot be relieved, see your doctor.

#### ❖ Having more trouble than usual with attention & concentration

No one can concentrate well when they are tired, so it is not surprising that many people have trouble concentrating for a while after they have had a mild brain injury. Maybe you cannot even concentrate well enough to read the newspaper. If you really need to, just read for a short time, and then come back to it when you have had a break. The same thing applies to other areas where concentration is needed. Leave things that need your complete concentration until you are feeling better. If you need to concentrate on something important, do it when you are feeling fresh.



❖ Having more trouble than usual with remembering things (memory difficulties/forgetfulness)

You cannot expect your brain to be as good at remembering things as it usually is. Don't worry if you can't think of a name or a phone number that you ought to know, or if you go to get something, and then can't remember what it is. Your memory is only going to be a problem until you recover. In the meantime, get your family and friends to remind you of important dates and appointments, or write things down.

❖ Feeling dizzy or sick without vomiting (nausea)

Occasionally, people find that they get a sick or uncomfortable feeling if they move or change their position quickly. Usually it is only a problem for a few days. If you find that things seem to spin round if you sit up suddenly after lying down, or if you turn your head sharply, it is best to avoid such sudden movements or changes in position until it clears. If the dizziness persists for more than a week or two, see your doctor.

❖ Balance problems

You may find that you are a bit more clumsy than usual. Don't worry if you do find that you are a bit unsteady on your feet, or bump into furniture, or maybe drop things. Just take everything you do a little more slowly. Your brain is the control centre for your whole body. It has to make sense out of all the messages coming in from your eyes and ears and other senses, and to send the right signals to the right muscles for you to be able to do anything. So give yourself more time to do things.

❖ More difficulty than usual with making decisions and solving problems, getting things done or being organized

You may find you are less able to plan ahead or follow through the steps that are required in carrying out an activity. These kinds of difficulties may cause particular problems during the first few days after a mild brain injury but they are usually temporary in nature. When facing situations that present problems or opportunities to plan, it may help to think things through in a more structured and objective way. For example, you may want to ask yourself a series of questions like:

1. What do I want to achieve?
2. What are the available options?
3. What is the best option?
4. What steps will I need to take to achieve this?

After these questions have been considered and answered, you can then carry out your plan. Writing down a goal, plan or problem also helps to give structure to your thinking and helps to make things clearer. Using a daily and weekly time table, planner, or keeping a diary can provide structure and ensure that plans are made routinely and on an ongoing basis.

❖ Feeling vague, slowed or 'foggy' thinking

Some people who have sustained a mild brain injury find their thinking is a bit slower. This means they might have some difficulty keeping up with conversations or following directions, and things take longer to get done. Encourage others to slow down by asking questions and having them repeat what they have said. Allow yourself extra time to complete tasks and avoid situations where you are under pressure to do things quickly.

❖ Feeling more tired than usual and lacking energy (fatigue)

At first, even a little effort may make you feel very tired. Your brain has less energy to spare than it normally does. If you feel sleepy, go to bed. You will probably find that you need several hours more sleep than you usually do. Let your brain tell you when it needs to sleep, even if it is the middle of the day.

- ❖ **Irritability/mood swings. Losing your temper and getting annoyed easily**  
Some people who have had a mild brain injury find that they get annoyed easily by things that normally would not upset them. This does not last very long, but it can be difficult for you and for your family. It happens because the brain controls your emotional system as well as the rest of your body. After a mild brain injury your emotions may not be as well controlled as they usually are. There are several ways to deal with this. Some people find that going out of a room, or away from a situation as soon as it begins to get annoying is enough. Others use relaxation techniques (controlled breathing, progressive muscle relaxation) to help them get back on an even keel. You may find that you can stop the irritability from developing by doing an activity that uses up some physical energy like riding an exercise bicycle, if tiredness permits. Irritability will be worse when you are tired, so rest will also help.
- ❖ **Anxiety or depression**  
Feeling anxious, worried, frightened, angry and low in mood are normal emotions after sustaining a mild brain injury. These feelings often pass in the weeks following the injury, as a person gradually resumes their usual activities. Recognise that emotional upset and worry is a normal part of recovery, even though you may have suffered an injury in the past and not felt like this before. Explain any difficulties that you are experiencing to your family and friends, so that they can understand the effect the injury has had on you and support you in managing your difficulties. Recognise if your worry about symptoms intensifies and a vicious circle develops. If that happens remind yourself of the point above. If symptoms nevertheless do not improve, or if you have suffered from anxiety or depression before the injury and the brain injury has intensified those feelings, visit your doctor.
- ❖ **More sensitive to lights or sounds**  
You may find that your eyes are sensitive to bright light. Wearing dark glasses in strong light can help to manage this and the need for dark glasses will likely clear up within a few days. When you want to shut out something you don't want to look at, all you have to do is close your eyes. It is much harder to shut your ears. When your brain is fully awake it uses part of its energy to dampen down noises that would interfere with what you are doing. After a mild brain injury your brain may not have enough energy to spare to do this, and you may find that most noises bother you. Explain to your family and friends, and ask them to keep the noise level down if they can.
- ❖ **Change in sleep patterns. Trouble sleeping or sleeping too much**  
Don't worry about the sleep disturbance. This is usually temporary and your normal routine will come back gradually. If you are having trouble falling asleep you may try things like reducing stimulation by not watching TV in bedroom or spending long times on the computer, avoiding a large meal before bed, avoiding caffeine, using relaxation techniques (controlled breathing, progressive muscle relaxation), or getting up for about 30 minutes if you are unable to sleep for long periods. It is best to avoid sleep medications but if your sleeping pattern has become very disrupted, discuss with your doctor if a short course of medication may be helpful in re-establishing your sleeping pattern.
- ❖ **Reduced tolerance to alcohol**  
After a mild brain injury you may be more sensitive to the effects of alcohol. A small amount may worsen the effects of the brain injury. It can cause unsteadiness and dizziness which may lead to a fall and further injury. It is sensible to avoid alcohol for at least one week after injury and then monitor carefully how alcohol affects you. Reduce your normal intake until you feel fully recovered.
- ❖ **Tinnitus. Ringing in the ears**  
Tinnitus is due to damage to the inner ear after brain injury. It is usually described as a whistling, ringing or roaring sound and may be accompanied by some hearing loss. It usually settles on its own within a few weeks after injury. If the ringing in your ears gets worse or does not go away, see your doctor.

Information included on this advice card was adapted from the *Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury following Closed Head Injury* (MAA NSW, 2008) and the *Information about Mild Head Injury or Concussion* booklet (Ponsford, Willmott, Nelms & Curran, 2004).

## BRAIN INJURY ADVICE CARD (SHORT VERSION)

### Important Points about Mild Brain Injury

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

### Warning Signs

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

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

### The First 24-48 Hours after Injury

- Warning Signs: **You should be observed and return to hospital if you develop any of the above warning signs.**
- Rest/Sleeping: Rest (both physical and mental) and avoid strenuous activity for at least 24 hours. It is alright for you to sleep tonight but you should be checked every four hours by someone to make sure you are alright.
- Driving: Do not drive for at least 24 hours. You should not drive until you feel much better and can concentrate properly. Talk to your doctor.
- Drinking/Drugs: Do not drink alcohol or take sleeping pills or recreational drugs in the next 48 hours. All of these can make you feel worse. They also make it hard for other people to tell whether the injury is affecting you or not.
- Pain Relief: Use **acetaminophen** or **acetaminophen/codeine** for headaches. **Do not use aspirin or anti inflammatory pain relievers** such as ibuprofen or naproxen (NSAIDs), which may increase the risk of complications.
- Sports: Do not play sports for at least 24 hours.

**See your local doctor if you are not starting to feel better within a few days of your injury.**

### **The First 4 Weeks after Injury**

You may have some common effects from the brain injury which usually resolve in several weeks to three months. These are called **post concussion symptoms**. Tiredness can exaggerate the symptoms.

Return to your normal activities gradually (not all at once) during the first weeks or months. **You can help yourself get better by:**

- **Rest/Sleeping:** Your brain needs time to recover. It is important to get adequate amounts of sleep as you may feel more tired than normal and you need to get adequate amounts of both physical and mental rest.
- **Driving:** Do not drive or operate machinery until you feel much better and can concentrate properly. Talk to your doctor.
- **Drinking/Drugs:** Do not drink alcohol or use recreational drugs until you are fully recovered. They will make you feel much worse. Do not take medication unless advised by your doctor.
- **Work/Study:** You may need to take time off work or study until you can concentrate better. Most people need a day or two off work but are back full time in less than 2 weeks. How much time you need off work or study will depend on the type of job you do. See your doctor and let your employer or teachers know if you are having problems at work or with study. You may need to return to study or work gradually.
- **Sport/Lifestyle:** It is dangerous for the brain to be injured again if it has not recovered from the first injury. Talk to your doctor about the steps you need to take to gradually increase sports activity and return to play. **If in doubt, sit out.**
- **Relationships:** Sometimes your symptoms will affect your relationship with family and friends. You may suffer irritability and mood swings. See your doctor if you or your family are worried.

### **Recovery**

- You should start to feel better within a few days and be 'back to normal' within about 4 weeks. See your local doctor if you are not starting to feel better.
- Your doctor will monitor these symptoms and may refer you to a specialist if you do not improve over 4 weeks up to 3 months.

Information included on this advice card was adapted from the Motor Accidents Authority of NSW, *Guidelines for Mild Traumatic Brain Injury following a Closed Head Injury* (MAA NSW, 2008) and the *Information about Mild Head Injury or Concussion* booklet (Ponsford, Willmott, Nelms & Curran, 2004).

## APPENDIX 1.3

### RIVERMEAD POST CONCUSSION SYMPTOMS QUESTIONNAIRE

#### The Rivermead Post Concussion Symptoms Questionnaire

After a head injury or accident some people experience symptoms which can cause worry or nuisance. We would like to know if you now suffer from any of the symptoms given below. As many of these symptoms occur normally, we would like you to compare yourself now with before the accident. For each one, please circle the number closest to your answer.

- 0 = Not experienced at all
- 1 = No more of a problem
- 2 = A mild problem
- 3 = A moderate problem
- 4 = A severe problem

Compared with before the accident, do you now (i.e., over the last 24 hours) suffer from:

Headaches.....	0	1	2	3	4
Feelings of Dizziness .....	0	1	2	3	4
Nausea and/or Vomiting .....	0	1	2	3	4
Noise Sensitivity,					
easily upset by loud noise .....	0	1	2	3	4
Sleep Disturbance.....	0	1	2	3	4
Fatigue, tiring more easily .....	0	1	2	3	4
Being Irritable, easily angered .....	0	1	2	3	4
Feeling Depressed or Tearful .....	0	1	2	3	4
Feeling Frustrated or Impatient .....	0	1	2	3	4
Forgetfulness, poor memory .....	0	1	2	3	4
Poor Concentration .....	0	1	2	3	4
Taking Longer to Think .....	0	1	2	3	4
Blurred Vision .....	0	1	2	3	4
Light Sensitivity,					
Easily upset by bright light.....	0	1	2	3	4
Double Vision .....	0	1	2	3	4
Restlessness .....	0	1	2	3	4

Are you experiencing any other difficulties?

1. \_\_\_\_\_ 0 1 2 3 4
2. \_\_\_\_\_ 0 1 2 3 4

King NS, Crawford S, Wenden FJ, Moss NE, Wade DT. The Rivermead Post Concussion Symptoms Questionnaire: a measure of symptoms commonly experienced after head injury and its reliability. *Journal of Neurology*. 1995;242(9):587-592. © Springer-Verlag 1995

## APPENDIX 2.1

### SPECIALIZED BRAIN INJURY CLINICS/CENTRES IN ONTARIO

INSTITUTION	LOCATION AND CONTACT INFORMATION	SERVICES PROVIDED
<b>Bridgepoint Health</b>	<b>Mailing Address:</b> 14 St. Matthews Road Toronto, ON, M4M 2B5 <b>Phone:</b> 416-461-8252 <b>Fax:</b> 416-461-5696 <b>Information Contact:</b> Utilization Specialist, Neuro Rehab and Activation - 416-461-8252 ext. 2305; Case Manager, Day Treatment Extension: ext. 2371 <b>Website:</b> <a href="http://www.bridgepointhealth.ca/Home.aspx">http://www.bridgepointhealth.ca/Home.aspx</a>	In patient active neuro rehab, Neuropsychology, Nursing, Occupational Therapy, Out patient rehab, Physiotherapy, Social work, Speech-Language Pathology
<b>Hamilton Health Sciences: ABI Program</b>	<b>Mailing Address:</b> Regional Rehabilitation Centre - Hamilton Health Sciences 237 Barton Street East Hamilton, ON, L8L 2X2 <b>Phone:</b> 905-521-2100 ext. 74101 <b>Information Contact:</b> John Zsofcsin, Clinical Manager <b>Website:</b> <a href="http://www.hhsc.ca/body.cfm?xyzpdqabc=0&amp;id=11&amp;action=detail&amp;ref=5">http://www.hhsc.ca/body.cfm?xyzpdqabc=0&amp;id=11&amp;action=detail&amp;ref=5</a>	Behavioural, Cognitive, Communication, Community reintegration, In patient rehab, Medical, Outpatient rehab, Physical, Psychological, Psychosocial, and Psychiatric components as necessary
<b>Ottawa Hospital Rehab Centre: ABI Program</b>	<b>Mailing Address:</b> 1102 - 505 Smyth Road Ottawa, ON, K1H 8M2 <b>Phone:</b> 613-737-7350 <b>Fax:</b> 613-737-7056 <b>Information Contact:</b> Marilyn Church (mchurch@toh.on.ca) or Nancy Waters (nwaters@toh.on.ca ) <b>Website:</b> <a href="http://www.ottawahospital.on.ca/sc/rehabcentre/servicesclinics/abi-e.asp">http://www.ottawahospital.on.ca/sc/rehabcentre/servicesclinics/abi-e.asp</a>	Anger management, Behavioural Rehab, Brain injury education, Cognitive Rehab, Emotional Adjustment, Family education, Financial management, Hospital (In Patient Rehab), Neuropsychological Assessment, Occupational Therapy, Out Patient Rehab, Physiotherapy, Recreational Therapy, Social work, Stress management, Vocational preparation
<b>Parkwood Hospital</b>	<b>Mailing Address:</b> 801 Commissioners Road London, ON, N6C 5J1 <b>Phone:</b> 519-685-4064 <b>Fax:</b> 519-685-4066 <b>Information Contact:</b> Maureen Hilditch (519-685-4064) <b>Website:</b> <a href="http://www.sjhc.london.on.ca/parkwood/programs/rehab/abi.htm">http://www.sjhc.london.on.ca/parkwood/programs/rehab/abi.htm</a>	Cognitive Rehab, Community-based Out patient Rehab, Job Coaching, Job Placement Support, Neuropsychological Assessment, Nursing Care, Nursing Homes/Long-term Care Facility, Nutritional, Occupational Therapy, Recreational Therapy, School Reintegration, Speech-Language Therapy



<b>St. Joseph's Care Group: ABI Program</b>	<b>Mailing Address:</b> 35 North Algoma Street Box 3251 Thunder Bay, ON, P7B 5G7 <b>Phone:</b> 807-343-2431 <b>Fax:</b> 807-343-0144 <b>Information Contact:</b> Pr Director (nelson@tbh.net) <b>Website:</b> <a href="http://www.sjcg.net/services/complex-physical-rehab/physical-rehab/abi.aspx">http://www.sjcg.net/services/complex-physical-rehab/physical-rehab/abi.aspx</a>	Cognitive Rehab, Hospital (In patient) Rehab, Neuropsychological Assessment, Nutritional, Occupational Therapy, Recreational Therapy, Social Work, Speech-Language Therapy
<b>St. Joseph's Health Care: ABI Program</b>	<b>Mailing Address:</b> 100 Westmount Road Guelph, ON, N1H 5H8 <b>Phone:</b> 519-524-6000 <b>Fax:</b> 519-767-3437 <b>Information Contact:</b> Paula Rogers (info@sjhh.guelph.on.ca) <b>Website:</b> <a href="http://www.sjhh.guelph.on.ca/default.aspx">http://www.sjhh.guelph.on.ca/default.aspx</a>	Community outreach services, Complex continuing care, Physiatry services, Rehabilitation services.
<b>St. Mary's of the Lake Hospital: ABI Program</b>	<b>Mailing Address:</b> 340 Union Street Kingston, ON, K7L 5A2 <b>Phone:</b> 613-544-5220 <b>Fax:</b> 613-544-8558 <b>Information Contact:</b> Acquired Brain Injury Clinic Referrals - 613-544-1894 <b>Website:</b> <a href="http://www.pccchealth.org/cms/sitem.cfm/clinical_services/rehabilitation/physical_medicine_and_rehabilitation_clinics/">http://www.pccchealth.org/cms/sitem.cfm/clinical_services/rehabilitation/physical_medicine_and_rehabilitation_clinics/</a>	In patient Rehab, Medical assessment, Out patient Rehab, Regional community brain injury service, Referrals for treatment to therapists and other agencies as appropriate.
<b>St. Michael's Hospital: Follow-up Head Injury Clinic</b>	<b>Mailing Address:</b> 30 Bond Street Toronto, ON, M5B 1W8 <b>Phone:</b> 416-864-5520 <b>Information Contact:</b> Alicja Michalak - Case Manager: 416-864-5520; Kristina Kennedy - Admin/Research: 416-864-6060 ext. 6359 <b>Website:</b> <a href="http://www.stmichaelshospital.com/programs/trauma/head-injury-clinic.php">http://www.stmichaelshospital.com/programs/trauma/head-injury-clinic.php</a>	Cognitive services, Medical services, Patient and family education and support, Psychiatry services, Psycho-social services
<b>Sudbury Regional Hospital</b>	<b>Mailing Address:</b> 41 Ramsey Lake Road Sudbury, ON, P3E 5J1 <b>Phone:</b> 705-523-7100 <b>Fax:</b> 705-523-7051 <b>Information Contact:</b> Kathy Lee (klee@hrsrh.on.ca) <b>Website:</b> <a href="http://www.hrsrh.on.ca/portalEn/ProgramsandServices/ContinuingCareandRehabilitation/tabid/562/Default.aspx">http://www.hrsrh.on.ca/portalEn/ProgramsandServices/ContinuingCareandRehabilitation/tabid/562/Default.aspx</a>	Aquatic Therapy, Case Management, Cognitive Rehab, Cognitive Therapy, Community Living Skills, Community Reintegration, Community-based Out patient Rehab, Hospital (In Patient) Rehab, Occupational Therapy, Physiotherapy, Recreational Therapy, Social Work

<b>Sunnybrook Health Sciences Centre: Mild to Moderate TBI Clinic</b>	<b>Mailing Address:</b> 2075 Bayview Avenue North York, ON, M4N 3M5 <b>Information Contact:</b> Alison Jardine, TBI Clinic Coordinator. <b>Phone:</b> 416-480-4095, <b>Fax:</b> 416-480-4613, <b>E-mail:</b> alison.jardine@sunnybrook.ca <b>Website:</b> <a href="http://sunnybrook.ca/content/?page=Focus_BSP_Home">http://sunnybrook.ca/content/?page=Focus_BSP_Home</a>	Patients are seen within the first 3 months after injury. Brain injury education, Medical services for physical symptoms, Neuropsychiatric services for cognitive, emotional, or behavioural difficulties
<b>Toronto Rehabilitation Institute</b>	<b>Mailing Address:</b> 550 University Avenue Toronto, ON, M5G 2A2 <b>Information Contact:</b> Richard Khoo, Program Services Manager, Neuro Cognitive Stream: 416-597-3422 ext. 3950; Elaine Widdett, Program Service Manager, Neuro Physical Stream: 416-597-3422 ext. 3804; Carmen Volpe, Service Coordinator: 416-597-3422 ext. 3493 <b>Website:</b> <a href="http://www.torontorehab.on.ca/patient/neuro/index.htm">http://www.torontorehab.on.ca/patient/neuro/index.htm</a>	Behavioural Rehab, Cognitive Rehab, Hospital (In patient) Rehab, Neuropsychological Assessment, Occupational Therapy, Out patient Rehab, Patient and Family Education, Recreational Therapy, Social Work, Speech-Language Therapy
<b>Trillium Health Centre: Outpatient Neurorehab Services</b>	<b>Mailing Address:</b> 100 Queensway West Mississauga, ON, L5B 1B8 <b>Phone:</b> 905-848-7100 <b>Information Contact:</b> 905-848-7580 ext. 2474 <b>Website:</b> <a href="http://www.trilliumhealthcentre.org/index.html">http://www.trilliumhealthcentre.org/index.html</a>	Nursing, Occupational Therapy, Physiotherapy, Speech Language Pathology, Social Work
<b>University Health Network: Toronto Western Hospital</b>	<b>Mailing Address:</b> 399 Bathurst Street Toronto, ON, M5T 2S8 <b>Information Contact:</b> Dr. Chanth Seyone (Director): 416-603-5009 or Dr. Minella de Souza: 416-603-5009 <b>Website:</b> <a href="http://www.uhn.ca/clinics_&amp;_Services/clinics/psychiatry/programs/Neuropsychiatry/Clinics/brain_injury.asp">http://www.uhn.ca/clinics_&amp;_Services/clinics/psychiatry/programs/Neuropsychiatry/Clinics/brain_injury.asp</a>	Case Management, Neuropsychiatric services, Patient and family support, Sleep therapy.
<b>York-Simcoe Brain Injury Services (associated with York Central Hospital)</b>	<b>RICHMOND HILL OFFICE</b> 13311 Yonge Street, Suite 202 Richmond Hill, ON, L4C 3L6 <b>Phone:</b> 905-773-3038, <b>Toll free:</b> 1-800-362-7793 <b>Fax:</b> 905-773-5176 <b>BARRIE OFFICE</b> 570 Bryne Drive, Unit H Barrie, ON, L4N 9P6 <b>Phone:</b> 705-721-7793 <b>Fax:</b> 705-728-7456 <b>Information Contact:</b> Client Services Associate, 905-773-3038 ext 6193	Behavioural assessment, treatment, and consultation, Brain Injury education, Caregiver workshops, Case management, Neuropsychological/ Neuropsychiatric assessment, Problem solving groups, Rehabilitation community support

## APPENDIX 3.1

### SPORT CONCUSSION ASSESSMENT TOOL (SCAT2; McCrory et al., 2009\*)

# SCAT2

## Sport Concussion Assessment Tool 2



Name \_\_\_\_\_

Sport/team \_\_\_\_\_

Date/time of injury \_\_\_\_\_

Date/time of assessment \_\_\_\_\_

Age \_\_\_\_\_ Gender ☐ M ☐ F

Years of education completed \_\_\_\_\_

Examiner \_\_\_\_\_

#### What is the SCAT2?¹

This tool represents a standardized method of evaluating injured athletes for concussion and can be used in athletes aged from 10 years and older. It supersedes the original SCAT published in 2005². This tool also enables the calculation of the Standardized Assessment of Concussion (SAC)³,⁴ score and the Maddocks questions⁵ for sideline concussion assessment.

#### Instructions for using the SCAT2

The SCAT2 is designed for the use of medical and health professionals. Preseason baseline testing with the SCAT2 can be helpful for interpreting post-injury test scores. Words in *italics* throughout the SCAT2 are the instructions given to the athlete by the tester.

This tool may be freely copied for distribution to individuals, teams, groups and organizations.

#### What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific symptoms (like those listed below) and often does not involve loss of consciousness. 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.

**Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle.**

## Symptom Evaluation

### How do you feel?

You should score yourself on the following symptoms, based on how you feel now.

	none	mild		moderate		severe	
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

**Total number of symptoms** (Maximum possible 22) \_\_\_\_\_

**Symptom severity score** \_\_\_\_\_

(Add all scores in table, maximum possible: 22 x 6 = 132)

Do the symptoms get worse with physical activity? ☐ Y ☐ N

Do the symptoms get worse with mental activity? ☐ Y ☐ N

#### Overall rating

If you know the athlete well prior to the injury, how different is the athlete acting compared to his / her usual self? Please circle one response.

no different

very different

unsure

\* McCrory P, Meeuwisse W, Johnston K et al. Consensus statement on concussion in sport: 3rd international conference on concussion in sport held in Zurich, November 2008. *British Journal of Sport Medicine*. 2009;43:76-84.

# Cognitive & Physical Evaluation

**1 Symptom score** (from page 1)  
22 minus number of symptoms of 22

**2 Physical signs score**  
Was there loss of consciousness or unresponsiveness? ☐ Y ☐ N  
If yes, how long?  minutes  
Was there a balance problem/unsteadiness? ☐ Y ☐ N  
**Physical signs score** (1 point for each negative response) of 2

**3 Glasgow coma scale (GCS)**  
**Best eye response (E)**  
No eye opening 1  
Eye opening in response to pain 2  
Eye opening to speech 3  
Eyes opening spontaneously 4  
**Best verbal response (V)**  
No verbal response 1  
Incomprehensible sounds 2  
Inappropriate words 3  
Confused 4  
Oriented 5  
**Best motor response (M)**  
No motor response 1  
Extension to pain 2  
Abnormal flexion to pain 3  
Flexion/Withdrawal to pain 4  
Localizes to pain 5  
Obey commands 6  
**Glasgow Coma score (E + V + M)** of 15  
GCS should be recorded for all athletes in case of subsequent deterioration.

**4 Sideline Assessment – Maddocks Score**  
*"I am going to ask you a few questions, please listen carefully and give your best effort."*  
**Modified Maddocks questions** (1 point for each correct answer)  
At what venue are we at today? 0 1  
Which half is it now? 0 1  
Who scored last in this match? 0 1  
What team did you play last week/game? 0 1  
Did your team win the last game? 0 1  
**Maddocks score** of 5  
Maddocks score is validated for sideline diagnosis of concussion only and is not included in SCAT 2 summary score for serial testing.

**5 Cognitive assessment**  
**Standardized Assessment of Concussion (SAC)**  
**Orientation** (1 point for each correct answer)  
What month is it? 0 1  
What is the date today? 0 1  
What is the day of the week? 0 1  
What year is it? 0 1  
What time is it right now? (within 1 hour) 0 1  
**Orientation score** of 5

**Immediate memory**  
*"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."*

**Trials 2 & 3:**  
*"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."*

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. Score 1 pt. for each correct response. Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

List	Trial 1	Trial 2	Trial 3	Alternative word list
elbow	0 1	0 1	0 1	candle baby finger
apple	0 1	0 1	0 1	paper monkey penny
carpet	0 1	0 1	0 1	sugar perfume blanket
saddle	0 1	0 1	0 1	sandwich sunset lemon
bubble	0 1	0 1	0 1	wagon iron insect
<b>Total</b>				

**Immediate memory score** of 15

**Concentration**  
**Digits Backward:**  
*"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."*  
If correct, go to next string length. If incorrect, read trial 2. One point possible for each string length. Stop after incorrect on both trials. The digits should be read at the rate of one per second.

	Alternative digit lists
4-9-3	0 1 6-2-9 5-2-6 4-1-5
3-8-1-4	0 1 3-2-7-9 1-7-9-5 4-9-6-8
6-2-9-7-1	0 1 1-5-2-8-6 3-8-5-2-7 6-1-8-4-3
7-1-8-4-6-2	0 1 5-3-9-1-4-8 8-3-1-9-6-4 7-2-4-8-5-6

**Months in Reverse Order:**  
*"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"*

1 pt. for entire sequence correct  
Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan 0 1

**Concentration score** of 5

<sup>1</sup> This tool has been developed by a group of international experts at the 3<sup>rd</sup> International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2008. The full details of the conference outcomes and the authors of the tool are published in British Journal of Sports Medicine, 2009, volume 43, supplement 1. The outcome paper will also be simultaneously co-published in the May 2009 issues of Clinical Journal of Sports Medicine, Physical Medicine & Rehabilitation, Journal of Athletic Training, Journal of Clinical Neuroscience, Journal of Science & Medicine in Sport, Neurosurgery, Scandinavian Journal of Science & Medicine in Sport and the Journal of Clinical Sports Medicine.

<sup>2</sup> McCrory P et al. Summary and agreement statement of the 2<sup>nd</sup> International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine. 2005; 39: 196-204

<sup>3</sup> McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sports Medicine. 2001; 11: 176-181

<sup>4</sup> McCrea M, Randolph C, Kelly J. Standardized Assessment of Concussion: Manual for administration, scoring and interpretation. Waukesha, Wisconsin, USA.

<sup>5</sup> Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32-3

<sup>6</sup> Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30



## 6

## Balance examination

This balance testing is based on a modified version of the Balance Error Scoring System (BESS). A stopwatch or watch with a second hand is required for this testing.

## Balance testing

*"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances."*

## (a) Double leg stance:

*"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."*

## (b) Single leg stance:

*"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, 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."*

## (c) Tandem stance:

*"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, 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."*

## Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

Which foot was tested: ☐ Left ☐ Right  
(i.e. which is the **non-dominant** foot)

Condition	Total errors
Double Leg Stance (feet together)	of 10
Single leg stance (non-dominant foot)	of 10
Tandem stance (non-dominant foot at back)	of 10
<b>Balance examination score (30 minus total errors)</b>	<b>of 30</b>

## 7

## Coordination examination

## Upper limb coordination

Finger-to-nose (FTN) task: *"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."*

Which arm was tested: ☐ Left ☐ Right

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. Failure should be scored as 0.

Coordination score

of 1

## 8

## Cognitive assessment

## Standardized Assessment of Concussion (SAC)

## Delayed recall

*"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."*

Circle each word correctly recalled. Total score equals number of words recalled.

List	Alternative word list		
elbow	candle	baby	finger
apple	paper	monkey	penny
carpet	sugar	perfume	blanket
saddle	sandwich	sunset	lemon
bubble	wagon	iron	insect

Delayed recall score

of 5

## Overall score

Test domain	Score
Symptom score	of 22
Physical signs score	of 2
Glasgow Coma score (E + V + M)	of 15
Balance examination score	of 30
Coordination score	of 1
<b>Subtotal</b>	<b>of 70</b>
Orientation score	of 5
Immediate memory score	of 5
Concentration score	of 15
Delayed recall score	of 5
<b>SAC subtotal</b>	<b>of 30</b>
<b>SCAT2 total</b>	<b>of 100</b>
<b>Maddocks Score</b>	<b>of 5</b>

Definitive normative data for a SCAT2 "cut-off" score is not available at this time and will be developed in prospective studies. Embedded within the SCAT2 is the SAC score that can be utilized separately in concussion management. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in neurological functioning.

**Scoring data from the SCAT2 or SAC should not be used as a stand alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.**

## Athlete Information

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

### Signs to watch for

Problems could arise over the first 24-48 hours. You should not be left alone and must go to a hospital at once if you:

- Have a headache that gets worse
- Are very drowsy or can't be awakened (woken up)
- Can't recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused; are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on your feet; have slurred speech

**Remember, it is better to be safe.**

**Consult your doctor after a suspected concussion.**

### Return to play

Athletes should not be returned to play the same day of injury.

When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:

1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages.

**Medical clearance should be given before return to play.**

Tool	Test domain	Time	Score			
SCAT2	Date tested					
	Days post injury					
	Symptom score					
	Physical signs score					
	Glasgow Coma score (E + V + M)					
	Balance examination score					
	Coordination score					
	Orientation score					
	Immediate memory score					
	Concentration score					
	Delayed recall score					
	SAC Score					
Total	SCAT2					
Symptom severity score (max possible 132)						
Return to play			<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

### Additional comments

.....

## Concussion injury advice (To be given to concussed athlete)

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

**If you notice any change in behaviour, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please telephone the clinic or the nearest hospital emergency department immediately.**

### Other important points:

- Rest and avoid strenuous activity for at least 24 hours
- No alcohol
- No sleeping tablets
- Use paracetamol or codeine for headache. Do **not** use aspirin or anti-inflammatory medication
- Do **not** drive until medically cleared
- Do **not** train or play sport until medically cleared

Clinic phone number

Patient's name

Date/time of injury

Date/time of medical review

Treating physician

Contact details or stamp



# Pocket SCAT2



**FIFA®**



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

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\* McCrory P, Meeuwisse W, Johnston K et al. Consensus statement on concussion in sport: 3rd international conference on concussion in sport held in Zurich, November 2008. *British Journal of Sport Medicine*. 2009;43:76-84.

## 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."*

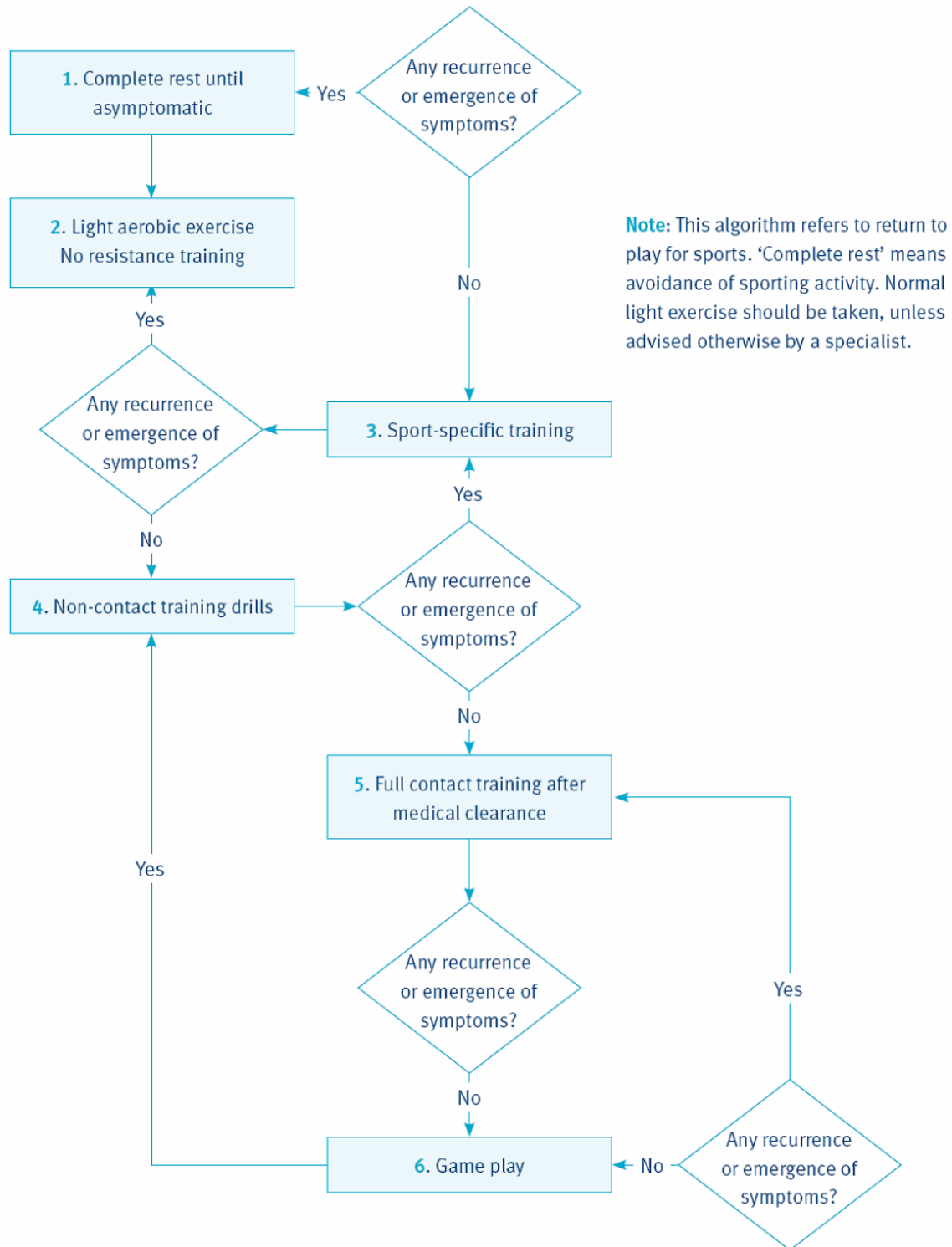
Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more than 5 seconds) then this may suggest a concussion.

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**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.**

## APPENDIX 3.3

SAFE STEPS TO RETURN TO PLAY AFTER A POSSIBLE TRAUMATIC BRAIN INJURY ALGORITHM FROM THE NEW ZEALAND GUIDELINES GROUP GUIDELINE 'TRAUMATIC BRAIN INJURY: DIAGNOSIS, ACUTE MANAGEMENT AND REHABILITATION' (NZGG, 2006)





## APPENDIX 4.1

### ICD-10 DEFINITIONS FOR DIFFERENTIAL DIAGNOSES RELATED TO mTBI

<b>Depressive Episode</b> (F32)	<p>In typical mild, moderate, or severe depressive episodes, the patient suffers from lowering of mood, reduction of energy, and decrease in activity. Capacity for enjoyment, interest and concentration is reduced, and marked tiredness after even minimum effort is common. Sleep is usually disturbed and appetite diminished. Self-esteem and self-confidence are almost always reduced and, even in the mild form, some ideas of guilt and worthlessness are often present. The lowered mood varies little from day to day, is unresponsive to circumstances and may be accompanied by so-called "somatic" symptoms, such as loss of interest and pleasurable feelings, waking in the morning several hours before the usual time, depression worst in the morning, marked psychomotor retardation, agitation, loss of appetite, weight loss, and loss of libido. Depending upon the number and severity of symptoms, a depressive episode may be specified as mild, moderate or severe.</p> <p><i>Includes:</i> Single episodes of:</p> <ul style="list-style-type: none"> <li>• Depressive reaction</li> <li>• Psychogenic depression</li> <li>• Reactive depression</li> </ul> <p><i>Excludes:</i> Adjustment disorder Recurrent depressive disorder When associated with conduct disorders</p>
<b>Organic Anxiety Disorder</b> (F06.4)	<p>A disorder characterized by the essential descriptive features of a generalized anxiety disorder (see below), a panic disorder (see below), or a combination of both, but arising as a consequence of an organic disorder.</p> <p><i>Excludes:</i> Anxiety disorders, nonorganic or unspecified</p>
<b>Generalized Anxiety Disorder</b> (F41.1)	<p>Anxiety that is generalized and persistent but not restricted to, or even strongly predominating in, any particular environmental circumstances (i.e., it is "free-floating"). The dominant symptoms are variable but include complaints of persistent nervousness, trembling, muscular tensions, sweating, lightheadedness, palpitations, dizziness, and epigastric discomfort. Fears that the patient or a relative will shortly become ill or have an accident are often expressed.</p> <p>Anxiety:   Neurosis               Reaction               State</p> <p><i>Excludes:</i> Neurasthenia</p>
<b>Panic Disorder</b> (F41.0)	<p>The essential feature is recurrent attacks of severe anxiety (panic), which are not restricted to any particular situation or set of circumstances and are therefore unpredictable. As with other anxiety disorders, the dominant symptoms include sudden onset of palpitations, chest pain, choking sensations, dizziness, and feelings of unreality (depersonalization or derealization). There is often also a secondary fear of dying, losing control, or going mad. Panic disorder should not be given as the main diagnosis if the patient has a depressive disorder at the time the attacks start; in these circumstances the panic attacks are probably secondary to depression.</p> <p>Panic:     Attack               State</p> <p><i>Excludes:</i> Panic disorder with agoraphobia</p>

<b>Post Traumatic Stress Disorder</b> (F43.1)	<p>Arises as a delayed or protracted response to a stressful event or situation (of either brief or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone. Predisposing factors, such as personality traits (e.g., compulsive, asthenic) or previous history of neurotic illness, may lower the threshold for the development of the syndrome or aggravate its course, but they are neither necessary nor sufficient to explain its occurrence. Typical features include episodes of repeated reliving of the trauma in intrusive memories (“flashbacks”), dreams or nightmares, occurring against the persisting background of a sense of “numbness” and emotional blunting, detachment from other people, unresponsiveness to surroundings, anhedonia, and avoidance of activities and situations reminiscent of the trauma. There is usually a state of autonomic hyperarousal with hypervigilance, an enhanced startle reaction, and insomnia. Anxiety and depression are commonly associated with the above symptoms and signs, and suicidal ideation is not infrequent. The onset follows the trauma with a latency period that may range from a few weeks to months. The course is fluctuating but recovery can be expected in the majority of cases. In a small proportion of cases the condition may follow a chronic course over many years, with eventual transition to an enduring personality change.</p>
<b>Persistent Somatoform Pain Disorder</b> (F45.4)	<p>The predominant complaint is of persistent, severe, and distressing pain, which cannot be explained fully by a physiological process or a physical disorder, and which occurs in association with emotional conflict or psychosocial problems that are sufficient to allow the conclusion that they are the main causative influences. The result is usually a marked increase in support and attention, either personal or medical. Pain presumed to be of psychogenic origin occurring during the course of depressive disorders or schizophrenia should not be included here.</p> <p>Psychalgia  Psychogenic: Backache  Headache  Somatoform pain disorder</p> <p><i>Excludes:</i> Backache NOS  Pain: NOS  Acute  Chronic  Intractable  Tension headache</p>
<b>Whiplash Associated Disorder</b> (S13.4)	<p><b>Sprain and Strain of Cervical Spine</b></p> <p>Anterior longitudinal (ligament), cervical  Atlanto-axial (joints)  Atlanto-occipital (joints)  Whiplash injury</p>
<b>Substance Dependence Syndrome</b> (F19.2)	<p>A cluster of behavioural, cognitive, and physiological phenomena that develop after repeated substance use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite harmful consequences, a higher priority given to drug use than to other activities and obligations, increased tolerance, and sometimes a physical withdrawal state.</p> <p>The dependence syndrome may be present for a specific psychoactive substance (e.g., tobacco, alcohol, diazepam), for a class of substances (e.g., opioid drugs), or for a wider range of pharmacologically different psychoactive substances.</p> <p>Chronic alcoholism  Dipsomania  Drug addiction</p>

<b>Factitious Disorder</b> (F68.1)	<p>The patient feigns symptoms repeatedly for no obvious reason and may even inflict self-harm in order to produce symptoms or signs. The motivation is obscure and presumably internal with the aim of adopting the sick role. The disorder is often combined with marked disorders of personality and relationships.</p> <p>Hospital hopper syndrome Münchhausen's syndrome Peregrinating patient</p> <p><i>Excludes:</i> Factitial dermatitis Person feigning illness (with obvious motivation)</p>
<b>Malingering</b> (Z76.5)	<p>Person feigning illness (with obvious motivation)</p> <p><i>Excludes:</i> Factitious disorder Peregrinating patient</p>
<b>Somatoform Disorder</b> (F45.0)	<p>The main feature is repeated presentation of physical symptoms together with persistent requests for medical investigations, in spite of repeated negative findings and reassurances by doctors that the symptoms have no physical basis. If any physical disorders are present, they do not explain the nature and extent of the symptoms or the distress and preoccupation of the patient.</p> <p><i>Excludes:</i> Dissociative disorders Hair-plucking Lalling Lisping Nail-biting Psychological or behavioural factors associated with disorders or distress classified elsewhere Sexual dysfunction, not caused by organic disorder or disease Thumb-sucking Tic disorders (in childhood and adolescence) Tourette's syndrome Trichotillomania</p>



## APPENDIX 6.1

### INTERNATIONAL CLASSIFICATION OF HEADACHE DISORDERS (ICHD-II): ACUTE POST-TRAUMATIC HEADACHE ATTRIBUTED TO MILD HEAD INJURY

IHS	Diagnosis	ICD-10
5.1.2	Acute post-traumatic headache attributed to mild head injury [S09.9]	G44.880

#### Diagnostic Criteria:

- A. Headache, no typical characteristics known, fulfilling criteria C and D
- B. Head trauma with all of the following
  1. Either no loss of consciousness, or loss consciousness of < 30 minutes' duration
  2. Glasgow Coma Scale (GCS)  $\geq$  13
  3. Symptoms and/or signs diagnostic of concussion
- C. Headache develops within 7 days after head trauma
- D. One or other of the following:
  1. Headache resolves within 3 months after head trauma
  2. Headache persists but 3 months have not yet passed since head trauma

#### Comment:

Mild head injury may give rise to a symptom complex of cognitive, behavioural and consciousness abnormalities and a GCS of  $\geq$ 13. It can occur with or without abnormalities in the neurological examination, neuroimaging (CT scan, MRI), EEG, evoked potentials, CSF examination, vestibular function tests and neuropsychological testing. There is no evidence that an abnormality in any of these changes the prognosis or contributes to treatment. These studies should not be considered routine for patients with ongoing post-traumatic headache. They may be considered on a case-by-case basis, or for research purposes.

## APPENDIX 6.2

### INTERNATIONAL CLASSIFICATION OF HEADACHE DISORDERS (ICHD-II): CHRONIC POST-TRAUMATIC HEADACHE ATTRIBUTED TO MILD HEAD INJURY

IHS	Diagnosis	ICD-10
5.2.2	Chronic post-traumatic headache attributed to mild head injury [S09.9]	G44.31

#### Diagnostic Criteria:

- A. Headache, no typical characteristics known, fulfilling criteria C and D
- B. Head trauma with all of the following
  1. Either no loss of consciousness, or loss consciousness of < 30 minutes' duration
  2. Glasgow Coma Scale (GCS)  $\geq$  13
  3. Symptoms and/or signs diagnostic of concussion
- C. Headache develops within 7 days after head trauma
- D. Headache persists for > 3 months after head trauma

#### Comment:

Mild head injury may give rise to a symptom complex of cognitive, behavioural and consciousness abnormalities and a GCS of  $\geq$ 13. It can occur with or without abnormalities in the neurological examination, neuroimaging (CT scan, MRI), EEG, evoked potentials, CSF examination, vestibular function tests and neuropsychological testing. There is no evidence that an abnormality in any of these changes the prognosis or contributes to treatment. These studies should not be considered routine for patients with ongoing post-traumatic headache. They may be considered on a case-by-case basis, or for research purposes.

## APPENDIX 6.3

### DIAGNOSTIC CRITERIA FOR SELECTED PRIMARY HEADACHE TYPES FROM THE INTERNATIONAL CLASSIFICATION OF HEADACHE DISORDERS (ICHD-II)

#### 1.1 Migraine without aura

*Diagnostic criteria:*

- A. At least 5 attacks fulfilling criteria B-D
- B. Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)
- C. Headache has at least two of the following characteristics:
  - 1. unilateral location
  - 2. pulsating quality
  - 3. moderate or severe pain intensity
  - 4. aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs)
- D. During headache at least one of the following:
  - 1. nausea and/or vomiting
  - 2. photophobia and phonophobia
- E. Not attributed to another disorder

#### 2.2 Frequent episodic tension-type headache

*Diagnostic criteria:*

- A. At least 10 episodes occurring on  $\geq 1$  but  $< 15$  days per month for at least 3 months ( $\geq 12$  and  $< 180$  days per year) and fulfilling criteria B-D
- B. Headache lasting from 30 minutes to 7 days
- C. Headache has at least two of the following characteristics:
  - 1. bilateral location
  - 2. pressing/tightening (non-pulsating) quality
  - 3. mild or moderate intensity
  - 4. not aggravated by routine physical activity such as walking or climbing stairs
- D. Both of the following:
  - 1. no nausea or vomiting (anorexia may occur)
  - 2. no more than one of photophobia or phonophobia
- E. Not attributed to another disorder

#### 4.1 Primary stabbing headache

*Diagnostic criteria:*

- A. Head pain occurring as a single stab or a series of stabs and fulfilling criteria B-D
- B. Exclusively or predominantly felt in the distribution of the first division of the trigeminal nerve (orbit, temple and parietal area)
- C. Stabs last for up to a few seconds and recur with irregular frequency ranging from one to many per day
- D. No accompanying symptoms
- E. Not attributed to another disorder

#### 13.8 Occipital neuralgia

*Diagnostic criteria:*

- A. Paroxysmal stabbing pain, with or without persistent aching between paroxysms, in the distribution(s) of the greater, lesser and/or third occipital nerves
- B. Tenderness over the affected nerve
- C. Pain is eased temporarily by local anaesthetic block of the nerve

## APPENDIX 6.4

### INTERNATIONAL CLASSIFICATION OF HEADACHE DISORDERS (ICHD-II): MEDICATION-OVERUSE HEADACHE

IHS	Diagnosis	ICD-10
<b>8.2</b>	<b>Medication-overuse headache (MOH)</b>	<b>G44.41 or G44.83</b>
Previously used terms	Rebound headache, drug-induced headache, medication-misuse headache	

#### Diagnostic Criteria:

- Headache<sup>1</sup> present on  $\geq 15$  days/month fulfilling criteria C and D
- Regular overuse<sup>2</sup> for  $\geq 3$  months of one or more drugs that can be taken for acute and/or symptomatic treatment of headache<sup>3</sup>
- Headache has developed or markedly worsened during medication overuse
- Headache resolves or reverts to its previous pattern within 2 months after discontinuation of overused medication<sup>4</sup>

#### Notes:

- The headache associated with medication overuse is variable and often has a peculiar pattern with characteristics shifting, even within the same day, from migraine-like to those of tension-type headache.
- Overuse is defined in terms of duration and treatment days per week. What is crucial is that treatment occurs both frequently and regularly, i.e., on 2 or more days each week. Bunching of treatment days with long periods without medication intake, practised by some patients, is much less likely to cause medication-overuse headache and does not fulfill criterion B.
- MOH can occur in headache-prone patients when acute headache medications are taken for other indications.
- A period of 2 months after cessation of overuse is stipulated in which improvement (resolution of headache, or reversion to its previous pattern) must occur if the diagnosis is to be definite. Prior to cessation, or pending improvement within 2 months after cessation, the diagnosis 8.2.8 **Probable medication-overuse headache** should be applied. If such improvement does not then occur within 2 months, this diagnosis must be discarded.

#### Comments:

Medication-overuse headache is an interaction between a therapeutic agent used excessively and a susceptible patient. The best example is overuse of symptomatic headache drugs causing headache in the headache-prone patient. By far the most common cause of migraine-like headache occurring on  $\geq 15$  days per month and of a mixed picture of migraine-like and tension-type-like headaches on  $\geq 15$  days per month is overuse of symptomatic migraine drugs and/or analgesics. Chronic tension-type headache is less often associated with medication overuse but, especially amongst patients seen in headache centres, episodic tension-type headache has commonly become a chronic headache through overuse of analgesics.

Patients with a pre-existing primary headache who develop a new type of headache or whose migraine or tension-type headache is made markedly worse during medication overuse should be given both the diagnosis of the pre-existing headache and the diagnosis of 8.2 **Medication-overuse headache**.

The diagnosis of medication-overuse headache is clinically extremely important because patients rarely respond to preventative medications whilst overusing acute medications.

## APPENDIX 6.5

### IMPORTANT COMPONENTS TO INCLUDE IN THE NEUROLOGICAL AND MUSCULOSKELETAL EXAM

Perform a neurologic exam and musculoskeletal exam including cervical spine examination.

- Examine the head for site of injury
- Examine the cervical spine exam for range of motion
- Conduct a brief cognition and language screen during your interview
- Examine cranial nerve 2 (pupil symmetry and reactivity), visual fields, check to ensure no optic edema is present
- Examine cranial nerves 3, 4, 6 (no abnormalities in eye movements, diplopia, nystagmus)
- Conduct a motor screen to check for pronator drift, asymmetrical weakness and symmetry of reflexes
- Conduct a sensory exam to check that no extinction to bilateral tactile stimuli occurs
- Test coordination such as finger to nose movements, gait and tandem gait

If any focal abnormalities are observed refer for appropriate imaging and to an appropriate specialist.

## APPENDIX 6.6

### ADVICE ON THE ASSESSMENT AND MANAGEMENT OF POST-TRAUMATIC HEADACHE

#### Assessment of Post-Traumatic Headache

- Establish the degree of headache-related disability (i.e. missed work/school, decreased productivity, missed social/recreational activities, bedridden) which will assist in stratifying treatment to the degree of disability.
- Establish the average, minimum and maximum daily or weekly consumption of over-the-counter and prescription acute headache medications utilized. This is critical to establish whether or not medication overuse might be contributing to the post-traumatic headache.
- Ascertain the patient's previous treatment experiences and responses to date (including benefits and side-effects).

#### Management of Post-Traumatic Headache

- Education should be provided on lifestyle strategies that may minimize headache occurrence including: maintaining a consistent bed-time and wake-time and avoiding sleep deprivation and sleeping in, eating breakfast, lunch and dinner at consistent times each day and avoiding delayed or missed meals, maintaining adequate hydration, minimizing stress and/or improving coping strategies/incorporating relaxation strategies, and getting outdoors and walking or exercising as tolerated.
- Based upon the patient's headache characteristics, previous treatment experiences, co-morbidities, and contraindications, consideration may be given to the following acute headache medications: over-the-counter or prescription NSAIDs, acetylsalicylic acid, acetaminophen, combination analgesics (with codeine or caffeine), or migraine-specific medications such as ergotamine or triptans. For chronic post-traumatic headache management, narcotic analgesics should only be utilized as rescue therapy for acute attacks when other first and second-line therapies fail or are contraindicated.
- Clear instructions on the maximal allowable daily dosing and the maximum allowable monthly frequency of medication consumption should be provided - combination analgesics, narcotic analgesics, ergotamines and triptans can be utilized no more than 10 days per month and simple analgesics (i.e. acetaminophen or NSAIDs) should be utilized no more than 15 days per month to avoid medication overuse (rebound) headache.
- If nausea +/- vomiting is present, consider implementation of over-the-counter anti-emetics (oral tablets or rectal suppositories) or prescription anti-emetics. If headaches are migrainous and nausea/vomiting significant, non-oral formulations of triptans (i.e. nasal spray or subcutaneous injections) can be utilized.
- All patients should be required to maintain an accurate headache and medication calendar (diary). Ideally, a blank monthly calendar should be utilized. Advise the patients to put the calendar in their bedroom beside their toothbrush and fill out nightly or utilize a PDA or notebook to record the information and then transfer to their monthly calendar.
- If headaches are occurring too frequently or are too disabling, consideration should be given to prophylactic therapy. Note that all therapies utilized for the prophylaxis of post-traumatic headaches are off-label. Prophylactic therapies should be utilized using a "start-low and go slow" approach. A therapeutic trial of a prophylactic therapy should last 12 weeks unless there are intolerable medication side-effects. The only useful way to evaluate the effectiveness of a prophylactic therapy is review of the patient's headache and medication calendar. If the prophylactic therapy is efficacious, it should be continued for a minimum of 3-6 months and then gradually weaned off, if possible.

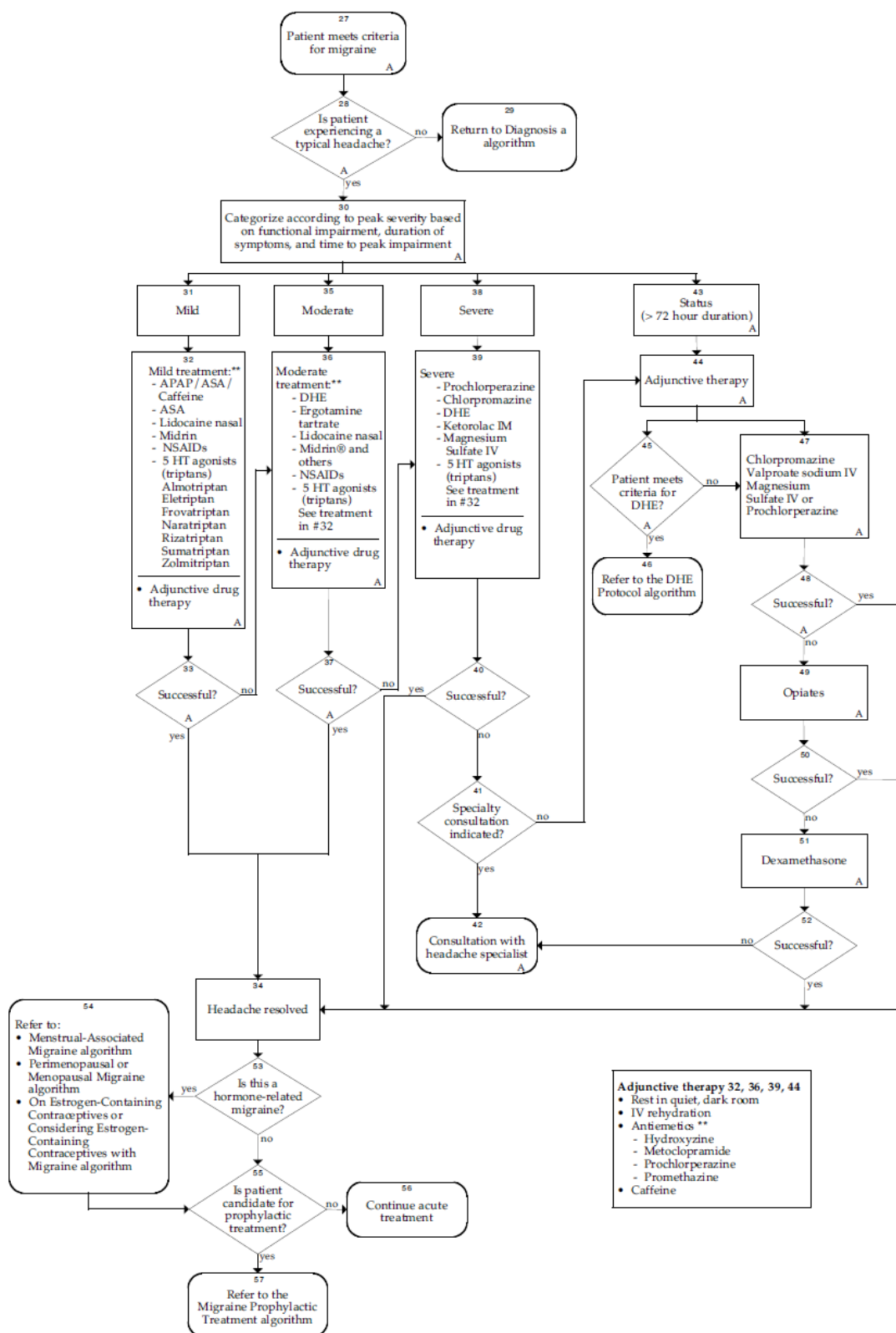


- Patients must be advised of realistic goals with regards to prophylactic therapy – the goal is not to “cure” the individual’s headaches; rather, the goal is to try to decrease the individual’s headache frequency and/or headache intensity and/or headache duration and/or acute medication requirements. Patient’s should also be advised that there are no “designer” drugs for headache prophylaxis – all medications utilized were created for other reasons and were subsequently found to be effective in headache prophylaxis in some, but not all, patients. This will pre-empt unnecessary patient confusion and non-compliance.
- If the headaches are tension-type in nature or unclassifiable, first-line therapy is Amitriptyline or Nortriptyline (starting at 10 mg po qhs and increasing by 10 mg q1-2 weeks as necessary/tolerated to a maximum of 50-100 mg po qhs). Amitriptyline is more sedating than Nortriptyline so should be utilized if there are concomitant sleep disturbances. Second-line therapy would be Gabapentin (starting at 100-300 mg po qhs and increasing by 100-300 mg q5 days as necessary/tolerated on a TID schedule to a maximum of approximately 600 mg po TID).
- If the headaches are migrainous in nature, first-line therapy would be a Tricyclic Antidepressant (i.e. Amitriptyline or Nortriptyline starting at 10 mg po qhs and increasing by 10 mg q1-2 weeks as necessary/tolerated to a maximum of 50-100 mg po qhs) or a beta-blocker (i.e. Nadolol starting at 20 mg po BID and increasing by 20 mg q5days as necessary/tolerated to 40-80 mg po BID or Propranolol 20 mg po TID and increasing by 20 mg q5days as necessary/tolerated to a maximum of 80 mg po TID). Second-line therapy includes Topiramate (starting at 12.5 mg po qhs and increasing by 12.5 mg po qhs qweekly as necessary/tolerated to a maximum of 100 mg po qhs) and Gabapentin (starting at 100-300 mg po qhs and increasing by 100-300 mg q5 days as necessary/tolerated on a TID schedule to a maximum of approximately 600 mg po TID). Third-line therapies would include Verapamil (starting at 40 mg po TID and titrating to 80 mg po TID as necessary/tolerated), Pizotifen (starting at 0.5 mg po qhs and increasing by 0.5 mg qweekly as necessary/tolerated to 3.0 mg po qhs) and Flunarizine (starting at 5 mg po qhs and increasing to 10 mg po qhs after 10-14 days). The choice of prophylactic therapy depends on comorbid symptoms (i.e. consider Amitriptyline if concomitant insomnia, a Beta-blocker if concomitant hypertension, Topiramate if concomitant obesity) and contraindications (avoid Beta-blocker/Calcium-channel blocker if hypotensive, Tricyclic if excessive fatigue, Topiramate if excessive cognitive symptoms, Flunarizine if depression etc).
- Should multiple attempts at oral prophylactic agents prove ineffective, consideration could be given to interventional therapy. Botulinum Toxin Type A using a fixed-dose, follow-the-pain treatment paradigm has proven beneficial in recent phase 3 RCT trials for the prophylaxis of chronic migraine. Currently, the use of Botulinum Toxin Type A for the prophylaxis of chronic headaches is off-label and, if utilized, patients should be well-informed about the off-label nature of this treatment approach and it should be administered only by an expert in headache management and BOTOX administration. Nerve blocks (i.e. occipital nerve blocks) should be restricted to intractable daily post-traumatic headache and should be discontinued if the repetitive nerve blocks are ineffective after weekly treatment for 4-6 weeks.
- Consideration should be given to non-pharmacological therapies to assist headache management including relaxation therapy, biofeedback and cognitive behavioral therapy.
- If headaches remain inadequately controlled, referral to a neurologist or traumatic brain injury clinic is recommended.

*The advice presented herein was created by Dr. Jonathan Gladstone, MD, FRCPC, and was based in part on his recent review article entitled ‘From Psychoneurosis to ICHD-2: An Overview of the State of the Art in Post-traumatic Headache’ (Gladstone, 2009). Dr. Gladstone currently serves as Director, Gladstone Headache Clinic; Director of Neurology and Headache Medicine, Cleveland Clinic Canada; Headache Specialist, Sunnybrook Health Sciences Centre; Co-Director, Headache Clinic The Hospital for Sick Children; Headache/Neurology Specialist, Head and Neck Injury Clinic, Toronto Rehabilitation Institute.*

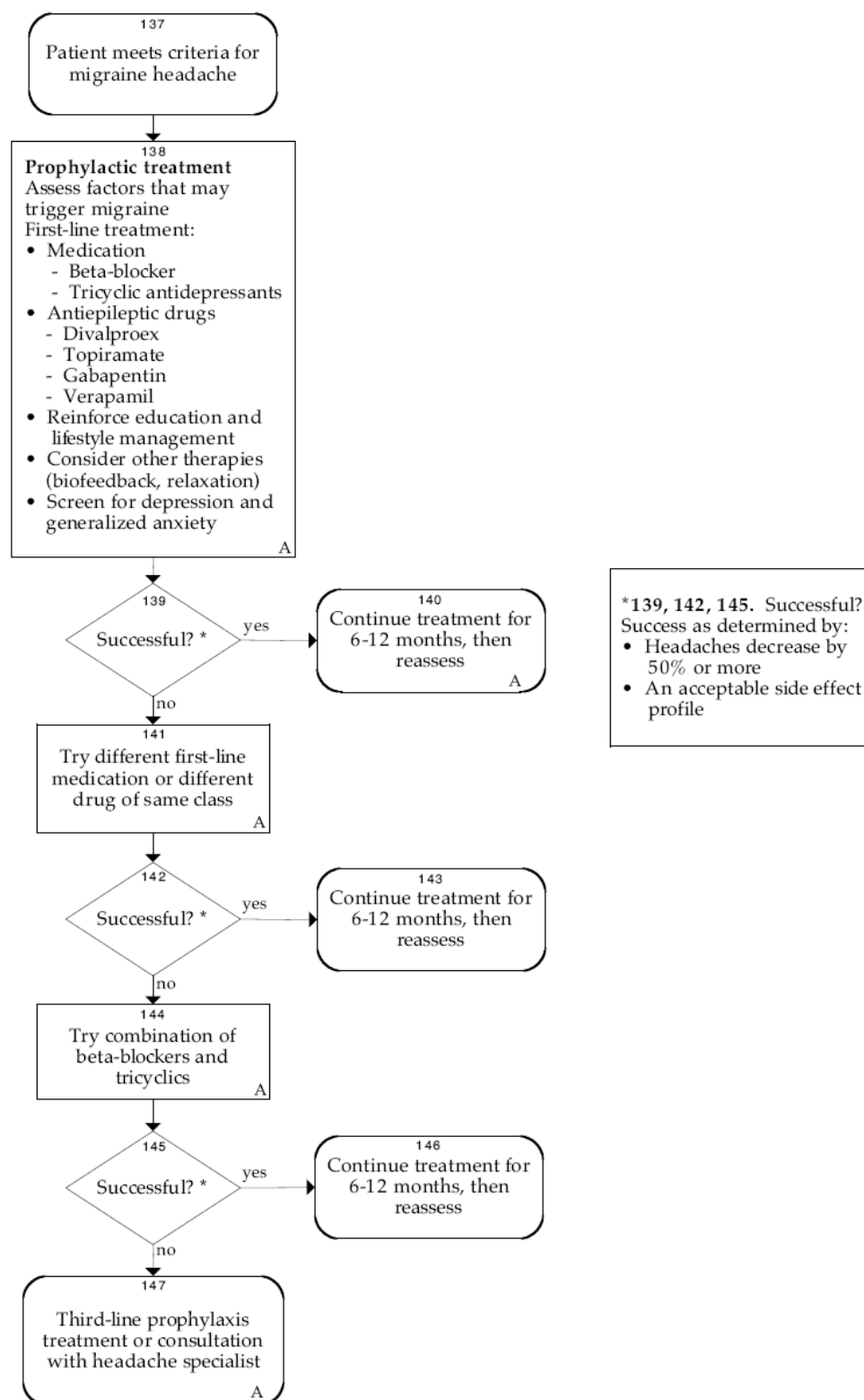
## APPENDIX 6.7

### MIGRAINE TREATMENT ALGORITHM FROM THE INSTITUTE FOR CLINICAL SYSTEMS IMPROVEMENT (ICSI) HEALTH CARE GUIDELINE: DIAGNOSIS AND TREATMENT OF HEADACHE



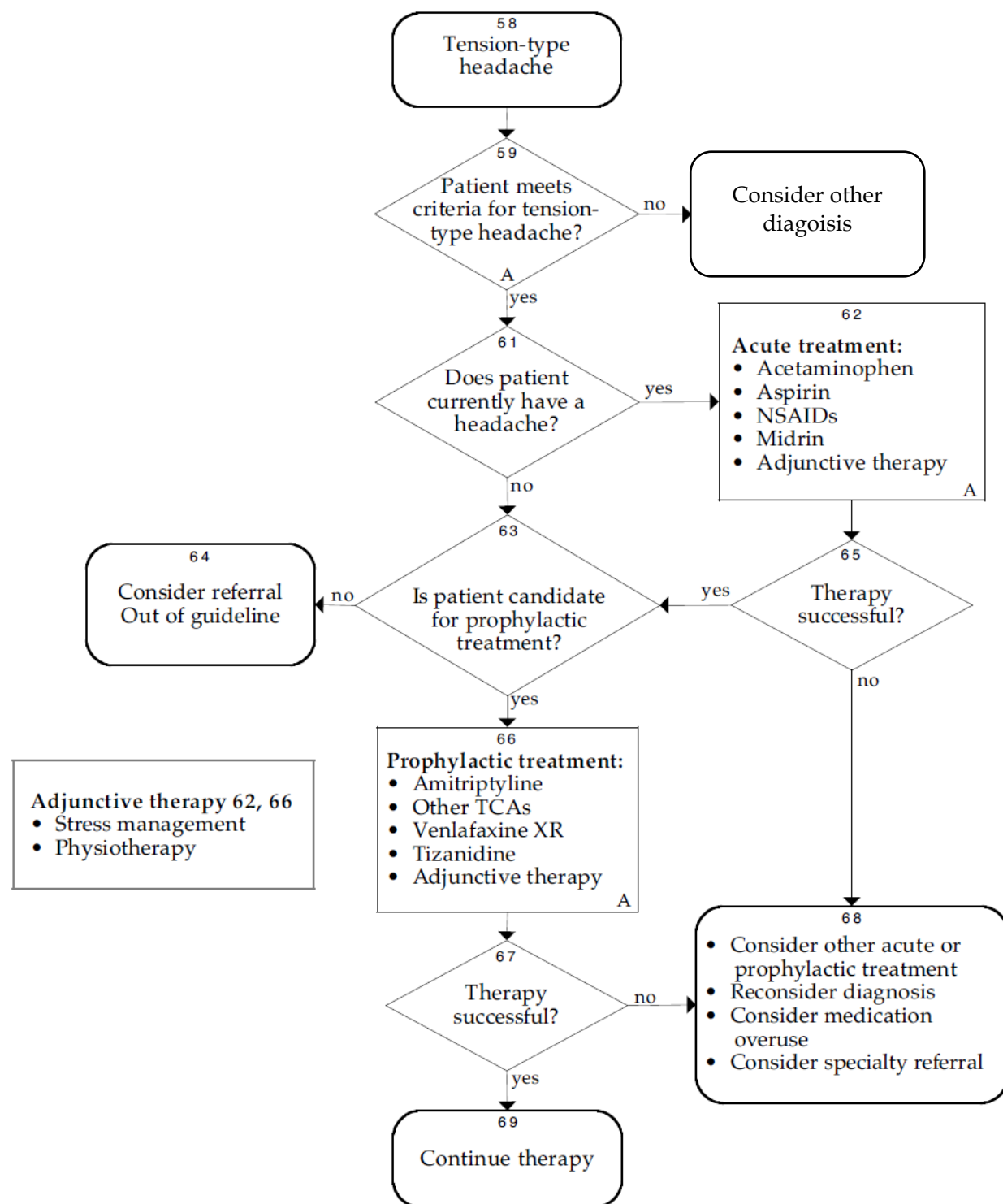
## APPENDIX 6.8

### MIGRAINE PROPHYLACTIC TREATMENT ALGORITHM FROM THE INSTITUTE FOR CLINICAL SYSTEMS IMPROVEMENT (ICSI) HEALTH CARE GUIDELINE: DIAGNOSIS AND TREATMENT OF HEADACHE



## APPENDIX 6.9

### TENSION-TYPE HEADACHE ALGORITHM FROM THE INSTITUTE FOR CLINICAL SYSTEMS IMPROVEMENT (ICSI) HEALTH CARE GUIDELINE: DIAGNOSIS AND TREATMENT OF HEADACHE



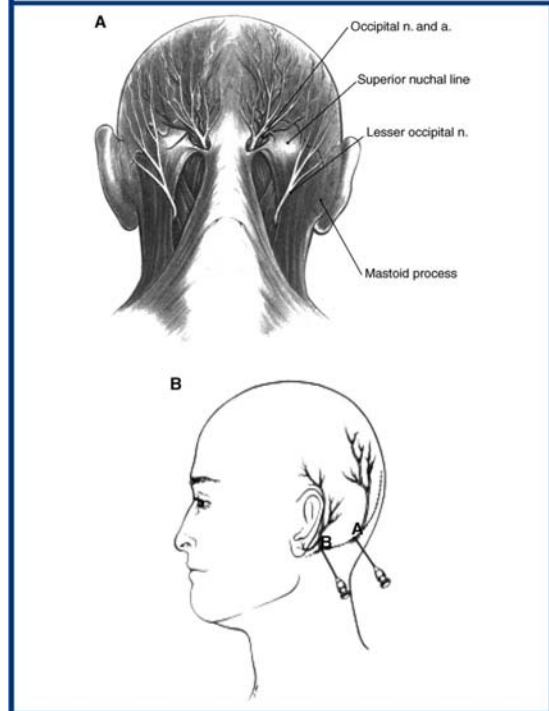
## APPENDIX 6.10

### INFORMATION ON DIAGNOSIS AND MANAGEMENT OF OCCIPITAL NEURALGIA HEADACHE

Occipital neuralgia is a common form of post-traumatic headache (Evans, 2004). This form of headache is characterized by aching, pressure, stabbing, or throbbing pain in the region of the greater or lesser occipital nerves (see illustration to the right) that may also radiate towards the vertex (Krusz, 2005). Occipital neuralgia headache may last from minutes to days and can be either unilateral or bilateral. Upon examination, the nerve will be tender to palpation and percussing the nerve trunk may cause paresthesias in its sensory distribution, known as Tinel's sign (Krusz, 2005). Hypoesthesia, or reduced sensation (e.g., to pinprick or temperature) compared to an uninvolved area, may also be noted in the nerve's skin distribution (Krusz, 2005). Administration of an occipital nerve block can both aid in diagnosis as well as treatment. The table below provides information regarding the injection technique for occipital nerve blocks.

Nerve blocks are effective alone or in combination with injectable corticosteroids. (Evans, 2004). Nonsteroidal anti-inflammatory drugs and muscle relaxants may also help improve occipital neuralgia headache (Evans, 2004). If a true occipital neuralgia with paroxysmal lancinating pain is present, baclofen, carbamazepine, tizanidine, or gabapentin could also be considered for management of symptoms. Also, physical therapy and transcutaneous nerve stimulators may help some headaches (Evans, 2004).

FIGURE 1.  
(A) Anatomy of the greater and lesser occipital nerves (Adapted from Katz J. *Atlas of regional anesthesia*. Norwalk (CT): Appleton-Century-Crofts; 1985. p. 47; with permission). (B) Relationships of greater (A) and lesser (B) occipital nerves (Adapted from Carron H, Korbon GA, Rowlingson JC. *Regional anesthesia*. Orlando (FL): Grune and Stratton; 1984. p. 42; with permission).



Reproduced with permission from Elsevier Limited

#### Directions for Injection of Occipital Nerve Blocks

- A local anesthetic agent, such as 1- to 2-% lidocaine hydrochloride or 0.5% bupivacaine hydrochloride, often with a corticosteroid (e.g., triamcinolone acetonide, 40 mg) is prepared.
- Cleanse skin at injection site (refer to above figure) with an alcohol wipe.
- A 25-gauge needle is inserted in one of two areas, or in both:
  - the lesser occipital nerve is infiltrated 3.5 cm inferolaterally to the occipital protuberance and just posteromedially to the mastoid process
  - the greater occipital nerve block is accomplished near the midline just lateral to the erector muscles of the neck
- The needle is directed cephalad until it just touches the skull base. It is withdrawn slightly and aspirated to make sure that none of the occipital arteries have been entered.
- Approximately 3mL of volume is injected per site.
- Observe the patient for any transient signs of hypotension or dizziness that are due to the anesthetic agent

Note: Pain relief is often rapid and may last for several weeks. The procedure can be repeated, if needed. Complications are rare, however, reports of Cushing's syndrome resulting from repeated injections do exist. Extremely rarely, injections of local anesthetic within the nerve sheath can track into the central nervous system and cause transient neurologic dysfunction relating to the brainstem.

Content taken from Krusz, 2005 (with permission from Elsevier Limited)

#### References

Evans RW. Post-traumatic headaches. *Neurologic Clinics of North America*. 2004;22:237-249.

Krusz JC. Aggressive interventional treatment of intractable headaches in the clinic setting. *Clinics in Family Practice*. 2005;7:545-565.

## APPENDIX 7.1

### SLEEP HYGIENE GUIDE FOR PATIENTS AND SLEEP DIARY FROM THE BRITISH COLUMBIA GUIDELINES AND PROTOCOLS ADVISORY COMMITTEE

# Sleep Hygiene

## A GUIDE FOR PATIENTS

**Follow these rules for healthy sleep.**

- Get up at the same time each day, seven days a week, to reinforce your body's internal clock.
- Go to bed only when you are sleepy.
- If you're not asleep after about 20 minutes, go to another room and do something relaxing. Return to bed when you are drowsy-tired.
- Use your bed only for sleeping or sex. Don't worry or watch TV in bed so your body learns the bed is for sleeping.
- Keep your bedroom dark and comfortably cool.
- Exercise during the day (three to four hours before bedtime).
- Don't drink coffee or tea within six hours of bedtime.
- Don't drink alcohol in the evening. It can make you wake up in the middle of the night.
- Try eating a light carbohydrate snack before bed.

SLEEP DIARY						
Date						
Did you nap today? When and how long?						
Did you exercise today? When and how long?						
Time into bed						
Time of "lights out"						
Time to fall asleep						
Number of awakenings						
Longest awakening						
Time of "lights on"						
Time out of bed						
Total sleep time						
Sleep quality (0 - 10) 0 = worst, 10 = best ever						



## APPENDIX 7.2

### THERAPEUTIC OPTIONS FROM THE ALBERTA TOP CLINICAL PRACTICE GUIDELINE FOR ADULT PRIMARY INSOMNIA: DIAGNOSIS TO MANAGEMENT

#### First-line Pharmacotherapy: Highest level of evidence supporting efficacy and safety

Agents	Recommended Dose	Comments
Zopiclone	3.75-7.5 mg	<ul style="list-style-type: none"> <li>Short half-life provides lower risk of morning hang-over effect</li> <li>Metallic after-taste most common adverse reaction</li> </ul>
Temazepam	15-30 mg	<ul style="list-style-type: none"> <li>Intermediate half-life carries a low-moderate risk of morning hang-over effect</li> </ul>

#### Second-line Pharmacotherapy: Moderate level of formal evidence. Extent of current use and favorable tolerability support use as second-line agents

Agents	Recommended Dose	Comments
Trazodone	25-50 mg	<ul style="list-style-type: none"> <li>Shorter half-life carries lower risk of morning hang-over effect</li> </ul>

#### Variable Evidence

Agents	Recommended Dose	Comments
L-Tryptophan	500 mg-2 gm	<ul style="list-style-type: none"> <li>Evidence supporting efficacy is variable and insufficient. May be requested by individual patients looking for a “natural source” agent.</li> </ul> <p>Taken 60 minutes before bedtime</p>
Melatonin	0.3-5 mg	
Valerian	400-900 mg	

#### Other Non-Prescription Products

Agents	Usual Dose	Comments
Diphenhydramine - Benadryl® - Sleep Eze - Simply Sleep - Nytol® - Unisom®	25-50 mg hs	Potential for serious side effects arising from anticholinergic properties (especially in elderly); residual daytime sleepiness, diminished cognitive function, dry mouth, blurred vision, constipation, urinary retention, etc.  These products are not intended for long term use and tolerance to sedative effects likely develops rapidly (3 days)  Gravol not approved in Canada as a sleep aid
Dimenhydrinate - Gravol	25-50 mg hs	
Doxylamine - Unisom 2	25-50 mg hs	

Toward Optimized Practice (TOP) Working Group for Insomnia. Guideline for adult primary insomnia: diagnosis to management. Edmonton, AB: Toward Optimized Practice. 2010 Feb. Available from:

24H[http://www.topalbertadoctors.org/informed\\_practice/clinical\\_practice\\_guidelines/complete%20set/Insomnia/insomnia\\_management\\_guideline.pdf](http://www.topalbertadoctors.org/informed_practice/clinical_practice_guidelines/complete%20set/Insomnia/insomnia_management_guideline.pdf)

### Not Recommended

The following agents are not recommended for the management of conditioned insomnia except in cases where the agent is being used specifically to manage a co-morbidity such as depression.

Agents	Comments
Antidepressants - mirtazapine, fluvoxamine, tricyclics	Relative lack of evidence
Amitriptyline	Relative lack of evidence and significant adverse effects (such as weight gain)
Antihistamines - chlorpheniramine	Relative lack of evidence or excessive risk of daytime sedation, psychomotor impairment and anticholinergic toxicity
Antipsychotics (Conventional or 1st-Generation) - chlorpromazine, methotrimeprazine, loxapine	Relative lack of evidence and unacceptable risk of anticholinergic and neurological toxicity
Antipsychotics (Atypical or 2nd-Generation) - risperidone, olanzapine, quetiapine	Relative lack of evidence and unacceptable cost and risk of metabolic toxicity
Benzodiazepines (Intermediate and Long-Acting) - diazepam, clonazepam, flurazepam, lorazepam, nitrazepam, alprazolam, oxazepam Benzodiazepines (Short-Acting) - triazolam	Excessive risk of daytime sedation and psychomotor impairment No longer recommended due to unacceptable risk of memory disturbances, abnormal thinking and psychotic behaviors

Chlorals - chloral hydrate, ethchlorvinyl	Excessive risk of tolerance, dependence and abuse as well as adverse gastrointestinal and CNS effects
Muscle relaxants - cyclobenzaprine, meprobamate	Relative lack of evidence and excessive risk of adverse CNS effects

## APPENDIX 7.3

### ADVICE ON SLEEP CONSOLIDATION

- ❖ Advise the patient that napping will reduce the depth and restorative quality of sleep the following night.
- ❖ Devise a “sleep prescription” with the patient: a fixed bed time and wake time.
- ❖ Determine the average total sleep time.
- ❖ Prescribe the time in bed to current total sleep time plus 1 hour.
- ❖ The minimum sleep time should be no less than 5 hours.
- ❖ Set a consistent wake time (firmly fixed 7 days/week).
- ❖ The bed time is determined by counting backwards from the fixed wake time (For example: a patient estimates the total sleep time to be 5-6 hours/night, the total time in bed is 8 hours/night for a sleep efficiency of  $5.5/8=68\%$ . The prescribed total sleep time would be 6.5-7 hours/night, if the wake time is 6AM then the prescribed bed time is 11-11:30PM.
- ❖ For the first 2-4 weeks these times should remain consistent and the clinician should monitor the patients adherence to the program with sleep diaries.
- ❖ Once the patient is sleeping for about 90 percent of the time spent in bed for 5 consecutive days, then the amount of time spent in bed is slowly increased by 15-30 minutes every 5 days. If sleep efficiency of 90 percent is maintained, then therapy is successful. The average total sleep time for most people is between 6 and 8 hours a night.

## APPENDIX 8.1

### INITIAL SCREENING AND ASSESSMENT RECOMMENDATIONS FROM THE MAA NSW GUIDELINES FOR THE MANAGEMENT OF ANXIETY FOLLOWING MOTOR VEHICLE ACCIDENTS (2003)

#### Initial screening

##### >>> Recommendations

- > Provide psychological first aid. Even if indicators of poor prognosis are not found during initial screening the patient needs psychological first aid.
- > If there are concerns about the patient's presentation there should be early review and/or referral.
- > Where feasible enquire briefly and respectfully about each of the indicators of poor prognosis.
- > In the presence of indicators of poor prognosis, an assessment is recommended two weeks after the accident.

##### >>> Rationale

- > Very early after trauma (hours or days), screening is to identify individuals more likely to develop problems as time progresses rather than for diagnostic purposes. Even brief screening is sometimes difficult to conduct at this time.

#### Summary of evidence

The recommendations on initial screening are adapted from Litz et al. (2002) and are consistent with the literature related to:

- > history taking
- > prognostic indicators.

The recommendations are also consistent with the *Disaster Mental Health Response Handbook*, (NSW Health 2000).

#### Evidence from the literature related to history taking

- > Foa, Keane and Friedman (2000) recommend that the following be included in a history: family history, life context, symptoms, beliefs, strengths, weaknesses, support system and coping skills.
- > Keane, Weathers and Foa (2000) noted the following recommendations for history taking from the NIMH National Centre for PTSD Conference on PTSD on Assessment Standardisation, 1995: history should include frequency, intensity, and duration of symptoms as reported by patients; patient ratings of impairment and disability; history of traumatic events which should cover event occurrences, perceived life threat, harm, injuries, frequency, duration, age and comorbidity.

#### Basis of recommendations

Study design: Level II, two systematic reviews.

Evidence quality: High – the quality of conduct of the systematic review is high and the studies reviewed are highly relevant.

# Assessment

## »»» Recommendations

### **Initial Assessment:-**

- > Following the initial screening, assessment should be conducted two weeks after the MVA if the person has ASD symptoms and/or indicators of poor prognosis.
- > The assessment should cover questions about each of the indicators of poor prognosis.
- > As assessment may be distressing if perceived as a continuation of the traumatic experience, the patient should be asked to communicate any such distress.
- > The patient should be informed they may experience an exacerbation or re-experiencing of symptoms **after** an assessment and this is part of the process of resolving the experience (NSW Health 2000).

### **Ongoing assessment at 3, 6 and 12 months should include:-**

- > Review of the diagnosis
- > Review for the presence of indicators of poor prognosis with attention to the recovery environment (after the accident indicators)
- > Assess return-to-work issues and,
- > Revise the management plan.

## »»» Rationale

Attention should focus on the minority of people who will develop PTSD. Identifying these people immediately after a MVA is premature because it is difficult to distinguish those who have a transient reaction from those who will have persistent problems.

### **Assessment tools:-**

- > Clinicians should consider using tools as part of the overall assessment of the patient.
- > The recommended tools are user friendly, accessible and have demonstrated good psychometric properties for the assessment of ASD and PTSD.

### **For ASD**

- > Acute Stress Disorder Scale (ASDS) - self-report. A copy is provided as Appendix 2.
- > Acute Stress Disorder Structured Interview (ASDI) - clinician administered. A copy is provided as Appendix 3.

### **For PTSD**

- > PTSD Checklist – civilian version (PCL-C) - self report. A copy is provided as Appendix 4.

Additional assessment tools are described in Appendix 5.

## Summary of evidence on assessment

Recommendations on assessment are based on the literature related to:-

- > history taking
- > prognostic indicators.

## Summary of evidence on assessment tools

The recommended tools have demonstrated good psychometric properties, are user friendly and accessible.

## Evidence from literature on assessment tools

### *ASD Scale (ASDS) and ASD Structured Interview (ASDI)*

- > In the 1998 study the ASDS demonstrated reasonable internal consistency, convergent validity, and test-retest reliability. The described cut-off score identified 95% of participants diagnosed with ASD and 88% not diagnosed with ASD against the ASDI (not a gold standard). In regard to predicting future PTSD there was limited success. ASDS predicted those going on to develop PTSD but did not filter out those who did not. Therefore, the authors recommended that ASDS should be supplemented by clinical assessment. (Bryant et al. (1998a) and Bryant, Moulds, and Guthrie (2000b)).

### *PTSD Checklist (PCL-C)*

- > Blanchard et al. (1996) examined the psychometric properties of the PCL using diagnoses and scores from the Clinician Administered PTSD Scale (CAPS). They supported the use of the PCL-C as a brief screening instrument for PTSD, but urged caution about its use as a diagnostic tool.
- > In a systematic review, Keane, Weathers, and Foa (2000) noted that when used with MVA patients and compared with CAPS, correlation was 0.93 and overall diagnostic efficiency was 0.90.

## Basis of recommendation

Study design: Level II, includes two systematic reviews.

Evidence quality: High. The quality of conduct of the systematic reviews is high and the studies reviewed are highly relevant and of high quality. The other studies include random controlled trials (RCTs).



## APPENDIX 8.2

### PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

#### Patient Health Questionnaire – PHQ-9

Patient name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all (0)	Several days (1)	More than half the days (2)	Nearly every day (3)
a. Little interest or pleasure in doing things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Feeling down, depressed, or hopeless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Trouble falling/staying asleep, sleeping too much.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Feeling tired or having little energy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Poor appetite or overeating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Trouble concentrating on things, such as reading the newspaper or watching TV.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Moving or speaking so slowly that other people could have noticed. Or the opposite; being so fidgety or restless that you have been moving around more than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Thoughts that you would be better off dead or of hurting yourself in some way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. If you checked off any problem on this questionnaire so far, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

☐ Not difficult  
at all

☐ Somewhat  
difficult

☐ Very  
difficult

☐ Extremely  
difficult

**TOTAL SCORE** \_\_\_\_\_

## Instructions – How To Score The PHQ-9

Major depressive disorder is suggested if:

1. Of the 9 items, 5 or more are checked as at least ‘more than half the days’
2. Either item a. or b. is positive, that is, at least ‘more than half the days’

Other depressive syndrome is suggested if:

1. Of the 9 items, a., b., or c., are checked as at least ‘more than half the days’
2. Either item a., or b. is positive, that is, at least ‘more than half the days’.

Also, PHQ-9 scores can be used to plan and monitor treatment. To score the instrument, tally each response by the number value under the answer headings, (not at all=0, several days=1, more than half the days=2, and nearly every day=3). Add the numbers together to total the score on the bottom of the questionnaire. Interpret the score by using the guide listed below.

### Guide for Interpreting PHQ-9 Scores

Score	Action
0-4	The score suggests the patient may not need depression treatment
5-14	Mild major depressive disorder. Physician uses clinical judgment about treatment, based on patient’s duration of symptoms and functional impairment.
15-19	Moderate-major depressive disorder. Warrants treatment for depression, using antidepressant, psychotherapy or a combination of treatment.
20 or higher	Severe major depressive disorder. Warrants treatment with antidepressant, with or without psychotherapy, follow frequently.

### Functional Health Assessment

The instrument also includes a functional health assessment. This asks the patient how emotional difficulties or problems impact work, things at home, or relationships with other people. Patient responses can be one of four: Not difficult at all, Somewhat difficult, Very difficult, Extremely difficult. The last two responses suggest that the patient’s functionality is impaired. After treatment begins, functional status and number score can be measured to assess patient improvement.

## APPENDIX 8.3

### PTSD CHECKLIST-CIVILIAN VERSION (PCL-C)

# PTSD Checklist – Civilian Version (PCL-C)

Name ..... Date .....

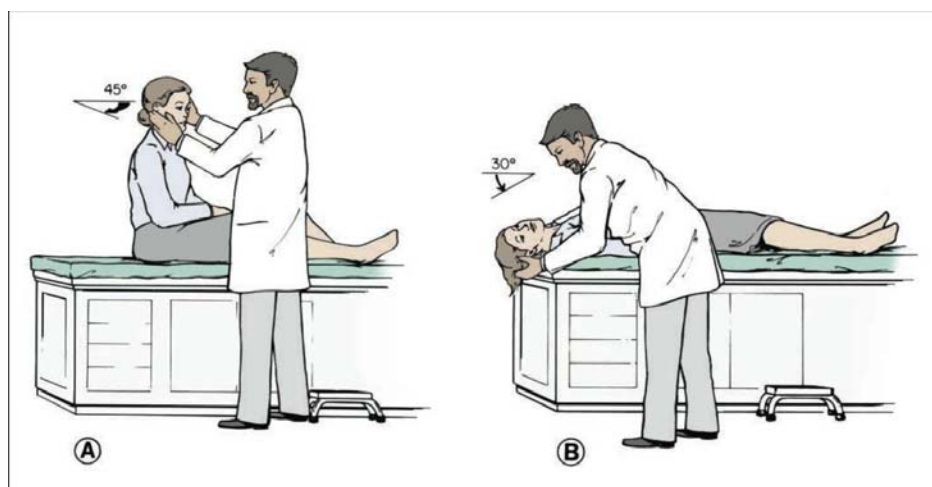
**Instructions:** Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then *circle one* of the numbers to the right to indicate how much you have been bothered by that problem *in the last month*.

	Not at all	Mildly	Medium	Quite a bit	Very much
1. Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?	1	2	3	4	5
2. Repeated, disturbing dreams of stressful experience from the past?	1	2	3	4	5
3. Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)?	1	2	3	4	5
4. Feeling very upset when something reminded you of a stressful experience from the past?	1	2	3	4	5
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of a stressful experience from the past?	1	2	3	4	5
6. Avoid thinking about or talking about a stressful experience from the past or avoid having feelings related to it?	1	2	3	4	5
7. Avoid activities or situations because they remind you of a stressful experience from the past?	1	2	3	4	5
8. Trouble remembering important parts of a stressful experience from the past?	1	2	3	4	5
9. Loss of interest in things that you used to enjoy?	1	2	3	4	5
10. Feeling distant or cut off from other people?	1	2	3	4	5
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?	1	2	3	4	5
12. Feeling as if your future will somehow be cut short?	1	2	3	4	5
13. Trouble falling or staying asleep?	1	2	3	4	5
14. Feeling irritable or having angry outbursts?	1	2	3	4	5
15. Having difficulty concentrating?	1	2	3	4	5
16. Being “super alert” or watchful on guard?	1	2	3	4	5
17. Feeling jumpy or easily startled?	1	2	3	4	5

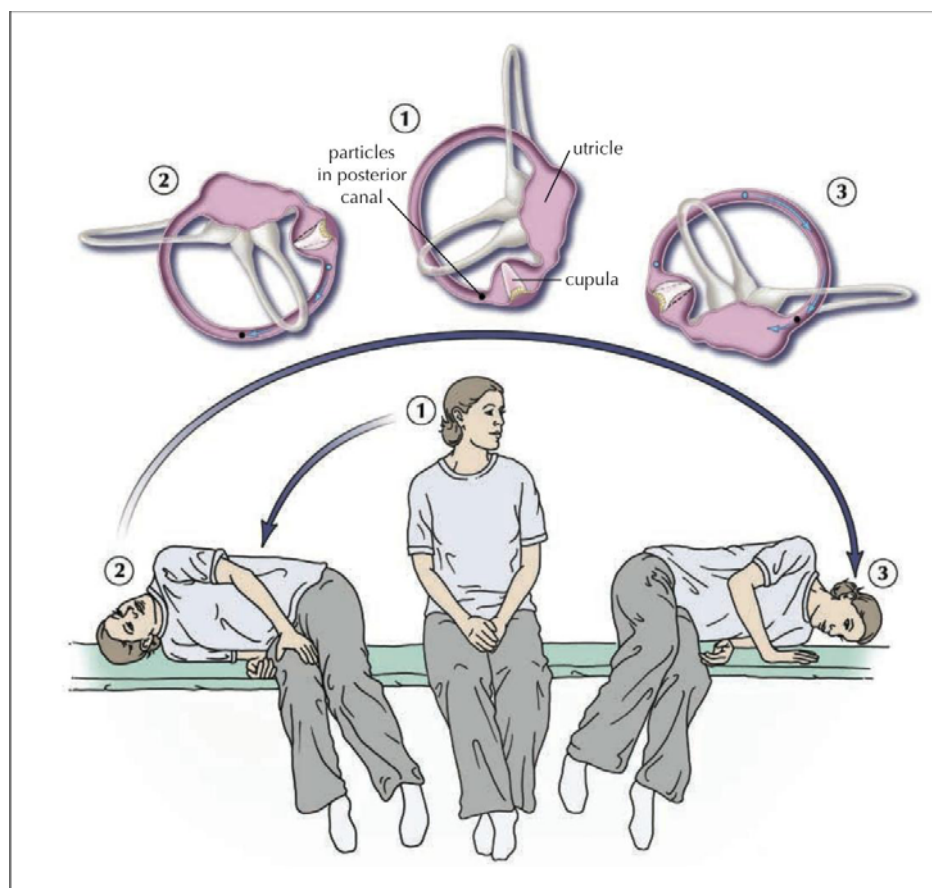
PCL-M for DSM – IV (11/1/94) Weathers, Litz, Huska, Keane. National Center for PTSD – Behavioural Science Division. This is a government document in the public domain.

## APPENDIX 10.1

### DIX-HALLPIKE MANOEUVRE AND PARTICLE REPOSITIONING MANOEUVRE (PRM)



**Fig. 6: Dix-Hallpike manoeuvre (right ear).** The patient is seated and positioned so that the patient's head will extend over the top edge of the table when supine. The head is turned 45° toward the ear being tested (position A). The patient is quickly lowered into the supine position with the head extending about 30° below the horizontal (position B). The patient's head is held in this position and the examiner observes the patient's eyes for nystagmus. In this case with the right side being tested, the physician should expect to see a fast-phase counter-clockwise nystagmus. To complete the manoeuvre, the patient is returned to the seated position (position A) and the eyes are observed for reversal nystagmus, in this case a fast-phase clockwise nystagmus.



**Fig. 7: Liberatory manoeuvre of Semont (right ear).** The top panel shows the effect of the manoeuvre on the labyrinth as viewed from the front and the induced movement of the canaliths (from blue to black). This manoeuvre relies on inertia, so that the transition from position 2 to 3 must be made very quickly.



## APPENDIX 12.1

### FATIGUE SEVERITY SCALE (FSS)

#### Fatigue Severity Scale (FSS)

The Fatigue Severity Scale (FSS) is a method of evaluating the impact of fatigue on you. The FSS is a short questionnaire that requires you to rate your level of fatigue.

The FSS questionnaire contains nine statements that rate the severity of your fatigue symptoms. Read each statement and circle a number from 1 to 7, based on how accurately it reflects your condition during the past week and the extent to which you agree or disagree that the statement applies to you.

- A low value (e.g., 1) indicates strong disagreement with the statement, whereas a high value (e.g., 7) indicates strong agreement.
- It is important that you circle a number (1 to 7) for every question.

FSS Questionnaire							
During the past week, I have found that:	Disagree <-----> Agree						
My motivation is lower when I am fatigued.	1	2	3	4	5	6	7
Exercise brings on my fatigue.	1	2	3	4	5	6	7
I am easily fatigued.	1	2	3	4	5	6	7
Fatigue interferes with my physical functioning.	1	2	3	4	5	6	7
Fatigue causes frequent problems for me.	1	2	3	4	5	6	7
My fatigue prevents sustained physical functioning.	1	2	3	4	5	6	7
Fatigue interferes with carrying out certain duties and responsibilities.	1	2	3	4	5	6	7
Fatigue is among my three most disabling symptoms.	1	2	3	4	5	6	7
Fatigue interferes with my work, family, or social life.	1	2	3	4	5	6	7
	<b>Total Score:</b>						

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#### Scoring your results

Now that you have completed the questionnaire, it is time to score your results and evaluate your level of fatigue. It's simple: Add all the numbers you circled to get your total score.

#### The Fatigue Severity Scale Key

A total score of less than 36 suggests that you may not be suffering from fatigue.

A total score of 36 or more suggests that you may need further evaluation by a physician.

## APPENDIX 12.2

### LIST OF MEDICATIONS ASSOCIATED WITH FATIGUE, ASTHENIA, SOMNOLENCE, AND LETHARGY FROM THE MULTIPLE SCLEROSIS COUNCIL (MSC) GUIDELINE

MEDICATIONS	RATE OF SYMPTOMS	MEDICATIONS	RATE OF SYMPTOMS
<i>Medications are cited that cause symptoms in &gt; 5% of patients</i>			
<b>Analgesics</b>		<b>Antihypertensive</b>	
Butalbital	■	Acebutolol (Sectral)	●
Butorphanol (Stadol NS)	●	Amiloride (Moduretic)	●
Dihydrocodeine	■	Atenolol (Tenoretic, Tenormin)	●
Fentanyl (Duragesic transdermal)	●	Benazepril (Lotensin)	●
Hydrocodone (Vicoprofen)	●	Betaxolol (Kerlone)	●
Morphine	■	Carteolol (Cartrol)	●
Oxycodone (Oxycontin)	●	Clonidine (Catapres, Combipress)	●
Tramadol (Ultram)	●	Diltiazem (Tiazac)	●
		Doxazosin (Cardura)	●
<b>Anticonvulsants</b>		Guanadrel (Hylorol)	●
Carbamazepine (Tegretol)	◆	Guanfacine (Tenex)	●
Clorazepate (Tranxene)	■	Labetalol (Normodyne, Trandate)	●
Divalproex (Depakote)	●	Metoprolol (Lopressor, Toprol)	●
Felbamate (Felbatol)	●	Nifedipine (Adalat)	●
Gabapentin (Neurontin)	●	Perindopril (Aceon)	●
Lamotrigine (Lamictal)	●	Prazosin (Minipress, Minizide)	●
Phenobarbital	▲		
Primidone (Mysoline)	▲	<b>Anti-Inflammatory</b>	
<b>Antidepressants</b>		Fenoprofen (Nalfon)	●
Buspirone (Buspar)	●	Ketorolac (Toradol)	●
Clomipramine (Anafranil)	●	Naproxen (Anaprox, Naprelan, Naprosyn)	●
Doxepin (Sinequan)	◆	Tolmetin (Tolectin)	●
Fluoxetine (Prozac)	●		
Fluvoxamine (Luvox)	●	<b>Antipsychotic</b>	
Mirtazapine (Remeron)	●	Clozapine (Clozaril)	●
Nefazodone (Serzone)	●	Mesoridazine (Serentil)	■
Paroxetine (Paxil)	●	Molindone (Moban)	■
Sertraline (Zoloft)	●	Olanzapine (Zyprexa)	●
Trazodone (Desyrel)	●	Risperidone (Risperdal)	●
Tricyclic agents	■		
Venlafaxine (Effexor)	●	<b>Asthma Drugs</b>	
		Fluticasone (Flovent)	●
<b>Antihistamines</b>		Terbutaline	●
Astemizole (Hismanal)	●		
Azatadine (Trinalin)	■	<b>Carbonic Anhydrase Inhibitors</b>	
Azelastine (Astelin)	●	Dichlorphenamide (Daranide)	◆
Cetirizine (Zyrtec)	●		
Chlorpheniramine	◆	<b>Cardiac</b>	
Diphenhydramine	■	Bepidil (Vascor)	●
Loratadine (Claritin)	●	Amiodarone (Cordarone)	●
Phenylephrine	◆	Disopyramide (Norpace)	●
Terfenadine (Seldane)	●	Flecainide (Tambocor)	●
		Nifedipine (Procardia)	●
		Quinine (Cardioquin, Quinidex)	●
		Sotalol (Betapace)	●

#### Legend

● >50%	● 25-50%	● 10-25%	● 5-10%
■ Most Frequent	■ Among Most Frequent	■ Among Frequent	▲ Can Develop During Therapy
◆ Most Common	◆ Among Most Common	▲ Occasional	

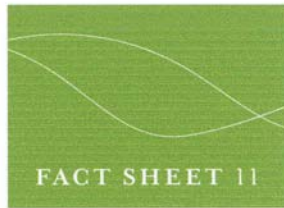
Adapted from the Multiple Sclerosis Council (MSC) Guideline



MEDICATIONS	RATE OF SYMPTOMS	MEDICATIONS	RATE OF SYMPTOMS
<i>Medications are cited that cause symptoms in &gt; 5% of patients</i>			
<b>Diabetic Agents</b>		<b>Nicotine Agents</b>	
Glipizide (Glucotrol)	●	Habitrol	●
Troglitazone (Rezulin)	●	Nicotrol nasal spray	●
		Prostep	●
<b>Gastrointestinal</b>		<b>Sedative Hypnotics</b>	
Dicyclomine (Bentyl)	●	Alprazolam (Xanax)	●
Granisetron (Kytril)	●	Clonazepam (Klonopin)	●
Metoclopramide (Reglan)	●	Diazepam (Valium)	●
		Estazolam (ProSom)	●
<b>Genitourinary</b>		Quazepam (Doral)	●
Terazosin (Hytrin)	●	Secobarbital (Seconal)	◆
		Temazepam (Restoril)	●
<b>Hormone Replacement</b>		Triazolam (Halcion)	●
Depo-Provera (medroxyprogesterone)	●	Zolpidem (Ambien)	●
Progesterone cream (Crinone)	●		
Leuprolide (Lupron)	●	<b>Other</b>	
(Lupron depot preparation)	●	Dexfenfluramine (Redux)	●
<b>Immune Modulators</b>		Fenfluramine (Pondimin)	◆
Interferon beta-1a (Avonex)	●	Scopolamine (Transderm Scop)	●
Interferon beta-1b (Betaseron)	●		
<b>Muscle Relaxants</b>			
Carisoprodol (Soma)	■		
Cyclobenzaprine (Flexeril)	●		
Dantrolene (Dantrium)	■		
Diazepam (Valium)	◆		
Tizanidine (Zanaflex)	●		

#### Legend

● >50%	● 25-50%	● 10-25%	● 5-10%
■ Most Frequent	■ Among Most Frequent	■ Among Frequent	▲ Can Develop During Therapy
◆ Most Common	◆ Among Most Common	▲ Occasional	



## Managing Fatigue

*THIS FACT SHEET explains the symptoms and triggers of fatigue and provides some strategies to minimise and manage it.*

Fatigue is a common and very disabling symptom experienced by people with acquired brain injury (ABI) or neurological conditions. Some people with multiple sclerosis, for example, describe an overwhelming sense of general fatigue that can occur at any time of the day. It happens without warning and the person needs to rest immediately before the symptoms get worse.

Fatigue is also a problem among carers as they find themselves managing increased workloads and greater responsibilities. Members of the rehabilitation team understand your position and can recommend support services, such as respite care, and coping strategies. Do consult with your GP or a trusted team member before your own health is affected.

### What is Fatigue?

The fatigue associated with brain injury or neuromuscular damage often appears more suddenly, lasts longer and takes longer to recover from than ordinary fatigue. Make no mistake, it is *real*, and not a case of mind over matter.

### What Causes Fatigue?

Fatigue can occur for no apparent reason or after relatively mild exertion. It may be caused by physical activity, but is just as likely to occur as a result of mental activity.

Planning the week's errands, organising a work schedule, calculating a weekly budget or simply reading, can be very draining. We all experience this to some extent but for the person with brain injury, it happens more easily and much more frequently.

### Strategies

Fatigue can be managed with good planning and rest periods, but first carers and the family member affected need to acknowledge that it is *real*.

### Symptoms

The following symptoms may all suggest fatigue:

- > Withdrawal.
- > Loss of appetite.
- > Shortness of breath.
- > Slower movement and speech.
- > Short answers, quieter voice, a dull tone of voice.
- > Irritability, anxiety, crying episodes.
- > Increased forgetfulness.
- > Lack of motivation to plan for each day.
- > Lack of interest in things the person normally considers important (e.g. appearance, grooming).

Fatigue also intensifies symptoms experienced because of ABI or a neurological condition, such as:

- > Poor vision.
- > Slurred speech.
- > Difficulty finding words.
- > Poor concentration.
- > Cramps or weak muscles.
- > Poor coordination or balance.

The next step is to work out what triggers it and what factors make the symptoms worse, such as holding a demanding conversation for more than 10 minutes or watching a film with a complicated plot. You can then work together to develop strategies to conserve energy.

**Contingency plans:** Fatigue may occur at the least convenient times – on public transport or during a meeting. You need to negotiate ways of coping when this happens. You can use specific strategies or call in extra support. Work out contingency plans with your family member. Your neuropsychologist, occupational therapist or physiotherapist can help with suggestions.

**Assess your environment:** Provide an environment that is easy to move around and work in. Think about how and where things are stored, bench heights, entrances, types of furnishing, lighting. For example, some people may find fluorescent lighting or dim lighting more tiring.

**Assess best hours:** Some people function best in the mornings, so complete demanding tasks then. Others function better in the afternoon or the evening. Organise your routine accordingly.

**Schedule rest periods:** Make a daily or weekly schedule and include regular rest periods. "Rest" means *do nothing at all*.

**Use aids:** Use mechanical aids to conserve energy for when it really counts. One man spared his legs extra effort by using his wheelchair to get from his house to the car, then from the car to the church, before walking his daughter, the bride, down the aisle.

**Break it down:** Break down activities into a series of smaller tasks. This provides opportunities to rest while allowing the person to complete the task. Encourage sensible shortcuts.

**Set priorities:** Focus on things that must be done and let the others go.

**Medication highs & lows:** Be aware of changes throughout the day that relate to medication. Is the person better or worse immediately after their tablets? Plan their activities around these times.

**Sleep:** Encourage a regular sleeping pattern. Some people may also need a regular nap – or two – during the day.

**Fitness:** Your family member should maintain fitness within their individual ability, that is, enough exercise to stay fit, but never to the point of causing tension, overtiredness or cramps.

**Weight:** Maintaining a healthy weight helps. If your family member's condition affects their ability to eat, consult a dietician and speech pathologist to ensure they have a nutritious diet that is easy to manage

(See Fact Sheet 8: *Eating and Swallowing Problems*).

**Weather:** Hot weather can also increase fatigue. Plan around this.

**Seek support:** Ask for advice. In particular, an occupational therapist can visit your home and advise on an energy-conserving plan of action.

## Contacts

For more information, talk to your doctor or condition-specific support organisation (See Contacts pg7).

## APPENDIX 13.1

### RETURN TO WORK/STUDY CONSIDERATIONS FROM THE MAA NSW GUIDELINE FOR MILD TRAUMATIC BRAIN INJURY FOLLOWING CLOSED HEAD INJURY

#### General practitioner guide – return to work/study considerations

The range of factors to consider when a patient returns to work or study is similar. There needs to be adequate assessment and onwards referral where indicated. Return to work/study is managed in conjunction with a gradual return to other home/family, social and sporting activities. It is beneficial for the GP to contact the workplace prior to the patient returning to work (if possible), to discuss issues with the employer.

A patient may return to work within a few days of injury (typically 3–7 days with simple concussion), although on average patients with MTBI require three to four weeks off work. Frequently there are residual symptoms affecting the patient at home and/or in the workplace, although some symptoms may not become evident until the patient returns to work/study. Recovery continues over weeks and in some instances months.

#### Principles for management:

1. Provide information and reassurance routinely to assist the individual to understand their injury – symptoms generally resolve within weeks or months.
2. **Don't wait for failure.** Early intervention and a gradual return to work/study assists in preventing secondary sequelae (e.g., anxiety subsequent to failure).
3. Provide active management of a gradual process for an individual to return to activities and life roles (including driving, work, study, sport).
4. Encourage support from the family or significant others (e.g., work supervisor, university counsellor).
5. Provide treatment for specific symptoms as appropriate (headaches, depression).
6. It is essential that the medical practitioner understands the type of work/study the patient performs and the demands that work requires to safely assist a patient to return to work/study. The name of an individual's occupation is insufficient. For example, truck driver – may involve driving short local distances and have materials handling demands, or may involve driving a large multi-axle truck long distances interstate with minimal materials handling demands.

#### A. PATIENT RELATED VARIABLES TO ASSESS

##### Post concussive symptoms

- How many
- What are they
- Duration and intensity
- Which symptom/s have resolved (if any)
- Do the specific symptoms have the potential to impact on the individual's specific work tasks
- Whether fatigue is a symptom
- Whether cognitive symptoms present (e.g. attention).

##### Physical difficulties or injury

- Dizziness; dizziness has also been closely linked with psychological distress at six months post injury

##### Psychosocial

- Reduced social interaction (compared to preinjury)
- Preinjury work motivation
- Coping strategies.

##### Cultural/contextual issues

- Cultural factors at home/work
- Drug or alcohol use
- Social support
- Low preinjury earnings
- Police record/arrest record
- Preinjury work history.

#### B. WORK RELATED VARIABLES TO CONSIDER

##### Preinjury work hours

- Quantity
- Hours per day/shift
- Shift times (morning/afternoon/evening).
- rest breaks (fixed or self determined)

<http://www.maa.nsw.gov.au/default.aspx?MenuID=148>



### Pace of work

- Self paced/regulated
- Machine paced (e.g., conveyor line or operating machinery)
- Productivity demands
- Bonus system.

### Work tasks

- Cognitive and/or physical work task balance
- Whether tasks are routine or highly variable
- Memory or concentration demands
- Decision making demands
- Multitasking or competing simultaneous demands
- Communication demands (frequency and with how many people)
- Vigilance with machinery
- Responsibility/seniority and support from supervisor.

### Work environment

- Light and noise
- Inside/outside (impact of ambient temperature and climate control affects physical fatigue).

### Transport to/from work

- Public/private transport
- Others in the vehicle, e.g., coworker, children, being dropped off to care/school

### Driving (for commercial or heavy vehicle drivers<sup>3</sup>)

- Business requirements, e.g., rosters (shifts) driver training, contractual demands
- Legal requirements e.g., log books, licensing procedures
- Vehicle or vehicle load issues including, size, stability, load distribution (problem solving)
- Duty of care to passengers (e.g., bus driver)
- Risks associated with carriage of dangerous goods
- Skills required to manage the vehicle (e.g., turning and braking long vehicles)
- Demands associated with long periods spent on the road.

## C. RETURN TO WORK/STUDY STRATEGIES

Graduated or modified return to work/study may be considered and negotiated with the employer/ educational institution. Variables that may be modified include:

- Hours (e.g., days of the week, shifts, number of hours)
- Tasks (e.g., range of tasks, frequency of tasks, productivity demands, order of tasks). For a return to study - negotiation for less assignments, defer or delay exams, acquiring note taker or recording lectures in audio
- Workplace (e.g., work site change may reduce travel time, work pressures, quantity of tasks, responsibilities) or work hour parameters can be changed (quantity or time of day, e.g., change from night shift to day shift where there is more support, less body clock adjustment), or tasks or intensity/quantity of tasks (productivity)
- Increase rest breaks, change study timetable.

<http://www.maa.nsw.gov.au/default.aspx?MenuID=148>





## APPENDIX D

### SOURCES FOR THE mTBI GUIDELINE RECOMMENDATIONS

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):61-75.</p> <p>Borg J, Holm L, Peloso PM, Cassidy JD, von Holst H, Paniak C, Yates D. Non-surgical intervention and cost for mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):76-83.</p> <p>Chambers J, Cohen S, Hemminger L, Prall J, Nichols J. Mild traumatic brain injuries in low risk trauma patients. <i>Journal of Trauma</i>. 1996;41(6):976-980.</p> <p>Kraus J, Schaffer K, Ayers K, Stenehjem J, Shen K. Physical complaints, medical service use, and social and employment changes following traumatic brain injury: a 6 month longitudinal study. <i>Journal of Head Trauma Rehabilitation</i>. 2005;20(3):239-256.</p> <p>Miller LJ, Mittenberg W. Brief behavioural interventions in mild traumatic brain injury. <i>Applied Neuropsychology</i>. 1998;5(4):172-183.</p> <p>Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. <i>European Journal of Neurology</i>. 2003;10:175-181.</p> <p>von Holst H, Cassidy JD. Mandate of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):8-10.</p>			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.2 Diagnosis of mTBI should be performed through a combined assessment of clinical factors and symptoms.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):61-75.</p> <p>De Kruijk JR, Leffers P, Menheere P, Meerhoff S, Rutten J, Twijnstra A. Prediction of post-traumatic complaints after mild traumatic brain injury: early symptoms and biochemical markers. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:727-732.</p> <p>Fabbri A, Servadei G, Marchesini G, Morselli-Labate A, Dente M, Lervese T, Vandelli A. Prospective validation of a proposal for diagnosis and management of patients attending the emergency department for mild head injury. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2004;75:410-416.</p> <p>Iverson GL, Lange RT, Franzen MD. Effects of mild traumatic brain injury cannot be differentiated from substance abuse. <i>Brain Injury</i>. 2005;19(1):11-18.</p> <p>Lundin A, De Boussard C, Edman G, Borg J. Symptoms and disability until three months after mild TBI. <i>Brain Injury</i>. 2006;20(8):799-806.</p> <p>Meares S, Shores E, Taylor A, Batchelor J, Bryant R, Baguley I, Chapman J, Gurka J, Dawson K, Capon L, Marosszeky J. Mild traumatic brain injury does not predict acute post concussion syndrome. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2008;79:200-306.</p> <p>National Institute for Health and Clinical Excellence. <i>Head Injury: triage, assessment, investigation and early management of head injury in infants, children and adults, Clinical Guidelines</i>. 2003, National Collaborating Centre for Acute Care.</p> <p>New Zealand Guidelines Group. <i>Traumatic Brain Injury: diagnosis, acute management and rehabilitation</i>. NZGG, Editor. 2006.</p> <p>Owensworth T, Desbois J, Fleming J, Grant E, Strong J. The associations among self-awareness, emotional well-being and employment outcome following acquired brain injury: a 12 month longitudinal study. <i>Rehabilitation Psychology</i>. 2006;51(1):50-59.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Potter S, Leigh E, Wade D, Fleminger S. The Rivermead Post Concussion Symptoms Questionnaire: a confirmatory factor analysis. <i>Journal of Neurology</i>. 2006;253(12):1603-1614.</p> <p>Reed D. <i>Adult Trauma Clinical Practice Guidelines, Initial Management of Closed Head Injury in Adults</i>, ed. NSW Institute of Trauma Injury Management. 2007, Sydney.</p> <p>Reed, D. <i>Adult Trauma Clinical Practice Guidelines, Initial Management of Closed Head Injury in Adults</i>, ed. NSW Institute of Trauma Injury Management. 2007, Sydney.</p> <p>Shores EA, Lammel A, Batchelor J, Hullick C, Flynn M. Utility of the revised Westmead PTA scale in the acute assessment of mild traumatic brain injury (MTBI) - further analysis in International Neuropsychological Society 2006: Zurich.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>1.3 Standardized measurement of post traumatic amnesia should be routinely performed to assist with the monitoring, diagnosis, early management and prognosis of patients who have experienced mTBI. The Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS; see Appendix 1.1) is a standardized tool that can be used to monitor post traumatic amnesia.</p>	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):61-75.</p> <p>Bryant RA. Disentangling mild traumatic brain injury and stress reactions. <i>The New England Journal of Medicine</i>. 2008;358(5):525-527.</p> <p>De Monte V, Geffen G, Massavelli B. The effects of post traumatic amnesia on information processing following mild traumatic brain injury. <i>Brain Injury</i>. 2006;20(13/14):1345-1354.</p> <p>Ponsford J, Cameron P, Willmott C, Rothwell A, Kelly A, Nelms R, Ng K. Use of the Westmead PTA scale to monitor recovery of memory after mild head injury. <i>Brain Injury</i>. 2004;18(6):603-614.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Shores EA, Lammel A, Batchelor J, Hullick C, Flynn M. Utility of the revised Westmead PTA Scale in the acute assessment of mild traumatic brain injury (MTBI) - further analysis in International Neuropsychological Society 2006: Zurich.</p> <p>Shores EA, Lammel A, Hullick C, Sheedy J, Flynn M, Levick W, Batchelor J. The diagnostic accuracy of the Revised Westmead PTA Scale as an adjunct to the Glasgow Coma Scale in the early identification of cognitive impairment in patients with mild traumatic brain injury. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2008. Epub ahead of print (January 25).</p> <p>Turner-Stokes L, Disler PB, Nair A, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. 2005, The Cochrane Database of Systematic Reviews.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.4 Medical assessment should include screening for health and contextual factors (flags) to identify patients for increased risk of persistent symptoms and urgent complications, such as subdural hematoma. Refer to Table 7 outlining health and contextual risk factors (flags).	B	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Shores EA, Lammel A, Batchelor J, Hullick C, Flynn M. Utility of the revised Westmead PTA Scale in the acute assessment of mild traumatic brain injury (MTBI) - further analysis in International Neuropsychological Society 2006: Zurich.</p> <p>Carroll LJ, Cassidy JD, Peloso P, Borg J, von Holst H, Holm L, Paniak C, Pepin M. Prognosis for mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):84-105.</p> <p>De Kruijk JR, Leffers P, Menheere P, Meerhoff S, Rutten J, Twijnstra A. Prediction of post-traumatic complaints after mild traumatic brain injury: early symptoms and biochemical markers. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:727-732.</p> <p>Iverson GL, McCracken LM. Post concussive symptoms in persons with chronic pain. <i>Brain Injury</i>. 1997;11(11):783-790.</p> <p>Iverson GL. Outcome from mild traumatic brain injury. <i>Current Opinion in Psychiatry</i>. 2005;18:301-317.</p> <p>Ponsford J, Cameron P, Willmott C, Rothwell A, Kelly A, Nelms R, Ng K. Use of the Westmead PTA scale to monitor recovery of memory after mild head injury. <i>Brain Injury</i>. 2004;18(6):603-614.</p> <p>Lundin A, De Boussard C, Edman G, Borg J. Symptoms and disability until three months after mild TBI. <i>Brain Injury</i>. 2006;20(8):799-806.</p> <p>Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):61-75.</p> <p>Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. <i>European Journal of Neurology</i>. 2003;10:175-181.</p> <p>Faux S, Sheedy J. A prospective controlled study in the prevalence of post traumatic headache following minor traumatic brain injury. <i>Pain Medicine</i>. 2008. Epub ahead of print (February 5th).</p> <p>Sheedy J, Geffen G, Donnelly J, Faux S. Emergency department assessment of mild traumatic brain injury and prediction of post-concussion symptoms at one month post injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2006;28:775-772.</p> <p>Meares S, Shores E, Taylor A, Batchelor J, Bryant R, Baguley I, Chapman J, Gurka J, Dawson K, Capon L, Marosszeky J. Mild traumatic brain injury does not predict acute post concussion syndrome. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2008;79:200-306.</p> <p>Cassidy JD, Carroll LJ, Cote P, Holm L, Nygren A. Mild traumatic brain injury after traffic collisions: a population-based inception cohort study. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):15-21.</p>			

Mickevičienė D, Schrader H, Obelienienė D, Surkiene D, Kunickas R, Stovner L. A controlled prospective inception cohort study on the post concussion syndrome outside the medicolegal context. *European Journal of Neurology*. 2004;11:411-419.

Owensworth T, Desbois J, Fleming J, Grant E, Strong J. The associations among self-awareness, emotional well-being and employment outcome following acquired brain injury: a 12 month longitudinal study. *Rehabilitation Psychology*. 2006;51(1):50-59.

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.5 Hourly clinical observation should occur until at least four hours post injury. If the patient meets recommended discharge criteria at four hours post time of injury, they should be considered for discharge.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.6 At four hours post injury, if the patient has a Glasgow Coma Scale score of 15, is clinically improving and has a normal CT scan or there is no indication for CT based on the Canadian CT Head Rules (Figure 3) but their A-WPTAS score < 18, then clinical judgement is required to determine whether the patient should be discharged home before a normal score for this measure is obtained.	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury Consensus	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
This recommendation has a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.7 If CT is not indicated on the basis of history and examination the clinician may conclude that the risk to the patient is low enough to warrant discharge to own care or to home, as long as no other factors that would warrant a hospital admission are present (for example, drug or alcohol intoxication, other injuries, shock, suspected nonaccidental injury, meningism, cerebrospinal fluid leak) and there are appropriate support structures for safe discharge and for subsequent care (for example, competent supervision at home).	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.8 All patients with any degree of brain injury who are deemed safe for appropriate discharge from an emergency department or the observation ward should receive verbal advice and a written brain injury advice card (See Appendix 1.2). The details of the card should be discussed with the patient and their care providers. When necessary, communication in languages other than English or by other means should be used to communicate the information.	C	National Institute for Health and Clinical Excellence, Head Injury: Triage, assessment, investigation and early management of head injury in infants, children and adults  Consensus	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation was identified to be based on level 5 evidence, defined as: Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles".			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.9 If the patient re-presents to the emergency department with symptoms related to the initial injury, the following should be conducted: <ul style="list-style-type: none"> <li>• Full re-assessment</li> <li>• A-WPTAS assessment</li> <li>• CT scan, if indicated,</li> <li>• Emphasis and encouragement to the patients to attend their family physician for follow-up after discharge.</li> </ul>	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury Consensus	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
This recommendation has a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.10 On presentation, the primary care provider should conduct a comprehensive review of every patient who has sustained mTBI. The assessment should include taking a history, examination, cognitive screen, post concussive symptom assessment and review of mental health.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):61-75.</p> <p>Borg J, Holm L, Peloso PM, Cassidy JD, von Holst H, Paniak C, Yates D. Non-surgical intervention and cost for mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):76-83.</p> <p>Chambers J, Cohen S, Hemminger L, Prall J, Nichols J. Mild traumatic brain injuries in low risk trauma patients. <i>Journal of Trauma</i>. 1996;41(6):976-980.</p> <p>De Kruijk JR, Leffers P, Menheere P, Meerhoff S, Rutten J, Twijnstra A. Prediction of post-traumatic complaints after mild traumatic brain injury: early symptoms and biochemical markers. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:727-732.</p> <p>Fabbri A, Servadei G, Marchesini G, Morselli-Labate A, Dente M, Lervese T, Vandelli A. Prospective validation of a proposal for diagnosis and management of patients attending the emergency department for mild head injury. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2004;75:410-416.</p> <p>Iverson GL, Lange RT, Franzen MD. Effects of mild traumatic brain injury cannot be differentiated from substance abuse. <i>Brain Injury</i>. 2005;19(1):11-18.</p>			



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- Meares S, Shores E, Taylor A, Batchelor J, Bryant R, Baguley I, Chapman J, Gurka J, Dawson K, Capon L, Marosszeky J. Mild traumatic brain injury does not predict acute post concussion syndrome. *Journal of Neurology, Neurosurgery and Psychiatry*. 2008;79:200-306.
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- Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. *Journal of International Neuropsychological Society*. 2000;6(5):568-579.
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- Reed D. *Adult Trauma Clinical Practice Guidelines, Initial Management of Closed Head Injury in Adults*, ed. NSW Institute of Trauma Injury Management. 2007, Sydney.
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- Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. *European Journal of Neurology*. 2003;10:175-181.
- Shores EA, Lammel A, Batchelor J, Hullick C, Flynn M. Utility of the revised Westmead PTA scale in the acute assessment of mild traumatic brain injury (MTBI) - further analysis in International Neuropsychological Society 2006: Zurich.
- von Holst H, Cassidy JD. Mandate of the WHO collaborating centre task force on mild traumatic brain injury. *Journal of Rehabilitation Medicine*. 2004;43(suppl):8-10.

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.11 An appraisal of the severity and impact of post concussive symptoms should be made. A standardized tool such as the Rivermead Post Concussion Symptoms Questionnaire (see Appendix 1.3) can aid in this.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
“This is the opinion of the Guideline Development Team, or feedback from consultation within New Zealand where no evidence is available.”			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
1.12 The clinician should consider that one type of symptom an individual who has sustained a mTBI is likely to experience is reduced cognitive functioning post injury which may resolve in a few days or continue for months before resolving, and can include problems with recall of material, speed of information processing, concentration and attention.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>De Monte V, Geffen G, Massavelli B. The effects of post traumatic amnesia on information processing following mild traumatic brain injury. <i>Brain Injury</i>. 2006;20(13/14):1345-1354.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.1 Because a variety of factors, including biopsychosocial, contextual, and temporal preinjury, injury and postinjury variables can impact on the outcomes of patients who have sustained mTBI, clinicians should consider these factors when planning and implementing the management of patients.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Rose JM. Continuum of care model for managing mild traumatic brain injury in a workers compensation context: a description of the model and its development. <i>Brain Injury</i>. 2005;19(1):29-39.</p> <p>World Health Organisation. <i>Towards a common language for functioning, disability and health ICF</i>. 2002, World Health Organization Geneva. p. 1-22.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.2 Minor problems should be managed symptomatically and the person should be offered reassurance and information on symptom management strategies.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>"This is the opinion of the Guideline Development Team, or feedback from consultation within New Zealand where no evidence is available."</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.3 All people who have sustained a possible or definite mTBI should receive information about common symptoms and reassurance that recovery over a short period of time (days to a few weeks) is highly likely.	B	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Mittenburg W, Burton DB. A survey of treatments for post-concussional syndrome. <i>Brain Injury</i>. 1994;8(5):429-37.</p> <p>Crepeau F, Scherzer P. Predictors and indicators of work status after traumatic brain injury: a metaanalysis. <i>Neuropsychological Rehabilitation</i>. 1993;3(1):5-35.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.4 A person who sustains mTBI should not drive for at least 24 hours and may require medical re-assessment. An extension of the recommended 24 hour time period is advised if there are symptoms or complications that result in loss of good judgement, decreased intellectual capacity (including slowed thinking), post traumatic seizures, visual impairment or loss of motor skills. If there are complications, a medical assessment is required before an individual returns to driving.	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury Consensus	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.5 Symptomatic patients should be followed every two to four weeks from the time of initial contact until no longer symptomatic or until another re-assessment procedure has been put in place.	C	Defense and Veterans Brain Injury Center, Updated Mild Traumatic Brain Injury (mTBI) Clinical Guidance	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>2.6 A patient experiencing reduced cognitive functioning in the first few days following injury, with education and support, should be expected, in the majority of cases, to have these symptoms resolve and preinjury cognitive functioning return within days, up to three months. However, for patients who have 1) comorbidities or identified health or contextual factors (Table 7) and do not improve by one month, or 2) persistent symptoms at 3 months, it recommended that these patients be referred for more comprehensive evaluation to a specialized brain injury environment (see Appendix 2.1).</p>	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>British Columbia, Mild Traumatic Brain Injury: review of the literature and a look at the WCB of BC data, D.C.M. WCB Evidence Based Practice Group, Editor. 2003, Compensation and Rehabilitation Services Division.</p> <p>Iverson GL. Outcome from mild traumatic brain injury. <i>Current Opinion in Psychiatry</i>. 2005;18:301-317.</p> <p>Mittenberg W, Canyock EM, Condit D, Patton C. Treatment of post concussion syndrome following mild head injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2001;23(6):829-836.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly A, Nelms R, Curran C, Ng K. Impact of early intervention on outcome following mild head injury in adults. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73(3):330-332.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Turner-Stokes L, Disler PB, Nair A, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. 2005, The Cochrane Database of Systematic Reviews.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.7 Patients with preinjury psychiatric difficulties should be provided with multidisciplinary treatment.	A	Ghaffar O, McCullagh S, Ouchterlony D, Feinstein A. Randomized treatment trial in mild traumatic brain injury. <i>Journal of Psychosomatic Research</i> . 2006;61:153-160.	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.8 Management of patients who have had mTBI by primary care providers should involve guidance on strategies to minimize the impact of symptoms and to gradually resume activity and participation in life roles.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Borg J, Holm L, Peloso PM et al. Non-surgical intervention and cost for mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;Suppl. 43:76-83.</p> <p>Ponsford J, Willmott C, Rothwell A et al. Impact of early intervention on outcome following mild head injury in adults. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:330-332.</p> <p>Mittenberg W, Canyock EM, Condit D, Patton C. Treatment of post-concussion syndrome following mild head injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2001;23:829-836.</p> <p>Wade DT, King NS, Wenden FJ, Crawford S, Caldwell FE. Routine follow up after head injury: A second randomized controlled trial. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 1998;65:177-183.</p> <p>Wade DT, Crawford S, Wenden FJ et al. Does routine follow up after head injury help? A randomised controlled trial. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 1997;62:478-484.</p>			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.9 The primary care provider should consider referral of a patient who has had mTBI to specialist services when symptoms and concerns persist and fail to respond to standard treatments for any of the three spheres of Somatic, Behavioural/Emotional and Cognitive Symptoms.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.10 The primary care provider should consider the risk of depression or other mental health disorders in patients who have experienced mTBI and that the emergence and maintenance of symptoms may be influenced by maladaptive psychological responses to the injury.	B	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Levin HS, Brown SA, Song JX, McCauley SR, Boake C, Contant CF, Goodman H, Kotiria K. Depression and post traumatic stress disorder at three months after mild to moderate traumatic brain injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2001;23(6):754-769.</p> <p>Mooney G, Speed J. The association between mild traumatic brain injury and psychiatric conditions. <i>Brain Injury</i>. 2001;15(10):865-877.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Rogers JM, Read CA. Psychiatric comorbidity following traumatic brain injury. <i>Brain Injury</i>. 2007;21(13-14):1321-1333.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.11 Education about symptoms, including an advice card (Appendix 1.2), and reassurance should be provided to all patients who have experienced mTBI. Education should ideally be delivered at the time of initial assessment or minimally within one week of injury/first assessment.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury  New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>British Columbia, Mild Traumatic Brain Injury: review of the literature and a look at the WCB of BC data, D.C.M. WCB Evidence Based Practice Group, Editor. 2003, Compensation and Rehabilitation Services Division.</p> <p>Iverson GL. Outcome from mild traumatic brain injury. <i>Current Opinion in Psychiatry</i>. 2005;18:301-317.</p> <p>Mittenberg W, Canyock EM, Condit D, Patton C. Treatment of post concussion syndrome following mild head injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2001;23(6):829-836.</p> <p>National Institute for Health and Clinical Excellence. <i>Head Injury: triage, assessment, investigation and early management of head injury in infants, children and adults, Clinical Guidelines</i>. 2003, National Collaborating Centre for Acute Care.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly A, Nelms R, Curran C, Ng K. Impact of early intervention on outcome following mild head injury in adults. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73(3):330-332.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Turner-Stokes L, Disler PB, Nair A, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. 2005, The Cochrane Database of Systematic Reviews.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
2.12 Elements that can be included in the education session are: 1) information about common symptoms, 2) reassurance that it is normal to experience some symptoms and that a positive outcome is expected, 3) typical time (allowing for individual differences) and course of recovery, 4) advice about how to manage or cope with symptoms, 5) advice about gradual reintegration to regular activities, 6) information on how to access further support if needed, 7) advice on stress management.	C	Workplace Safety and Insurance Board of Ontario, Mild Traumatic Brain Injury Program of Care  Defense and Veterans Brain Injury Center, Updated Mild Traumatic Brain Injury (mTBI) Clinical Guidance	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
3.1 Patients with sport-related mTBI may present acutely or sub-acutely. If any one of the signs/symptoms outlined in Table 8 are observed at any point following a blow to or jarring of the head, mTBI should be suspected and appropriate management instituted.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
3.2 When a player shows any symptoms or signs of mTBI: <ul style="list-style-type: none"> <li>the player should not be allowed to return to play in the current game or practice</li> <li>the player should not be left alone and should be regularly monitored for deterioration</li> <li>the player should receive a medical evaluation including evaluation of reported complaints [e.g., somatic symptoms (Rivermead Post-Concussion Symptom Checklist), balance, and cognition]</li> <li>return to play must follow a medically supervised stepwise process</li> <li>a player should not be returned to play until asymptomatic at rest and with exertion.</li> </ul>	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
3.3 A player should never return to play while symptomatic. "If in doubt, sit them out".	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury  Concussion in Sport Group, Summary and Agreement Statement of the 2 <sup>nd</sup> International Conference on Concussion in Sport, Prague 2004	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>3.4 Return to play after mTBI should follow a stepwise process, proceeding to the next level only if asymptomatic. If any symptoms occur after mTBI, the person should revert to the previous asymptomatic level and try to progress again after 24 hours.</p> <ol style="list-style-type: none"> <li>1. No activity. When asymptomatic, proceed to level 2.</li> <li>2. Light aerobic exercise such as walking or stationary cycling, no resistance training.</li> <li>3. Sport-specific training (e.g., skating in hockey, running in soccer).</li> <li>4. Non-contact training drills.</li> <li>5. Full contact training after medical clearance.</li> <li>6. Game play.</li> </ol> <p>See the “Safe Step to Return to Play After a Possible Traumatic Brain Injury” algorithm from the NZGG guideline (Appendix 3.3).</p>	C	<p>New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation</p> <p>Concussion in Sport Group, Summary and Agreement Statement of the 2<sup>nd</sup> International Conference on Concussion in Sport, Prague 2004</p>	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>3.5 An additional consideration in return to play is that athletes who have experienced mTBI should not only be symptom free but also should not be taking any pharmacological agents/medications that may affect or modify the symptoms of concussion.</p>	C	<p>Concussion in Sport Group, Summary and Agreement Statement of the 2<sup>nd</sup> International Conference on Concussion in Sport, Prague 2004</p>	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
4.1 Clinicians should assess and monitor persisting somatic, cognitive and emotional/ behavioural symptoms following mTBI.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Bryant RA. Disentangling mild traumatic brain injury and stress reactions. <i>The New England Journal of Medicine</i>. 2008;358(5):525-527.</p> <p>Iverson GL, McCracken LM. Post concussive symptoms in persons with chronic pain. <i>Brain Injury</i>. 1997;11(11):783-790.</p> <p>Iverson GL, Lange RT, Franzen MD. Effects of mild traumatic brain injury cannot be differentiated from substance abuse. <i>Brain Injury</i>. 2005;19(1):11-18.</p> <p>Kashluba S, Casey JE, Paniak C. Sensitivity and specificity of ICD-10 post concussion syndrome after MTBI. <i>Journal of the International Neuropsychological Society</i>. 2006;12:111-118.</p> <p>Meares S, Shores EA, Batchelor J, Baguley IJ, Chapman J, Gurka J, Marosszeky JE. The relationship of psychological &amp; cognitive factors and opioids in the development of the post concussion syndrome in general trauma patients with mild traumatic brain injury. <i>Journal of the International Neuropsychological Society</i>. 2006;12:792-801.</p> <p>Meares S, Shores E, Taylor A, Batchelor J, Bryant R, Baguley I, Chapman J, Gurka J, Dawson K, Capon L, Marosszeky J. Mild traumatic brain injury does not predict acute post concussion syndrome. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2008;79:300-306.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
4.2 A standardized scale, such as the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3), should be used to monitor symptoms.	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 (see Table 9 and Appendix 4.1)	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
5.1 Patients should be advised that they are likely to experience one or more persistent symptoms as a consequence of the mTBI for a short period and that this is expected (normal).	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Eyres S, Carey A, Gilworth G, Neumann V, Tennant A. Construct validity and reliability of the Rivermead Post Concussion Symptoms Questionnaire. <i>Clinical Rehabilitation</i>. 2005;19:878-887.</p> <p>Ingebrigtsen T, Waterloo K, Marup-Jensen S, Attner E, Romner B. Quantification of post concussion symptoms three months after minor head injury in 100 consecutive patients. <i>Journal of Neurology</i>. 1998;245(9):609-612.</p> <p>Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. <i>European Journal of Neurology</i>. 2003;10:175-181.</p> <p>Chambers J, Cohen S, Hemminger L, Prall J, Nichols J. Mild traumatic brain injuries in low risk trauma patients. <i>Journal of Trauma</i>. 1996;41(6):976-980.</p> <p>Sheedy J, Geffen G, Donnelly J, Faux S. Emergency department assessment of mild traumatic brain injury and prediction of post-concussion symptoms at one month post injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2006;28:775-772.</p> <p>Bazarian JJ, Zelman FP, Mookerjee S, Stigbrand T. Serum s-100B and cleaved-tau are poor predictors of long-term outcome after mild traumatic brain injury. <i>Brain Injury</i>. 2006;20(7):759-765.</p> <p>Lundin A, De Boussard C, Edman G, Borg J. Symptoms and disability until three months after mild TBI. <i>Brain Injury</i>. 2006;20(8):799-806.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
5.2 The patient should be advised that a full recovery of symptoms is expected.	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Chambers J, Cohen S, Hemminger L, Prall J, Nichols J. Mild traumatic brain injuries in low risk trauma patients. <i>Journal of Trauma</i>. 1996;41(6):976-980.</p> <p>Sheedy J, Geffen G, Donnelly J, Faux S. Emergency department assessment of mild traumatic brain injury and prediction of post-concussion symptoms at one month post injury. <i>Journal of Clinical and Experimental Neuropsychology</i>. 2006;28:775-772.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
5.3 Where there are prolonged and significant complaints after mTBI, Primary Care Providers should rule out other contributing or confounding factors (see Table 7).	A	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Bryant RA. Disentangling mild traumatic brain injury and stress reactions. <i>The New England Journal of Medicine</i>. 2008;358(5):525-527.</p> <p>Carroll LJ, Cassidy JD, Peloso P, Borg J, von Holst H, Holm L, Paniak C, Pepin M. Prognosis for mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. <i>Journal of Rehabilitation Medicine</i>. 2004;43(suppl):84-105.</p> <p>Powell G. Mild traumatic brain injury and post concussion syndrome: the importance of base rates in diagnosis and clinical information. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2008;79:237.</p> <p>Ponsford J, Willmott C, Rothwell A, Cameron P, Kelly AM, Nelms R, Curran C, Ng K. Factors influencing outcome following mild traumatic brain injury in adults. <i>Journal of International Neuropsychological Society</i>. 2000;6(5):568-579.</p> <p>Shores EA, Lammel A, Batchelor J, Hullick C, Flynn M. Utility of the revised Westmead PTA Scale in the acute assessment of mild traumatic brain injury (MTBI) - further analysis in International Neuropsychological Society 2006: Zurich.</p> <p>De Kruijk JR, Leffers P, Menheere P, Meerhoff S, Rutten J, Twijnstra A. Prediction of post-traumatic complaints after mild traumatic brain injury: early symptoms and biochemical markers. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:727-732.</p> <p>Iverson GL, McCracken LM. Post concussive symptoms in persons with chronic pain. <i>Brain Injury</i>. 1997;11(11):783-790.</p> <p>Iverson GL. Outcome from mild traumatic brain injury. <i>Current Opinion in Psychiatry</i>. 2005;18:301-317.</p> <p>Ponsford J, Cameron P, Willmott C, Rothwell A, Kelly A, Nelms R, Ng K. Use of the Westmead PTA scale to monitor recovery of memory after mild head injury. <i>Brain Injury</i>. 2004;18(6):603-614.</p> <p>Lundin A, De Boussard C, Edman G, Borg J. Symptoms and disability until three months after mild TBI. <i>Brain Injury</i>. 2006;20(8):799-806.</p>			

Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, Ericson K. Diagnostic procedures in mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. *Journal of Rehabilitation Medicine*. 2004;43(suppl):61-75.

Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. *European Journal of Neurology*. 2003;10:175-181.

Faux S, Sheedy J. A prospective controlled study in the prevalence of post traumatic headache following minor traumatic brain injury. *Pain Medicine*. 2008. Epub ahead of print (February 5th).

Sheedy J, Geffen G, Donnelly J, Faux, S. Emergency department assessment of mild traumatic brain injury and prediction of post-concussion symptoms at one month post injury. *Journal of Clinical and Experimental Neuropsychology*. 2006;28:775-772.

Meares S, Shores E, Taylor A, Batchelor J, Bryant R, Baguley I, Chapman J, Gurka J, Dawson K, Capon L, Marosszeky J. Mild traumatic brain injury does not predict acute post concussion syndrome. *Journal of Neurology, Neurosurgery and Psychiatry*. 2008;79:200-306.

Cassidy JD, Carroll LJ, Cote P, Holm L, Nygren A. Mild traumatic brain injury after traffic collisions: a population-based inception cohort study. *Journal of Rehabilitation Medicine*, 2004. 43 (supplement): p. 15-21.

Cassidy, J.D., Carroll, L.J., Peloso, P.M., Borg, J., von Holst, H., Holm, L., Kraus, J., Coronado, V.G., Incidence, risk factors and prevention of mild traumatic brain injury: results of the WHO collaborating centre task force on mild traumatic brain injury. *Journal of Rehabilitation Medicine*. 2004;43(suppl):28-60.

Mickevičienė D, Schrader H, Obelienienė D, Surkiene D, Kunickas R, Stovner L. A controlled prospective inception cohort study on the post concussion syndrome outside the medicolegal context. *European Journal of Neurology*. 2004;11:411-419.

Owensworth T, Desbois J, Fleming J, Grant E, Strong J. The associations among self-awareness, emotional well-being and employment outcome following acquired brain injury: a 12 month longitudinal study. *Rehabilitation Psychology*. 2006;51(1):50-59.

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
5.4 Persons with mTBI and pre-injury mental health conditions, or any other health or contextual factors, should be considered for early referral to a multidisciplinary treatment clinic capable of managing post concussive symptoms because these factors have been associated with poorer outcomes.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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. To aid in determining the specific phenotype of headache disorder present, refer to the ICHD-II classification criteria in Appendix 6.3. Refer to the advice regarding assessment of post-traumatic headache provided in Appendix 6.6.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
6.2 Perform a neurologic exam and musculoskeletal exam including cervical spine examination (refer to Appendix 6.5).	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 ICSI guideline (see Appendix 6.7-6.9) for treatment guidance. Refer to the advice regarding management of post-traumatic headache provided in Appendix 6.6.	C	State of Colorado Department of Labor and Employment, Traumatic Brain Injury Medical Treatment Guidelines	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	Alberta Medical Association Toward Optimized Practice, Clinical Practice Guideline Adult Primary Insomnia: Diagnosis to Management	Adults experiencing primary insomnia
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
7.2 Provide the sleep hygiene advice included in Appendix 7.1.	C	British Columbia Medical Association, Primary Care Management of Sleep Complaints in Adults	Adults, general population
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
7.3 Relaxation training is effective and recommended therapy in the treatment of chronic insomnia.	C	American Academy of Sleep Medicine, Practice Parameters for the Psychological and Behavioral Treatment of Insomnia: An Update	Adults, general population
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Edinger JD, Wohlgemuth WK, Radtke RA, et al. Cognitive behavioural therapy for treatment of chronic primary insomnia: A randomized, controlled trial. <i>Journal of the American Medical Association</i>. 2001;285:1856-1864.</p> <p>Lichstein KL, Riedel BW, Wilson NM, et al. Relaxation and sleep compression for late-life insomnia: a placebo controlled trial. <i>Journal of Consulting and Clinical Psychology</i>. 2001;69:227-239.</p> <p>Means MK, Lichstein KL, Epperson MT, et al. Relaxation therapy for insomnia: nighttime and day time effects. <i>Behaviour Research and Therapy</i>. 2000;38:665-678.</p> <p>Rybarczyk B, Lopez M, Benson R, et al. Efficacy of two behavioural treatment programs for comorbid geriatric insomnia. <i>Psychology and Aging</i>. 2002;17:288-298.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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. Refer to the Therapeutic Options Table taken from the Alberta TOP guideline (Appendix 7.2) for suggestions on useful medications.	C	Alberta Medical Association Toward Optimized Practice, Clinical Practice Guideline Adult Primary Insomnia: Diagnosis to Management	Adults experiencing primary insomnia
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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. See Appendix 7.3 for advice on achieving sleep consolidation.	C	Alberta Medical Association Toward Optimized Practice, Clinical Practice Guideline Adult Primary Insomnia: Diagnosis to Management  British Columbia Medical Association, Primary Care Management of Sleep Complaints in Adults	Adults, general population
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
8.1 Given their prevalence and potential impact, all patients with persistent symptoms following mTBI should be screened for mental health symptoms and disorders, including: <ul style="list-style-type: none"> <li>depressive disorders</li> <li>anxiety disorders, including PTSD</li> <li>irritability or other personality changes</li> <li>substance use disorders</li> <li>somatoform disorders</li> </ul> The use of self-report questionnaires can aid in the assessment and monitoring of common mental health disorders, such as the depression module of the Patient Health Questionnaire (PHQ-9; Appendix 8.2) and the PTSD Checklist - Civilian Version (PCL-C; Appendix 8.3). Other symptoms may be screened using the Rivermead Post Concussion Symptoms Questionnaire (Appendix 1.3).	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>8.2 Referral to a psychiatrist/mental health team (ideally with expertise in treating individuals with persistent symptoms following mTBI, if available) should be obtained if:</p> <ul style="list-style-type: none"> <li>the presentation is complex or severe</li> <li>psychosis or bipolar disorder is suspected</li> <li>the risk of suicide is judged significant</li> <li>initial treatment is not effective within two months</li> <li>failure or contraindication of medication strategies that are familiar</li> <li>presence of health or contextual factors known to potentially affect the course of recovery (see Table 7)</li> </ul>	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
“This is the opinion of the Guideline Development Team, or feedback from consultation within New Zealand where no evidence is available.”			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>8.3 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.</p>	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
"This is the opinion of the Guideline Development Team, or feedback from consultation within New Zealand where no evidence is available."			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation has a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation has a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	National Institute for Health and Clinical Excellence, Depression (amended): Management of Depression in Primary and Secondary Care	Adults, general population
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
8.8 Individuals with PTSD following mTBI should be offered a trial of trauma-focused CBT. 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).	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 (Appendix 1.3) includes items assessing cognition.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
9.2 Due 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.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 neuro-psychologist (ideally with experience with TBI). When a local neuropsychologist is not available or known, referral to a TBI centre can be made (see Appendix 2.1 for a list of TBI centres in Ontario). For systems with long wait times, practitioners should consider referral earlier than 3 months.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
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mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 persisting cognitive impairments on formal evaluation,  or  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).	C	Workplace Safety and Insurance Board Ontario, Mild Traumatic Brain Injury Program of Care	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
9.5 For cognitive sequelae following mTBI, the cognitive rehabilitation strategies that should be considered include compensatory strategies and restorative approaches.	C	Workplace Safety and Insurance Board Ontario, Mild Traumatic Brain Injury Program of Care	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	B	European Federation of Neurological Sciences (EFNS), EFNS Guidelines on Cognitive Rehabilitation: Report of an EFNS Task Force	Acquired Brain Injury
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>Glisky EL, Glisky ML. Learning and memory impairments. In: Eslinger PJ, ed. <i>Neuropsychological Interventions: Clinical Research and Practice</i>. New York: Guilford Press; 2002:137-162.</p> <p>Hart T, Hawkey K, Whyte J. Use of a portable voice organizer to remember therapy goals in traumatic brain injury rehabilitation: a within-subjects trial. <i>Journal of Head Trauma Rehabilitation</i>. 2002;17:556-570.</p> <p>Kapur N, Glisky EL, Wilson BA. Technological memory aids for people with memory deficits. <i>Neuropsychological Rehabilitation</i>. 2004;14:41-60.</p> <p>Kerner MJ, Acker M. Computer delivery of memory retraining with head injured patients. <i>Cognitive Rehabilitation</i>. 1985;Nov/Dec:26-31.</p> <p>Kirsch NL, Shenton M, Rowan J. A generic, in-house, alphanumeric paging system for prospective activity impairments after traumatic brain injury. <i>Brain Injury</i>. 2004;18:725-734.</p> <p>Tam S-F, Man W-K. Evaluating computer-assisted memory retraining programmes for people with post-head injury amnesia. <i>Brain Injury</i>. 2004;18:461-470.</p> <p>van den Broek MD, Downes J, Johnson Z, Dayus B, Hilton N. Evaluation of an electronic memory aid in the neuropsychological rehabilitation of prospective memory deficits. <i>Brain Injury</i>. 2000;14:455-462.</p> <p>Wilson BA, Emslic HC, Quirk K, Evans JJ. Reducing everyday memory and planning problems by means of a paging system: a randomised control crossover study. <i>Journal of Neurology, Neurosurgery, and Psychiatry</i>. 2001;70:477-482.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury Consensus	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
<p>De Kruijk JR, Leffers P, Menheere P, Meerhoff S, Rutten J, Twijnstra A. Prediction of post-traumatic complaints after mild traumatic brain injury: early symptoms and biochemical markers. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>. 2002;73:727-732.</p> <p>Heitger MH, Jones RD, Dalrymple-Alford JC, Frampton CM, Ardagh MW, Anderson TJ. Motor deficits and recovery during the first year follow mild closed head injury. <i>Brain Injury</i>. 2006;20(8):807-824.</p> <p>McCrory P, Johnston K, Meeuwisse M, Aubry M, Cantu R, Dvorak J, Graf-Bauman T, Kelly J, Lovell M, Schamasch P. Summary and agreement statement of the second International conference on concussion in sport, Prague 2004. <i>British Journal of Sports Medicine</i>. 2005;39:196-204.</p> <p>Savola O, Hillbom M. Early predictors of post-concussion symptoms in patients with mild head injury. <i>European Journal of Neurology</i>. 2003;10:175-181.</p>			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
10.2 If symptoms of benign positional vertigo are present the Dix-Hallpike Manoeuvre (see Appendix 10.1) should be used	A	Cochrane Systematic Review: Hilton MP, Pinder DK (2009). The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo.	Mixed
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
10.4 A canalith repositioning maneuver should be used to treat Benign Positional Vertigo if the Dix-Hallpike Maneuver is positive.	A	Cochrane Systematic Review: Hilton MP, Pinder DK (2009). The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo.	Mixed
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
10.5 Vestibular rehabilitation therapy is recommended for unilateral peripheral vestibular dysfunction.	A	Cochrane Systematic Review: Hillier SL, Hollohan V. (2008). Vestibular rehabilitation for unilateral peripheral vestibular dysfunction (Review).	Mixed
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
11.1 A) Take an appropriate history relevant to visual symptoms. B) Perform fundoscopic exam, and exams of visual acuity, visual fields and extraocular movements for symptoms of visual disturbance including visual field, blurring, diplopia, and photosensitivity.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
11.2 If visual abnormalities are observed, refer to an ophthalmologist, ideally a neuro-ophthalmologist or one specializing in brain injury.	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
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 (FSS; see Appendix 12.1).	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>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:</p> <ul style="list-style-type: none"> <li>• 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 or comorbid medical conditions associated with fatigue (e.g., metabolic disorders, e.g., thyroid screen, CBC, enemic, low CA, malnourishment).</li> <li>• Obtain sleep history to help identify primary or secondary sleep disorders (see optional self-report sleep diary in Appendix 7.1).</li> <li>• 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.</li> <li>• Conduct a general medical examination and a focused neurologic exam.</li> </ul>	C	Multiple Sclerosis Council for Clinical Practice Guidelines, Fatigue and Multiple Sclerosis: Evidence-Based Management Strategies for Fatigue in Multiple Sclerosis	Multiple Sclerosis
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
<p>12.3 If identified as a significant symptom, some key consideration that may aid in the management of persistent fatigue can include:</p> <ul style="list-style-type: none"> <li>• Aiming for a gradual increase in activity levels that will parallel improvement in energy levels.</li> <li>• Reinforce that pacing activities across the day will help patient to achieve more and to avoid exceeding tolerance levels.</li> <li>• Encouraging good sleep practices (especially regularity of sleep time, and avoidance of stimulants and alcohol), and proper relaxation times.</li> <li>• Using a notebook to plan meaningful goals, record activity achievement and identify patterns of fatigue.</li> <li>• Acknowledging that fatigue can be exacerbated by low mood.</li> </ul> <p>Provide patients with a pamphlet containing advice on coping strategies for fatigue (see Appendix 12.3).</p>	C	New Zealand Guidelines Group, Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
12.4 If fatigue is persistent then refer to a brain injury specialist for consideration of a medication trial	C	Consensus	-
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
-			



mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
13.1 When managing a patient's return to work/study, the Health Care Provider should consider patient related and contextual variables. These include physical difficulties arising from the injury, psychological issues, cognitive impairment, cultural or work-related contextual factors (e.g., workload and responsibilities, workplace environment, transport or driving issues, hours/shifts/rest breaks). Refer to Appendix 13.1 for guidance on return to work/study considerations.	C	Motor Accidents Authority of NSW, Guidelines for Mild Traumatic Brain Injury Following Closed Head Injury	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
The recommendation had a consensus grade.			

mTBI Guideline	Level of Evidence	Source of Recommendation (i.e., pre-existing guideline, literature, expert consensus)	Population Addressed by Source (TBI or other)
13.2 For individuals who experience persistent deficits following mTBI, or 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.	C	State of Colorado Department of Labor and Employment, Traumatic Brain Injury Medical Treatment Guidelines	TBI
<b>Primary Sources Cited in Pre-existing Guidelines</b>			
N/A			

## APPENDIX E

### RESULTS OF THE mTBI SYSTEMATIC REVIEW OF THE LITERATURE

#### Medication

Reference	Year	Country	Design
Silver JM, Koumaras B, Chen M, Mirski D, Potkin SG et al. Effects of rivastigmine on cognitive function in patients with traumatic brain injury. <i>Neurology</i> . 2006;67:748-755.	2006	USA	RCT
<b>Methods</b>			
<p><b>OBJECTIVE:</b> To compare the efficacy and safety of <b>rivastigmine</b> (3 to 6 mg/day) vs placebo over 12 weeks in patients with traumatic brain injury and persistent cognitive impairment. <b>METHODS:</b> This prospective, randomized, doubleblind, placebo-controlled study was conducted in 157 patients at least 12 months after injury. The primary efficacy measures were the Cambridge Neuropsychological Test Automated Battery (CANTAB) Rapid Visual Information Processing (RVIP) A= subtest and the Hopkins Verbal Learning Test (HVLT). The primary efficacy outcome was the proportion of patients who demonstrated 1.0 SD or greater improvement from baseline at week 12 on CANTAB RVIP A= or HVLT.</p>			
<b>Outcome</b>			
<p>The percentage of responders at week 12 on either the CANTAB RVIP A= or HVLT was 48.7% for rivastigmine and 49.3% for placebo (p=0.940). Furthermore, for the overall study population, there were no significant differences for any of the secondary efficacy variables. In a subgroup of patients with moderate to severe memory impairment (n =81), defined as 25% impairment or greater on HVLT at baseline, rivastigmine was significantly better than placebo for a number of measures, including the proportion of HVLT responders and CANTAB RVIP mean latency. <b>CONCLUSIONS:</b> Rivastigmine was safe and well tolerated in patients with traumatic brain injury with cognitive deficits. Rivastigmine shows promising results in the subgroup of patients with traumatic brain injury with moderate to severe memory deficits.</p>			

Reference	Year	Country	Design
Kee Y, Ko M, Na S, Park S & Kim K. Effects of single-dose methylphenidate on cognitive performance in patients with traumatic brain injury: a double-blind placebo-controlled study. <i>Clinical Rehabilitation</i> . 2006;20:24-30.	2006	Korea	RCT
<b>Methods</b>			
<p><b>OBJECTIVES:</b> To determine the effect of a single dose of <b>methylphenidate</b> on the cognitive performance of patients with traumatic brain injury (TBI), and particularly on working memory and visuospatial attention. <b>DESIGN:</b> A double-blind placebo-controlled study. The subjects were randomly divided into an experimental group taking methylphenidate and a control group taking a placebo. <b>SUBJECTS:</b> Eighteen subjects with TBI (16 male and two female) were enrolled. <b>INTERVENTIONS:</b> The patients were given 20 mg methylphenidate or a placebo. Cognitive assessments were performed at three times: before the medication as a baseline, 2 h after medication and at follow-up (48 h later). <b>MAIN MEASURES:</b> Cognitive assessments consisted of working memory tasks and endogenous visuospatial attention tasks designed using SuperLabPro 2.0 software. Response accuracy and reaction time were measured.</p>			
<b>Outcome</b>			
<p><b>RESULTS:</b> A significant decrease in the reaction time was also observed in the methylphenidate group only for the working memory task (p&lt;0.05). There were no significant improvements in response accuracy in the methylphenidate group compared with the placebo group for both the working memory and visuospatial attention tasks.</p>			

Reference	Year	Country	Design
Lee, H., Kim, S., Kim, J., Shin, I., Yang, S., et al. (2005). Comparing effects of methylphenidate, sertraline and placebo on neuropsychiatric sequelae in patients with traumatic brain injury. <i>Human Psychopharmacology</i> , 20, 97-104.	2005	Korea	RCT
<b>Methods</b>			
This study aimed to investigate the effects of <b>methylphenidate and sertraline</b> compared with placebo on various neuropsychiatric sequelae associated with traumatic brain injury (TBI). <b>METHODS:</b> This was a 4 week, double-blind, parallel-group trial. Thirty patients with mild to moderate degrees of TBI were randomly allocated to one of three treatment groups (n=10 in each group) with matching age, gender and education, i.e. methylphenidate (starting at 5 mg/day and increasing to 20 mg/day in a week), sertraline (starting at 25 mg/day and increasing to 100 mg/day in a week) or placebo. At the baseline and at the 4 week endpoint, the following assessments were administered: subjective (Beck Depression Inventory) and objective (Hamilton Depression Rating Scale) measures of depression; Rivermead Postconcussion Symptoms Questionnaire for postconcussional symptoms; SmithKline Beecham Quality of Life Scale for quality of life; seven performance tests (Critical Flicker Fusion, Choice Reaction Time, Continuous Tracking, Mental Arithmetic, Short-Term memory, Digit Symbol Substitution and Mini-Mental State Examination); subjective measures of sleep (Leeds Sleep Evaluation Questionnaire) and daytime sleepiness (Epworth Sleepiness Scale).			
<b>Outcome</b>			
<b>RESULTS:</b> Neuropsychiatric sequelae seemed to take a natural recovery course in patients with traumatic brain injury. Methylphenidate Results: Neuropsychiatric sequelae seemed to take a natural recovery course in patients with traumatic brain injury. Methylphenidate had significant effects on depressive symptoms compared with the placebo ( $p<0.05$ ), without hindering the natural recovery process of cognitive function. Although sertraline also had significant effects on depressive symptoms compared with the placebo ( $p<0.005$ ), it did not improve many tests on cognitive performances. Daytime sleepiness was reduced by methylphenidate ( $p<0.009$ ), while it was not by sertraline. <b>CONCLUSIONS:</b> Methylphenidate and sertraline had similar effects on depressive symptoms. However, methylphenidate seemed to be more beneficial in improving cognitive function and maintaining daytime alertness. Methylphenidate also offered a better tolerability than sertraline.			

Reference	Year	Country	Design
Tenovu O. Central acetylcholinesterase inhibitors in the treatment of chronic traumatic brain injury-clinical experience in 111 patients. <i>Progress in Neuro-Psychopharmacology &amp; Biological Psychiatry</i> . 2005;29:61-67.	2005	Finland	Pre-post
<b>Methods</b>			
N=111, criteria: chronic stable TBI with at least one of these symptoms: fatigue, poor memory, diminished attention, diminished initiation. Patients received either <b>donepezil, galantamine, or rivastigmine</b> .			
<b>Outcome</b>			
In total, 61% of patients had positive response, 39% had modest or no response. Clearest effect was a better vigilance and attention causing better general function. No significant differences between drugs in their effect or tolerability. CAls very promising therapeutic potential.			

Reference	Year	Country	Design
Hecht JS. Occipital nerve blocks in postconcussive headaches. A retrospective review and report on ten patients. Journal of Head Trauma Rehabilitation. 2004;19:58-71.	2004	USA	Retrospective
<b>Methods</b>			
Diagnosis and treatment of cervical <b>headaches</b> syndromes and occipital neuralgia are reviewed. Also a retrospective study of 10 postconcussive patients with headaches. Patients were treated with greater occipital nerve blocks. Greater Occipital Nerve blocks were performed using 0.5% bupivacaine.			
<b>Outcome</b>			
Following the nerve block injections, 80% had a “good” response and 20% had a “partial” response.			

Reference	Year	Country	Design
Kanetani K. Kimura M. & Endo S. Therapeutic effects of milnacipran (serotonin noradrenalin reuptake inhibitor) on depression following mild and moderate traumatic brain injury. Journal of Nippon Medical School. 2003;70:313-320.	2003	Japan	Pre-post
<b>Methods</b>			
Investigate the efficacy and safety of <b>milnacipran</b> for the treatment of depression following mild and moderate traumatic brain injury. N=10. Participants had to meet the DSM-IV criteria for depression due to TBI with major depressive like episode or minor depression. Initially given 30 mg/day of milnacipran twice daily, dosage was adjusted weekly for six weeks. Depression and cognitive state were measured before (week 0) and after treatment (weeks 2, 4, 6).			
<b>Outcome</b>			
On the basis of having a decrease in a final HAM-D score of more than 50%, the response rate for the nine patients was 66.7%, while in a final score of 7 or less, the remission rate for the nine patients was 44%. A significantly greater improvement in cognitive function was seen in patients treated with milnacipran.			

Reference	Year	Country	Design
Kaye NS, Townsend JB, Ivins R. An open-label trial of donepezil (Aricept) in the treatment of persons with mild traumatic brain injury. Journal of Neuropsychiatry and Clinical Neuroscience. 2003;15(3):383-384.	2003	USA	Pre-post
<b>Methods</b>			
In an open label trial, subjects who participated in this pilot program were the first 10 consecutive patients known to have sustained TBI and received treatment in one outpatient practice after the release of <b>donepezil</b> . Patients were given 5mg daily for the first 4 weeks and 10 mg daily for the second 4 weeks. Pretreatment and posttreatment neuropsychiatric evaluations, including clinical global improvement (CGI) ratings and a symptom focused neuropsychological test battery, were used to measure responses to the medication.			
<b>Outcome</b>			
No positive change in the domain of memory. Clinical global improvement conducted by two independent raters showed improvement. Patients rated themselves as somewhat improved in most cases. The <b>overall impression</b> was that they had improved focus, attention and clarity of thought while on the medication. A number of patients commented that their speed of processing appeared to be better or they were able to keep multiple ideas in mind simultaneously. Family members frequently described improved socialization.			

## Sleep

Reference	Year	Country	Design
Kemp S, Biswas R, Neumann V & Coughlan A. The value of melatonin for sleep disorders occurring post-head injury: a pilot RCT. <i>Brain Injury</i> . 2004;18:911-919.	2004	UK	RCT
<b>Methods</b>			
The present work used a randomized double-blind controlled cross-over trial to compare <b>Melatonin</b> (5 mg) and <b>Amitriptyline</b> (25 mg) in a small sample (N = 7) of TBI patients presenting with chronic sleep disturbance. All patients kept a sleep diary for 1-month and underwent a clinical interview and brief neuropsychological testing in the baseline phase one. Patients were then randomly allocated to either the Melatonin (5 mg) or Amitriptyline (25 mg) (phase two) groups. After 1-month on the first drug, patients were seen for repeat neuropsychological testing and repeat clinical interview. A 2-week washout period followed during which time patients did not receive medication. Patients were then prescribed the other drug for 1-month and seen for repeat neuropsychological testing and clinical interview at the end of this month (phase three). Patients were required to keep their sleep diary throughout the process.			
<b>Outcome</b>			
No differences in sleep latency, duration, quality or daytime alertness were found for either drug compared to baseline using significance testing. However, effect sizes revealed some encouraging changes. Patients on Melatonin reported improved daytime alertness compared to baseline. On Amitriptyline, patients reported increased sleep duration compared to baseline.			

Reference	Year	Country	Design
Ouellet M & Morin C. Efficacy of cognitive-behavioral therapy for insomnia associated with traumatic brain injury: a single-case experimental design. <i>Archives of Physical Medicine and Rehabilitation</i> . 2007;88:1581-1592.	2007	USA	Pre-post
<b>Methods</b>			
<p><b>OBJECTIVE:</b> To test the efficacy of a <b>cognitive-behavioral therapy (CBT) for insomnia</b> in persons having sustained traumatic brain injury (TBI). Single-case design with multiple baselines across.</p> <p><b>PARTICIPANTS:</b> Eleven subjects having sustained mild to severe TBI who developed insomnia after the injury.</p> <p><b>INTERVENTION:</b> Eight-week CBT for insomnia including stimulus control, sleep restriction, cognitive restructuring, sleep hygiene education, and fatigue management.</p> <p><b>MAIN OUTCOME MEASURES:</b> Total wake time, sleep efficiency, and diagnostic criteria.</p>			
<b>Outcome</b>			
Visual analyses, corroborated by intervention time series analyses and t-tests, revealed clinically and statistically significant reductions in total wake time and sleep efficiency for 8 (73%) of 11 participants ( $P < 0.05$ ). An average reduction of 53.9% in total wake time was observed across participants from pre to post-treatment. Progress was in general well maintained at the 1-month and 3-month follow-ups. The average sleep efficiency augmented significantly from pretreatment (77.2%) to post-treatment (87.9%), and also by the 3-month follow-up (90.9%). Improvements in sleep were accompanied by a reduction in symptoms of general and physical fatigue. <b>CONCLUSIONS:</b> The results of this study show that psychologic interventions for insomnia are a promising therapeutic avenue for TBI survivors.			

## Cognitive Behavioural Therapy and Cognitive Therapy

Reference	Year	Country	Design
Technology Evaluation Center. Cognitive rehabilitation for traumatic brain injury in adults. Assessment Program. 2008;23:1-28.	2008	USA	<b>Systematic Review</b>
<b>Methods</b>			
<p><b>OBJECTIVE:</b> To determine whether there is adequate evidence to demonstrate that cognitive rehabilitation results in improved health outcomes. For the purposes of this assessment, cognitive test performance is not considered a health outcome. Results of instruments assessing daily functioning or quality of life are considered health outcomes. <b>SEARCH STRATEGY:</b> Randomized, controlled trials of cognitive rehabilitation for traumatic brain injury cited in recent systematic review articles were obtained. MEDLINE® was searched (via PubMed) through January 2008 for randomized, controlled trials of cognitive rehabilitation. <b>SELECTION CRITERIA:</b> For the main evidence review, randomized, controlled trials of cognitive rehabilitation were selected. A recent nonrandomized study of a comprehensive holistic program of cognitive rehabilitation was also included.</p>			
<b>Outcome</b>			
<p>Two studies of comprehensive holistic cognitive rehabilitation were reviewed. The one randomized study found no differences in the outcomes of return to work, fitness for military duty, quality of life, and measures of cognitive and psychiatric function at 1 year. Rates of returning to work were greater than 90% for both the intervention and control groups. The other study of comprehensive rehabilitation was nonrandomized. The intervention group showed greater improvements in functioning as assessed by a questionnaire that evaluated community integration, home integration, and productivity assessed upon completion of the intervention. However, there were many differences in baseline characteristics between intervention and control groups, particularly regarding the time since injury.</p>			

Reference	Year	Country	Design
Tiersky LA, Anselmi V, Johnston MV, Kurtyka J, Roosen E et al. A trial of neuropsychologic rehabilitation in mild-spectrum traumatic brain injury. Archives of Physical Medicine and Rehabilitation. 2005;86:1565-1574.	2005	USA	RCT
<b>Methods</b>			
<p><b>OBJECTIVE:</b> To test the <b>effectiveness of a neuropsychologic rehabilitation</b> program consisting of psychotherapy and cognitive remediation in the treatment of the affective and neuropsychologic sequelae of mild-spectrum traumatic brain injury (TBI). <b>DESIGN:</b> Single-blind randomized, wait-listed controlled trial, with repeated measures and multiple baselines. <b>SETTING:</b> Outpatient clinic in northern New Jersey. <b>PARTICIPANTS:</b> Twenty persons with persisting complaints after mild and moderate TBI (11 in treatment group, 9 controls). <b>INTERVENTIONS:</b> The experimental group received both 50 minutes of individual cognitive-behavioral psychotherapy and 50 minutes of individual cognitive remediation, 3 times a week for 11 weeks. The control group was wait-listed and received treatment after conclusion of follow-up. <b>MAIN OUTCOME MEASURES:</b> Symptom Check List–90R General Symptom Index, plus scales of depression, anxiety, coping, attention, and neuropsychologic functioning.</p>			
<b>Outcome</b>			
<p><b>RESULTS:</b> Compared with the control group, the treatment group showed significantly improved emotional functioning, including lessened anxiety and depression. Most significant improvements in emotional distress were noted at 1 month and 3 months posttreatment. Performance on a measure of divided auditory attention also improved, but no changes were noted in community integration scores. <b>CONCLUSIONS:</b> Cognitive behavioral psychotherapy and cognitive remediation appear to diminish psychologic distress and improve cognitive functioning among community-living persons with mild and moderate TBI.</p>			



Reference	Year	Country	Design
Gurr B & Coetzer BR. The effectiveness of cognitive-behavioural therapy for post-traumatic headaches. <i>Brain Injury</i> . 2005;19:481-491.	2005	UK	Pre-post
<b>Methods</b>			
This research evaluated the effectiveness of a <b>multi-dimensional cognitive-behavioural</b> approach towards rehabilitation of post-traumatic headaches. The sample included 20 participants with post-traumatic headaches from an original sample of 41. Participants acted as their own controls. Outcome measures consisted of self-rating questionnaires to assess headache severity, intensity, duration, functioning and emotional well-being. Emotional and functional headache characteristics were studied using a multi-dimensional investigation which included relatives' perceptions of the sufferers headaches.			
<b>Outcome</b>			
The intervention proved effective and beneficial for the 20 therapy participants with significant improvement in intensity, duration and frequency ( $P<0.02$ ). It is concluded that cognitive-behavioural therapy provides a useful supplement to the treatment of post-traumatic headache.			

### Dizziness/Vertigo/Balance

Reference	Year	Country	Design
Hoffer ME, Gottshall KR, Moore R, Balough BJ & Wester D. Characterizing and treating dizziness after mild head trauma. <i>Otology &amp; Neurotology</i> . 2004;25:135-138.	2004	USA	Pre-post
<b>Methods</b>			
Fifty-eight cases of active duty and retired military personnel who sustained mild head trauma and had resultant dizziness. Participants were divided into three groups: posttraumatic positional vertigo, posttraumatic migraine-associated dizziness, and posttraumatic spatial disorientation. All groups (except for the positional group) underwent a 6-to 8-week standard <b>vestibular rehabilitation</b> program and then underwent repeat testing.			
<b>Outcome</b>			
The groups were compared on three criteria 1) improvement of objective physical examination and testing result abnormalities after therapy, 2) average time to return to work, and 3) average time to return to the perception of normal balance function based on the DHI and ABC tests. The migraine group of patients and the disorientation group of patients had distinct abnormalities of the vestibulo-ocular reflex (VOR) and the vestibulo-spinal reflex (VSR). Eighty-four percent of the migraine group demonstrated an improvement of these test results as compared with 27% of the disorientation group. Mean time to return to work was less than 1 week for the positional group, 3.8 weeks for the migraine group, and greater than 3 months for the disorientation group.			

Reference	Year	Country	Design
Marzo SJ, Leonetti JP, Raffin MJ & Letarte P. Diagnosis and management of post-traumatic vertigo. <i>Laryngoscope</i> . 2004;114:1720-1723.	2004		Retrospective pre-post
<b>Methods</b>			
Outpatient tertiary otolaryngology clinic setting from 1997- 2003. 16 (5 women, 11 men) met the inclusion criteria for the study including TBI and dizziness/vertigo. Their inpatient and outpatient charts, imaging studies, audiograms, vestibular tests, and physical therapy evaluations were reviewed. Patients had at least 6 months of follow-up.			

Outcome
Five patients had symptoms consistent with traumatic perilymphatic fistulas, two patients had symptoms consistent with post-traumatic Meniere's syndrome. Surgical therapy was not beneficial in relieving disequilibrium. Balance testing results did not predict return-to-work status. Eleven patients were not allowed to return to work in any capacity, two patients were allowed to return to work with limited duties, and three patients were allowed to return to work with no restrictions. Subjectively, all 16 patients benefited from 2 to 3 months of vestibular rehabilitation.

Reference	Year	Country	Design
Ernst A, Basta D, Seidl RO, Todt I, Scherer H et al. Management of posttraumatic vertigo. Otolaryngol Head Neck Surg. 2005;132:554-558.	2005	USA	Pre-post
Methods			
OBJECTIVE: To evaluate patients after blunt trauma of the head, neck, and craniocervical junction (without fractures) with vertigo and to report the results of treatment after extensive diagnostics. STUDY DESIGN: Prospective study of consecutive new cases with vertigo after trauma at different periods of onset. 63 patients were examined and treated. SETTING: Regional trauma medical center for the greater Berlin Area, tertiary referral unit.			
Outcome			
RESULTS: The primary disorders included labyrinthine concussion (18), rupture of the round window membrane (6), and cervicogenic vertigo (12). The secondary disorders included otolith disorders (5), delayed endolymphatic hydrops (12), and canalolithiasis (9). The patients were free of vertigo symptoms (except cervicogenic and otolith disorder) after treatment, which consisted of <b>habituation training, medical and surgical therapy options</b> . The follow-up was 1 year. CONCLUSION: Posttraumatic vertigo can be treated with a high success rate once the underlying disorder has been identified. The extent of the neurotological test battery determines the precision and quality of diagnostics. Surgical measures should be an integral part of treatment modalities if conservative treatment is not effective.			

Reference	Year	Country	Design
Gurr B & Moffat N. Psychological consequences of vertigo and the effectiveness of vestibular rehabilitation for brain injury patients. Brain Injury. 2001;15:387-400.	2001	UK	Pre-post
Methods			
The sample included 18 patients with vertigo due to acquired brain injury. Patients were assessed for vestibular disorder and referred to the therapy program. The therapy consisted of a behavioural exposure program to movements and activities which provoked vertigo and anxiety in order to facilitate compensation of vestibular dysfunction and habituation to physical anxiety symptoms.			
Outcome			
This vestibular rehabilitation program proved very effective and beneficial for the 18 patients, as their scores on measures of vertigo symptoms, handicap, emotional distress, physical flexibility and postural stability improved significantly post-therapy in comparison to no improvement during a waiting list period.			

## EEG

Reference	Year	Country	Design
Walker JE, Norma CA & Weber RK. Impact of qEEG-guided coherence training for patients with a mild closed head injury. <i>Journal of Neurotherapy</i> . 2002;6:31-43.	2002	Canada	Pre-post
<b>Methods</b>			
The purpose of this study is to evaluate whether <b>quantitative electroencephalography (qEEG) guided coherence training</b> is effective in remediating residual symptoms of MHI. <i>METHODS</i> : Twenty-six patients with persistent post-traumatic symptoms (PTS) were seen by the first author 3 to 70 months after a MHI and had a quantitative EEG (qEEG). Neurofeedback therapy designed to normalize abnormal qEEG coherence scores was provided to determine the effectiveness of this approach. Five training sessions addressed each qEEG abnormality. Training continued until the patient, by self-report, indicated that significant improvement had occurred or until a total of 40 sessions were given.			
<b>Outcome</b>			
Significant improvement (>50%) was noted in 88% of the patients (mean = 72.7%). All patients reported that they were able to return to work following the treatment, if they had been employed prior to the injury. On average, 19 sessions were required.			

Reference	Year	Country	Design
Schoenberger NE, Shiflett SC, Esty ML, Ochs L & Matheis RJ. Flexyx neurotherapy system in the treatment of traumatic brain injury: an initial evaluation. <i>Journal of Head Trauma Rehabilitation</i> . 2001;16:260-274.	2001	USA	RCT
<b>Methods</b>			
<i>OBJECTIVE</i> : To conduct a preliminary experimental evaluation of the potential efficacy of <b>Flexyx Neurotherapy System (FNS)</b> , an innovative electroencephalography (EEG)-based therapy used clinically in the treatment of traumatic brain injury (TBI). <i>PARTICIPANTS</i> : Twelve people aged 21 to 53 who had experienced mild to moderately severe closed head injury at least 12 months previously and who reported substantial cognitive difficulties after injury, which interfered with their functioning. <i>DESIGN</i> : Participants were randomly assigned to an immediate treatment group or a wait-list control group and received 25 sessions of FNS treatment. They were assessed at pretreatment, posttreatment, and follow-up with standardized neuropsychological and mood measures.			
<b>Outcome</b>			
Comparison of the two groups on outcome measures indicated improvement after treatment for participants' reports of depression ( $P<0.05$ ), fatigue ( $P<0.05$ ), and other problematic symptoms ( $P<0.01$ ), as well as for some measures of cognitive functioning. Most participants experienced meaningful improvement in occupational and social functioning.			

## Memory/Attention

Reference	Year	Country	Design
Dou ZL, Man DWK, Ou HN, Zheng JL & Tam SF. Computerized errorless learning-based memory rehabilitation for Chinese patients with brain injury: a preliminary quasi-experimental clinical design study. <i>Brain Injury</i> . 2006;20:219-225.	2006	China	RCT
<b>Methods</b>			
This study adopted a pre- and post-test quasi-experimental design. A total of 37 patients with TBI were randomly assigned to a <b>Computer-Assisted Memory Training Group (CAMG)</b> , a <b>Therapist-administered Memory Training Group (TAMG)</b> and a Control Group (CG). Except for the CG, the patients in both the CAMG and TAMG groups received, respectively, 1-month memory training programmes that were similar in content but differed in delivery mode. All patients were followed up 1 month after treatment. The outcome measures that were taken were the Neurobehavioural Cognitive Status Examination (NCSE or Cognistat), the Rivermead Behavioural Memory Test (RBMT) and The Hong Kong List Learning Test (HKLLT).			
<b>Outcome</b>			
<i>RESULTS:</i> The patients in the Computer-assisted Memory Rehabilitation (CAMG) and Therapist-administered Memory Rehabilitation group (TAMG) were found to perform better than the CG in the NCSE and RBMT, but no significant differences were found between the CAMG and TAMG. The CAMG showed significant improvement in their HKLLT assessment as compared with the TAMG and CG. No statistically significant differences were found between the CAMG and TAMG when comparing the post-training outcome measures with the follow-up results.			

Reference	Year	Country	Design
Tam S & Man W. Evaluation computer-assisted memory retraining programmes for people with post-head injury amnesia. <i>Brain Injury</i> . 2004;18:461-470.	2004	China	Pre-post test, quasi experimental design
<b>Methods</b>			
Tested four computer-assisted memory training strategies. Twenty-six persons with brain injury were randomly assigned to four age- and gender-matched memory training groups (self-paced, feedback, personalized, visual presentation) and they were trained using the related computer software, evaluated by the Rivermead Behavioural Memory Test (RBMT), self-efficacy scale and built-up computer performance records. A control group of patients suffering from brain injury did not receive any specific memory rehabilitation during their 2-week admission period into the rehabilitation centre and were just under general investigation.			
<b>Outcome</b>			
All four methods were positive among people with brain injury as compared with a control group. There were no significant differences between the four training methods. Clinical improvement was found in all four methods. The Feedback group showed significant improvement in self efficacy in comparison with other groups.			

## Problem Solving

Reference	Year	Country	Design
Rath JF, Simon D, Langenbahn DM, Sherr RL & Diller L. Group treatment of problem-solving deficits in outpatients with traumatic brain injury: a randomised outcome study. <i>Neuropsychological Rehabilitation</i> . 2003;13:461-488.	2003	USA	RCT
<b>Methods</b>			
60 high-level outpatients with TBI were randomly assigned to either conventional group neuropsychological rehabilitation or an <b>innovative group treatment</b> focused on the treatment of problem-solving deficits. Incorporating strategies for addressing underlying emotional self-regulation and logical thinking/reasoning deficits, the innovative treatment is unique in its attention to both motivational, attitudinal, and affective processes and problem-solving skills in persons with TBI.			
<b>Outcome</b>			
Participants in the innovative group improved in problem-solving ( $P<0.05$ ). Both the conventional and innovative groups improved on memory ( $P<0.05$ ), but not attentional testing. The conventional group had significant improvement in physical symptoms whereas the innovative group did not.			

## Vision/Reading

Reference	Year	Country	Design
Ciuffreda KJ, Rutner D, Kapoor N, Suchoff IB, Craig S et al. Vision therapy for oculomotor dysfunction in acquired brain injury: a retrospective analysis. <i>Optometry</i> . 2008;79:18-22.	2008	USA	Retrospective pre-post
<b>Methods</b>			
Retrospective review of patients from 2000-2003 for whom vision therapy was prescribed and who completed an optometric vision therapy program for remediation of their oculomotor dysfunctions were selected. This included 33 with TBI and 7 with CVA. The criterion for treatment success was denoted by marked/total improvement in at least 1 primary symptom and at least 1 primary sign.			
<b>Outcome</b>			
Ninety percent of those with TBI and 100% of those with CVA were deemed to have treatment success. These improvements remained stable at retesting 2 to 3 months later.			

Reference	Year	Country	Design
Ciuffreda KJ & Kapoor N. Oculomotor dysfunctions, their remediation, and reading-related problems in mild traumatic brain injury. <i>Journal of Behavioral Optometry</i> . 2007;18:72-77.	2007	USA	Review
<b>Methods</b>			
An overview of three studies done by their research group. These involved versional oculomotor dysfunctions, their related reading problems, and remediation in a group of visually symptomatic patients with mild TBI.			
<b>Outcome</b>			
The results have shown that in a large clinical sample ( $n=160$ ), approximately 90% had one or more oculomotor deficits, such as convergence insufficiency or abnormal saccadic tracking, with the potential to impair reading performance. Thirty-three of this same clinical sample completed a program of vision therapy. Ninety percent of these subjects exhibited improvement in at least one related sign and one related symptom. Lastly, in a small ( $n=9$ ) cohort of laboratory-tested, symptomatic subjects with oculomotor-based reading problems, all improved their overall reading performance and versional eye tracking ability, as assessed objectively and subjectively following basic versional training.			

Reference	Year	Country	Design
Ciuffreda KJ, Han Y, Kapoor N & Ficarra A. Oculomotor rehabilitation for reading in acquired brain injury. <i>NeuroRehabilitation</i> . 2006;21:9-21.	2006	USA	Cross over design
<b>Methods</b>			
The purpose of this study was to assess reading-related oculomotor rehabilitation in individuals with acquired brain injury. Adults with either stroke (n = 5) or traumatic brain injury (n = 9) participated. Training paradigms included single-line and multiple-line simulated reading, as well as basic versional tracking (fixation, saccade, and pursuit), twice per week over an 8 week period. Training modes included normal internal oculomotor visual feedback either in isolation (4 weeks) or concurrent with external oculomotor auditory feedback (4 weeks). Training effects were assessed objectively using infrared eye movement recording technology for simulated and actual reading, with the assessments occurring before, midway, and after training.			
<b>Outcome</b>			
Significant improvement (P<0.01) in reading ability under all conditions comparing pre treatment to post treatment.			

### Olfactory

Reference	Year	Country	Design
Fujii M, Fukazawa K, Takayasu S & Sakagami M. Olfactory dysfunction in patients with head trauma. <i>Auris Nasus Larynx</i> . 2002;29:35-40.	2002	Japan	Pre-post
<b>Methods</b>			
The olfactory function of 27 patients with head trauma was studied. The olfactory acuities of all the patients were examined using olfactory tests before the treatment, and 18 patients were examined again after the treatment. Olfactory functions were evaluated in 26 patients by T&T olfactometry and in 27 patients by Alinamin test. All of the patients were treated with a local injection of suspended steroid solution into the nasal mucosa			
<b>Outcome</b>			
Before the treatment, 16 patients (61.5%) presented anosmia, five patients (19.2%) presented severe hyposmia, three patients (11.5%) presented moderate hyposmia, and two patients (7.7%) presented mild hyposmia. Eighteen cases (69.2%) were negative for the Alinamin test and eight cases (30.8%) were positive. The improvement rates of recognition and detection thresholds by T&T olfactometry were 35.3 and 23.5%, respectively.			

### Depression/Psychological

Reference	Year	Country	Design
Soo C & Tate R. Psychological treatment for anxiety in people with traumatic brain injury (review). <i>Cochrane Database of Systematic Reviews</i> , Issue 3, 1-24.	2008		<b>Systematic review Cochrane</b>
<b>Methods</b>			
<p><b>OBJECTIVES:</b> To assess the effects of psychological treatments for anxiety in people with TBI. <b>SEARCH STRATEGY:</b> Comprehensively searched databases up until March 2006. Additionally, key journals were handsearched and reference lists of included trials were examined to identify further studies meeting inclusion criteria. <b>SELECTION CRITERIA:</b> Randomised controlled trials of psychological treatments for anxiety, with or without pharmacological treatment, for people with TBI were included in the review. Pharmacological treatments for anxiety in isolation (without psychological intervention) were excluded. <b>DATA COLLECTION AND ANALYSIS:</b> Two authors independently assessed methodological quality and extracted data from the included trials.</p>			



Outcome
Three trials were identified in this review as satisfying inclusion criteria. Results of all three trials were evaluated, however, one of these trials had compromised methodological quality and, therefore the focus was placed on the other two trials. Data were not pooled due to the heterogeneity between trials. The first trial (n = 24) showed a benefit of cognitive behavioural therapy (CBT) in people with mild TBI and acute stress disorder. Fewer people receiving CBT had diagnosis of post-traumatic stress disorder (PTSD) at post-treatment compared to the control supportive counselling group, with maintenance of treatment gains found at six-month follow up. The second trial (n = 20) showed that post-treatment anxiety symptomatology of people with mild to moderate TBI was lower in the combined CBT and neurorehabilitation group compared to the no intervention control group.

Reference	Year	Country	Design
Turner-Stokes L & MacWalter R. Use of antidepressant medication following acquired brain injury: concise guidance. Clinical Medicine. 2005;5:268-274.	2005	UK	Guideline
Methods			
This set of concise guidance was developed jointly by the British Society of Rehabilitation Medicine, the British Geriatrics Society and the Royal College of Physicians, to guide clinicians working with people who have brain injury of any cause (i.e., stroke, trauma, anoxia, infection, etc). The guidance covers (a) screening and assessment of depression in the context of brain injury, (b) issues to consider and discuss with the patient and their family before starting treatment, and (c) proper treatment planning and evaluation – including planned withdrawal at the end of treatment.			
Outcome			
A guideline to provide clinicians with an approach to managing minor to moderate depression in the context of rehabilitation or recovery from ABI, and to identify those individuals who require referral to mental health services.			

Reference	Year	Country	Design
Baker-Price L & Persinger MA. Intermittent burst-firing weak (1 micro tesla) magnetic fields reduce psychometric depression in patients who sustained closed head injuries: a replication and electroencephalographic validation. Perceptual and Motor Skills. 2003;96:965-974.	2003	Canada	RCT
Methods			
N=14. Patients who reported chronic depression more than one year after closed head injuries were exposed to weak (1 microTesla) <b>burst-firing magnetic fields</b> either across the temporal lobes or over the left frontal lobe. Treatment was for 30 minutes once per week for six weeks.			
Outcome			
The reduction in depression scores after 5 weeks of treatments and after 6 weeks of no treatment (follow-up) accommodated 54% of the variance for both groups. The changes in depression scores did not differ significantly between the two groups (temporal vs frontal).			

## Multi-disciplinary Rehabilitation

Reference	Year	Country	Design
Ghaffar O, McCullagh S, Ouchterlony D & Feinstein A. Randomized treatment trial in mild traumatic brain injury. <i>Journal of Psychosomatic Research</i> . 2006;61:153-160.	2006	Canada	RCT
<b>Methods</b>			
<p><b>OBJECTIVE:</b> To determine whether <b>multidisciplinary treatment of mild traumatic brain injury (MTBI)</b> improves neurobehavioral outcome at 6 months postinjury. <b>METHODS:</b> Subjects with MTBI were randomly assigned to treatment (n =97) or nontreatment (control, n=94) groups. Treated patients were assessed within 1 week of injury and thereafter managed by a multidisciplinary team according to clinical need for a further 6 months. Control subjects were not offered treatment. Six-month outcome measures included: severity of postconcussive symptoms (Rivermead Post Concussion Symptoms Questionnaire), psychosocial functioning (Rivermead Follow-up Questionnaire), psychological distress (General Health Questionnaire), and cognition (neurocognitive battery).</p>			
<b>Outcome</b>			
<p>Treatment and control subjects were well-matched for demographic and MTBI severity data. In addition, the two groups did not differ on any outcome measure. However, in individuals with preinjury psychiatric difficulties (22.9% of the entire sample), subjects in the treatment group had significantly fewer depressive symptoms 6 months postinjury compared with untreated controls (P=.01). <b>CONCLUSIONS:</b> These findings suggest that routine treatment of all MTBI patients offers little benefit.</p>			

Reference	Year	Country	Design
Turner-Stokes L, Disler PB, Nair A & Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age (review). <i>Cochrane Database of Systematic Reviews</i> , Issue 3.	2005		<b>Systematic review Cochrane</b>
<b>Methods</b>			
<p><b>OBJECTIVES:</b> To assess the <b>effects of multi-disciplinary rehabilitation following ABI in adults</b>, 16 to 65 years. To explore approaches that are effective in different settings and the outcomes that are affected. <b>SELECTION CRITERIA:</b> Randomised controlled trials (RCTs) comparing multi-disciplinary rehabilitation with either routinely available local services or lower levels of intervention; or trials comparing intervention in different settings or at different levels of intensity. Quasi-randomised and quasi-experimental designs were also included, providing they met pre-defined methodological criteria. We performed a 'best evidence' synthesis by attributing levels of evidence, based on methodological quality. We sub-divided trials in terms of severity of ABI and the setting and type of rehabilitation offered.</p>			
<b>Outcome</b>			
<p>We identified ten trials of good methodological quality and four of lower quality. <b>Within the subgroup of predominantly mild brain injury, 'strong evidence' suggested that most patients make a good recovery with provision of appropriate information, without additional specific intervention.</b></p>			

## Other TBI

Reference	Year	Country	Design
Elgmar Andersson E, Emanuelson I, Bjorklund R & Stalhammar DA. Mild traumatic brain injuries: the impact of early intervention on late sequelae. A randomized controlled trial. <i>Acta Neurochirurgica</i> . 2007;149:151-160.	2007	Sweden	RCT
<b>Methods</b>			
Hypothesis that <b>early rehabilitation of selected MTBI patients</b> would reduce long term sequelae. A randomized controlled trial with one year follow-up. Among 1719 consecutive patients with MTBI, 395 individuals, 16–60 years of age, met the MTBI definition. The control group (N=131) received regular care. The intervention group (N=264) was examined by a rehabilitation specialist. 78 patients were mainly referred to an occupational therapist. The problems were identified in daily activities and in terms of post-concussion symptoms (PCS), an individualized, tailored treatment was given. Primary endpoint was change in rate of PCS and in life satisfaction at one-year follow-up between the groups.			
<b>Outcome</b>			
No statistical differences were found between the intervention and control groups. Patients who experienced few PCS two to eight weeks after the injury and declined rehabilitation recovered and returned to their pre-injury status. Patients who suffered several PCS and accepted rehabilitation did not recover after one year. In this particular MTBI sample, <b>early active rehabilitation did not change the outcome to a statistically significant degree.</b>			

Reference	Year	Country	Design
Shi X, Tang Z, Sun D & He X. Evaluation of hyperbaric oxygen treatment of neuropsychiatric disorders following traumatic brain injury. <i>Chinese Medical Journal</i> . 2006;119:1978-1982	2006	China	Pre-post
<b>Methods</b>			
To study the effects of <b>Hyperbaric oxygen</b> (HBO) on cerebral blood flow (CBF) and the usefulness of single photon emission computed tomography (SPECT) images in the diagnosis and assessment of neuropsychiatric disorders after TBI, we compared the results of cerebral SPECT and cerebral computed tomography (CT) before and after HBO treatment. <i>METHODS:</i> Three hundred and ten patients with neuropsychiatric disorders arising from traumatic brain injury were treated twice with hyperbaric oxygen. Cerebral single photon emissions computed tomography (SPECT) images and computed tomography scans (CT) before and after hyperbaric oxygen treatment, were compared.			
<b>Outcome</b>			
<i>RESULTS:</i> Before treatment, the proportion of abnormal cerebral changes detected by SPECT was 81.3% but only 15.2% by CT. After HBO treatment, 70.3% of SPECT scans showed no abnormalities and these patients were clinically improved. Treatment improved regional cerebral blood flow. <i>CONCLUSION:</i> SPECT was much more sensitive than CT in the diagnosis of neuropsychiatric disorders following hyperbaric oxygen treatment of neuropsychiatric disorders arising from traumatic brain injury.			

Reference	Year	Country	Design
Comper P, Bisschop SM, Carnide N & Tricco A. A systematic review of treatments for mild traumatic brain injury. <i>Brain Injury</i> . 2005;19:863-880.	2005	Toronto	<b>Systematic Review</b>
<b>Methods</b>			
<i>AIM:</i> To assess the effectiveness of interventions for mild traumatic brain injury (MTBI) in adults as found in the literature. <i>RESEARCH DESIGN:</i> Systematic review of the literature. Methods: Six electronic databases and 18 journals within the brain injury field were manually searched between the years 1980-2003. References from articles were scanned for further literature. Studies that met broad inclusion criteria were subjected to a formal test of relevance.			
<b>Outcome</b>			
<i>RESULTS:</i> One thousand and fifty-five studies were initially identified and 163 were assessed using the relevance tool, yielding 20 studies for review. Four categories of interventions were identified: Pharmacotherapy, Cognitive Rehabilitation, Patient Education and Other. The majority of studies were weak, however there is evidence to support the effectiveness of patient education interventions.			

Reference	Year	Country	Design
Bedard M, Felteau M, Mazmanian D, Fedyks K, Klein R et al. Disability and Rehabilitation. 2003;25:722-731.	2003	Canada	Pre-post
<b>Methods</b>			
Objective was to examine the potential efficacy of a <b>mindfulness-based stress reduction</b> approach to improve quality of life in individuals who have suffered traumatic brain injuries. N = 21, convenience sample, individuals with mild to moderate brain injuries at least 1 year post-injury. Intervention was delivered in 12-weekly group sessions. Drop-outs were used as controls.			
<b>Outcome</b>			
The treatment group mean quality of life (SF-36) improved by 15.40 (SD=9.08) compared to 71.67 (SD=16.65; p=0.036) for controls. Improvements on the cognitive-affective domain of the Beck Depression Inventory II (BDI-II) were reported (p=0.029), while changes in the overall BDI-II (p=0.059) and the Positive Symptom Distress Inventory of the SCL-90R (p=0.054) approached statistical significance.			

Reference	Year	Country	Design
de Kruijk JR, Leffers P, Meerhoff S, Rutten J & Twijnstra A. Effectiveness of bed rest after mild traumatic brain injury: a randomised trial of no versus six days of bed rest. <i>Journal of Neurology, Neurosurgery and Psychiatry</i> . 2002;73:167-172.	2002	Netherlands	RCT
<b>Methods</b>			
<i>OBJECTIVE:</i> To evaluate the effect of bed rest on the severity of post traumatic complaints (PTC) after MTBI; patients presenting to the emergency room (N=107) were randomly assigned to two intervention strategies. One group was advised not to take bed rest (NO) and the other to take full bed rest (FULL) for six days after the trauma. Primary outcome measures were severity of PTC on a visual analogue scale and physical and mental health on the medical outcomes study 35 item short form health survey at two weeks, and three and six months after the trauma.			
<b>Outcome</b>			
Outcome variables in both groups clearly improved between two weeks and six months. After adjustment for differences in baseline variables, most PTC tended to be somewhat more severe in the FULL group six months after the trauma, but no significant differences were found. There were no significant differences in the outcome parameters between the two groups after three months. Two weeks after the trauma, most PTC in the FULL group were slightly less severe than those in the NO group, and physical subscores of the SF-36 in the FULL group were slightly better. These differences were not significant. <i>CONCLUSION:</i> as a means of speeding up recovery of patients with PTC after MBTI, bed rest is no more effective than no bed rest at all.			

## APPENDIX F

### SEARCH RESULTS FOR EXISTING TBI GUIDELINES

Authors	Title	Year Published	Population Addressed	Timeline Addressed	Decision
Motor Accidents Authority of NSW	Guidelines for Mild Traumatic Brain Injury following Closed Head Injury	2008	Mild TBI	Pre-hospital – 6 months following injury	Included for review by expert panel
Defense and Veterans Brain Injury Center	Updated Mild Traumatic Brain Injury (mTBI) Clinical Guidance	2008	Mild TBI	Acute – Sub-acute/Chronic	Included for review by expert panel
Thompson JM. Veterans Affairs Canada	Persistent Symptoms Following Mild Traumatic Brain Injury (mTBI) – A Resource for Clinicians and Staff	2008	Mild TBI	Not applicable	Excluded from further review because document is a review of the topic, not a clinical practice guideline with recommendations on care
UK Ministry of Defence, Defence Medical Services	Mild Traumatic Brain Injury Project Team Final Report	2008	Mild TBI	Not applicable	Excluded from further review because document is a report on current knowledge & research, not a clinical practice guideline
Work Loss Data Institute	Head (trauma, headaches, etc., not including stress and mental disorders)	2007	TBI in general	Acute – Long term	Excluded from further review because not accessible
National Collaborating Centre for Acute Care, National Institute for Health and Clinical Excellence	Head Injury. Triage, Assessment, Investigation and Early Management of Head Injury in Infants, Children and Adults.	2007	TBI in general	Primarily acute with small section on follow-up	Included for further review by expert panel
Workplace Safety and Insurance Board Ontario	Mild Traumatic Brain Injury Program of Care	2006	Mild TBI	Acute – Long term	Included for further review by expert panel

<b>Authors</b>	<b>Title</b>	<b>Year Published</b>	<b>Population Addressed</b>	<b>Timeline Addressed</b>	<b>Decision</b>
New Zealand Guidelines Group	Traumatic Brain Injury: Diagnosis, Acute Management and Rehabilitation	2006	TBI in general	Acute – Long term	Included for further review by expert panel
U.S. Department of Health and Human Services, Centers for Disease Control and Prevention	Heads Up: Facts for Physicians About Mild Traumatic Brain Injury (MTBI)	2006	Mild TBI	Not applicable	Excluded from further review because document presents general information and a tool-kit, but is not a clinical practice guideline
State of Colorado Department of Labor and Employment, Division of Workers' Compensation	Traumatic Brain Injury Medical Treatment Guidelines	2005	TBI in general	Acute – Long term	Included for further review by expert panel
Rose JM. WCB Alberta (Jeremy Rose)	Continuum of Care Model for Managing Mild Traumatic Brain Injury in a Workers' Compensation Context: A Description of the Model and its Development	2005	Mild TBI	Acute – Follow-up	Excluded from further review because document is not a clinical practice guideline
European Federation of Neurological Sciences (EFNS) Task Force	EFNS Guidelines on Cognitive Rehabilitation	2005	Acquired Neurological Damage (stroke, TBI, etc.)	Not applicable	Excluded from further review because document focuses on cognitive rehabilitation only and is not specific to TBI
McCrory P, Johnston K, Meeuwisse W, Aubry M, Cantu R, et al.	Summary and Agreement Statement of the 2nd International Conference on Concussion in Sport, Prague 2004	2005	Athletes	Sport-related	Included for further review by expert panel



Authors	Title	Year Published	Population Addressed	Timeline Addressed	Decision
Kissick J. ThinkFirst-SportSmart Concussion Education and Awareness Committee	New Concussion Management Guidelines: Concussion Question and Answer Document for Physicians	2005	Athletes	Sport-related	Excluded from further review because document is not a clinical practice guideline
WCB Evidence Based Practice Group, Martin, C.W.	Mild Traumatic Brain Injury. Review of the Literature and a Look at the WCB of BC Data.	2003	Mild TBI	Acute – Long term	Excluded from further review because document is a review of the topic and WCB's data, not a clinical practice guideline
European Federation of Neurological Societies (EFNS) Task Force	EFNS Guideline on Mild Traumatic Brain Injury: A Report of an EFNS Task Force	2002	Mild TBI	Primarily acute with small section on follow-up	Excluded from further review because document focuses on initial management and only includes 2 recommendations relating to follow-up care
Concussion in Sport Group	Summary and Agreement Statement of the First International Conference on Concussion in Sport, Vienna 2001	2002	Athletes	Sport-related	Excluded from further review because more recent version was available
The EAST Practice Management Guidelines Work Group. Cushman JG, Agarwal N, Fabian TC, Garcia V, Nagy KK, et al.	Practice Management Guidelines for the Management of Mild Traumatic Brain Injury	2001	Mild TBI	Not applicable	Excluded from further review because search valid only up to 1998

Authors	Title	Year Published	Population Addressed	Timeline Addressed	Decision
Johnston KM, Lassonde M, Ptito A.	A contemporary neurosurgical approach to sport-related head injury: the McGill Concussion Protocol	2001	Athletes	Sport-related	Excluded from further review because no recommendations made with regards to management other than return to play; guideline endorses Canadian Association of Sport Medicine Guideline
Royal College of Paediatrics and Child Health	Guidelines for Good Practice. Early Management of Patients with a Head Injury	2001	Children who have experienced TBI in general	Early management	Excluded from further review because document focuses on children's health and early management
Scottish Intercollegiate Guidelines Network (SIGN)	Early Management of Patients with a Head Injury	2000	TBI in general	Primarily acute with small section on follow-up	Excluded from further review because document focuses on early management and recommendations related to management/follow-up of mild TBI were few; also, search valid only up to 1997
Ingebrigsten T, Romner B, Kock-Jensen C. Scandinavian Neurotrauma Committee	Scandinavian Guidelines for Initial Management of Minimal, Mild, and Moderate Head Injuries	2000	Minimal – Moderate TBI	Acute care	Excluded from further review because document focuses on acute care and search valid only up to 1998
Canadian Academy of Sport Medicine Concussion Committee	Guidelines for Assessment and Management of Sport-Related Concussion	2000	Athletes	Sport-related	Excluded from further review because of brevity of the document and because not a formal clinical practice guideline
American Academy of Neurology	Practice Parameter: The Management of Concussion in Sports	1997	Athletes	Sport-related	Excluded from further review because more than ten years old