

# Northeast Rehabilitation Hospital Network

## **Brain Injury CPG Summary**



# Brain Injury CPG Summary

Northeast Rehabilitation Hospital has adopted these Brain Injury Clinical Practice Guidelines to guide the clinical care provided by our Rehab Team. Items with a "\*" apply to patients with a diagnosis of brain injury. Remaining items should be considered for each patient individually.

## VA/DoD: Management of Concussion—Mild Traumatic Brain Injury

### Diagnosis and Assessment

\*Suggested use of terms "history of mild traumatic brain injury (mTBI)" or "concussion"

\*Refrain from use of terms "brain damage" or "patients with mTBI" in communication with patients and the public

\*Recommend evaluation of individuals who present with symptoms or complaints related to brain injury at initial presentation

Suggest AGAINST using the following tests to establish diagnosis of mTBI: neuroimaging, serum biomarkers, EEG

Recommend AGAINST performing comprehensive neuropsychological/cognitive testing during the first 30 days following mTBI

Recommend AGAINST using the following tests in routine diagnosis and care of patients with symptoms attributed to mTBI: Comprehensive and focused neuropsychological testing, including Automated Neuropsychological Assessment Metrics (ANAM), NeuroCognitive Assessment Tool (NCAT), or immediate Post-Concussion Assessment and cognitive Testing (ImPACT).

For patients with new symptoms that develop more than 30 days after mTBI, suggest a focused diagnostic work-up specific to those symptoms only

### Co-occurring Conditions

\*Recommend assessing patients for psychiatric symptoms and comorbid psychiatric disorders including major depressive disorder, posttraumatic stress disorder, substance use disorders, and suicidality.

Treatment—Refer to Appendix B in full CPG for details on symptom management

Suggest considering and offering as appropriate, a primary care, symptom-driven approach in the evaluation and management of patients

\*Recommend NOT adjusting treatment strategy based on mechanism of injury

\*Recommend NOT adjusting outcome prognosis on mechanism of injury

### Headache

\*Individualized treatment tailored to the clinical features and patient preferences

May include headache education (stimulus control, use of caffeine, tobacco, alcohol and other stimulants)

Non-pharmacologic interventions (sleep hygiene ed, dietary modification, PT, relaxation, modification of the environment)

Pharmacologic interventions (acute pain, prevention of headache attacks)

### Dizziness and Disequilibrium

Suggest short-term trial of specific vestibular, visual, and proprioceptive therapeutic exercise to assess the individual's response to treatment

Referral to vestibular trained care provider (OT, PT)

A prolonged course of therapy in the absence of patient improvement is strongly discouraged

### Tinnitus

There is no evidence to suggest for or against the use of any particular modality for the treatment of tinnitus after mTBI

### Visual symptoms

There is no evidence to suggest for or against the use of any particular modality for the treatment of visual symptoms (diplopia, accommodation or convergence disorder, visual tracking deficits, and/or photophobia after mTBI)

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## VA/DoD: Management of Concussion—Mild Traumatic Brain Injury

### Sleep Disturbance

\*Individualized treatment tailored to the clinical features and patient preferences

\*Assessment of sleep patterns, sleep hygiene, diet, physical activities, and sleep environment

Sleep education (sleep hygiene, stimulus control, use of caffeine, tobacco, alcohol, and other stimulants)

Non-pharmacologic interventions (cognitive behavioral therapy specific for insomnia, dietary modification, physical activity, relaxation and

modification of sleep environment)

Pharmacologic interventions (sleep initiation, sleep maintenance)

### Behavioral Symptoms

\*Recommend evaluation and management according to existing evidence-based clinical practice guidelines

\*Recommend treatment be based upon individual factors and the nature and severity of symptoms

### Cognitive Symptoms

Suggest that patients with cognitive symptoms that do not resolve within 30-90 days and have been refractory to treatment for associated symptoms (i.e. headache, sleep disturbance) be referred for a structured cognitive assessment or neuropsychological assessment to determine functional limitations and guide treatment

Suggest that individuals with symptoms related to memory, attention, or executive function problems that do not resolve within 30-90 days and have been refractory to treatment of associated symptoms should be referred to cognitive rehabilitation therapists with expertise in TBI rehab

A prolonged course of therapy in the absence of patient improvement is strongly discouraged

Suggest AGAINST offering medications, supplements, nutraceuticals or herbal medicines for ameliorating the neurocognitive effects attributed to mTBI

### Setting of Care

Suggest AGAINST routine referral to specialty care in the majority of patients with history of mTBI

Suggest consultation and collaboration with a locally designated TBI or other specialist if the patient's symptoms do not resolve within 30-90 days and are refractory to initial treatment in primary care and significantly impact ADLs

Suggest referral to case managers within the primary care setting to provide additional psychoeducation, case coordination and support for patients with persistent symptoms that have been refractory to initial psychoeducation and treatment

There is insufficient evidence to recommend for or against the use of interdisciplinary/multidisciplinary teams in the management of patients with chronic symptoms attributed to mTBI

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## **SIGN 130: Brain Injury Rehabilitation in Adults**

### **Assessment and Treatment of Mild Brain Injury**

\*Diagnosis should be made according to WHO task force operational criteria

Patients presenting with non-specific symptoms following mTBI should be reassured that symptoms are benign and likely to settle within 3 months

Referral for cognitive (psychometric) assessment is NOT routinely recommended after mTBI

\*Mental state should be routinely examined with an emphasis on symptoms of phobic avoidance, traumatic re-experiencing phenomena (e.g. flashbacks, nightmares) and low mood

\*Assessment and consideration of pre-existing health variables such as previous neurological disorders and substance misuse should be carried out for patients with mTBI

Cranial imaging is NOT routinely recommended for the assessment of mTBI, but should be considered in an atypical case

\*All patients should be offered reassurance about the nature of their symptoms and advice on gradual return to normal activities after an uncomplicated mild traumatic brain injury

Antidepressants may be considered for symptom relief after mTBI

Referral for cognitive behavioral therapy following mTBI may be considered inpatients with persistent symptoms who fail to respond after three months

### **Physical Rehabilitation and Management—Brain Injury (TBI and ABI)**

Gait: Patients with TBI receiving gait training should NOT undergo treadmill training in preference to conventional over ground training

\*Functional ability: Repetitive task-oriented activities are recommended for improving functional ability, such as sit-to-stand or fine motor control

Contracture: Casts, splints, and passive stretching may be considered in cases where contracture and deformity are progressive

Spasticity: Botulinum neurotoxin therapy may be considered to reduce tone and deformity in patients with focal spasticity

Spasticity: Oral baclofen or tizanidine may be considered for treatment of spasticity

### **Cognitive Rehabilitation**

Patients with memory impairment should be trained in the use of compensatory memory strategies with a clear focus on improving everyday functioning rather than underlying memory impairment

For patients with mild-moderate memory impairment, both external aids and internal strategies (e.g. visual imagery) may be used

For patients with severe memory impairment, external compensations with a clear focus on functional activities is recommended

Learning techniques that reduce the likelihood of errors being made during the learning of specific information should be considered for people with moderate-severe memory impairment

Patients with attention impairment in the post-acute phase should be given strategy training relating to the management of attention problems in

personally relevant functional situations

Patients with deficits in executive functioning should be trained in meta-cognitive strategies relating to the management of difficulties with planning, problem solving and goal management in personally relevant functional situations

Interventions for cognitive deficits should be applied in the context of a comprehensive rehab program.

This involves an interdisciplinary team using a goal-focused program which has the capacity to address cognitive, emotional and behavioral difficulties with the aim of improving functioning in meaningful everyday activities

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### **Rehab of Behavioral and Emotional Disorders**

Propranolol or pindolol may be considered as a first line treatment option for moderate levels of agitation/aggression

Cognitive behavioral therapy should be considered for the treatment of acute stress disorder following mild TBI

Cognitive behavioral therapy should be considered for the treatment of anxiety symptoms following mild to moderate TBI

### **Communication and Swallowing**

Patient with communication deficits should be referred to speech and language therapy for assessment and management of their communication impairments

Instrumental assessment of dysphagia in patients should be considered where:

- Bedside assessment indicates possible pharyngeal stage problems

- The risks of proceeding on the basis of bedside assessment outweigh the possible benefits, and

- The bedside assessment alone does not enable a sufficiently robust clinical evaluation to permit the drawing up of an adequate plan for swallowing therapy

### **Management of the Patient in the Minimally Conscious or Vegetative State**

The Coma Recovery Scale-Revised should be used to assess patients in states of disordered consciousness

Amantadine may be considered as a means of facilitating recovery of consciousness in patients following severe brain injury

### **Service Delivery**

\*For optimal outcomes, higher intensity rehabilitation featuring early intervention should be delivered by specialist multidisciplinary teams

Planned discharge from inpatient rehab to home for patients who have experienced ABI provides beneficial outcomes and should be an integrated part of treatment programs

Pre-discharge home visits should be undertaken for patients who require them

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Principles for Organizing Rehabilitation Services**

- \*Individuals should have access to timely, specialized interdisciplinary rehab services
- \*Rehab interventions should be initiated as soon as condition allows
- \*Rehab programs should have clearly stated admissions criteria
- \*Rehab plan should be undertaken through a coordinated, interdisciplinary team and follow a patient-focused approach
- \*TBI team should include: PT, OT, SLP, TR, pharmacist, social worker, nurse, physician/physiatrist, nutritionist, psychologist, neuropsychologist, rehab support personnel
- \*Individuals with TBI should have a case or clinical coordinator
- \*Protocols should be in place to facilitate a transition from acute care to rehab
- \*Rehab environment should be conducive to recovery, promoting privacy and sleep hygiene
- \*Rehab plan should be goal oriented with a high involvement of the patient, family/caregivers, and the rehab team
- \*Rehab programs should monitor the population by collecting and analyzing data pertaining to clinical and socio-demographics
- \*Rehab programs should monitor key aspects of their processes and efficiency

### **Coordinating Management of Comorbid Conditions**

Collaboration and continuity mechanisms should be established with mental health services and programs  
 Collaboration and continuity mechanisms should be established with addiction/substance use services and programs  
 Healthcare professionals should be trained in behavior disorders specific to TBI

### **Inpatient Rehabilitation Models**

- \*Rehab teams should have access to specialist professionals, especially for individuals with multiple injuries and diagnoses
- \*Interdisciplinary team conferences should occur regularly
- Family conferences should be offered regularly
- Access to treatment should not be temporally limited, but should be dependent on the person's potential for measurable functional gain

### **Duration, Intensity, and other Attributes**

- \*A target length of stay should be established as soon as possible
- \*Target length of stay should be reviewed regularly for achievement of goals and progression towards functional independence
- Inpatient rehab interventions should target advanced cognitive functions, where patient capacity permits
- \*Inpatient rehab interventions should promote significant involvement of and effort by the person with TBI
- Inpatient rehab interventions for patients with lower FIM cognitive sub scored should target advanced expression tasks and advanced reading and writing where there is indication of impairment in these areas
- \*Individuals with TBI should receive a minimum of 3 hours per day of therapeutic interventions, including focus on cognitive tasks

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### **Planning Discharge to the Community**

\*A potential discharge date should be established early and reviewed regularly

Planned discharge to home from inpatient rehab provides beneficial outcomes

Individuals with TBI may be transferred back to the community, when appropriate specialized rehab and needs support can be continued in that environment without delay

\*A formalized discharge plan should be prepared, discussed with the person with TBI and family/caregivers, and shared with the next providers in the continuum of care

Outpatient rehab treatment plans should be jointly agreed to by the person with TBI, family/caregivers, and health care professionals involved

There should be a process for regularly reviewing how the outpatient rehab treatment program progresses

Essential alterations to the home should be recommended with a reasonable amount of time allowed for installation and completion prior to d/c

Individuals should be transitioned to home from IP rehab on a supported, gradual basis (home visits, out trips, ADL apartments)

\*Copies of the discharge report and patient care plan should be provided to the person with TBI, family/caregiver (with consent), and professionals relevant to rehab in the community

### **Post Discharge Follow-Up and Support**

\*All patients should have access, if needed, to scheduled telephone follow-up contact

Post discharge long-term services should be available, if needed

### **Community Rehabilitation**

Individuals should have access to specialized outpatient or community based rehab

\*A peer supported relationship model of intervention within a community based program should be available

Access to interval care (re-entry to care or intensification of services) should be allowed based on changes in status or needs

### **Optimizing Performance in Daily Living**

\*All individuals with TBI should be assessed for ADL and IADLs

\*All daily living tasks should be practiced in the most realistic and appropriate environment

\*An individualized life skills training protocol should be developed for each person with TBI to assist them in dealing effectively with the demands and challenges of everyday life

Appropriate environmental cues should be included, as appropriate, in the treatment plan for ADLs and IADLs

\*Compensatory training, individualized environmental adaptation, as well as remediation training should be provided

### **Leisure and Recreation**

\*All individuals with TBI should be assessed for pre-injury level of participation in leisure/meaningful activities and any barriers or compounding problems which inhibit their engagement in such activities

Individuals with difficulty undertaking activities of their choice should be offered a goal-directed community-based program aimed at increasing participation in leisure/meaningful and social activities



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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Driving**

Individuals who wish to drive should be assessed by an appropriate professional

If driving capacity is unclear, a comprehensive assessment should be undertaken at an approved driving center

If the person is deemed not appropriate to drive by professionals, then they should provide clear guidance about concerns about driving, reinforce the need for disclosure and assessment, provide information about the law and any obligations for reporting

### **Vocational/Education/Rehabilitation**

Individuals should be assessed for the need for vocational rehab to return to work or to school (see CPG for details of assessment and interventions)

If unable to engage in paid employment, individuals should be assisted to explore other avenues for productivity that promote community integration

### **Supporting Caregivers for Discharge and Community Living**

\*Rehab programs should be developed in coordination with caregivers

\*Family and caregivers should be provided with access to ongoing support

\*Rehab team should assess and document the family's capacity for and interest in taking on a caregiver role

### **Patient Education and Information (refer to Patient, Family, Caregiver Education section for more details)**

\*Individuals and their caregivers should be given information, advice, and the opportunity to talk about the impact of TBI on their lives

### **Public Awareness and Education**

Rehab programs should conduct or collaborate on activities aimed at increasing public/community awareness of TBI

### **Assessment of Capacity and Consent**

\*All clinicians must fully and sensitively assess the capacity of the person with TBI to consent throughout their assessment and rehab interventions

A formal evaluation of the capacity of the person with TBI should be conducted, if needed, by an appropriately qualified individual

A formal assessment of the needs of the person with TBI regarding capacity and the exercise of his/her civil rights should be made when necessary

### **Principles of Assessment**

\*Assessment should include: motor weakness, tone, balance, coordination, pain, speech, swallowing, sensation, hearing, vision, bowel, bladder,

cognition, behavior, additional injuries

\*Assessment should include seeking information from family and caregivers

Cognitive function should be evaluated by neuropsychologist, occupational therapist, speech-language pathologist and should be collaborative

\*Individuals should be assessed for cognitive impairments in the following areas: attention, visuospatial function, executive function, language, social communication, social cognition, learning and memory, awareness of impairments, detection/expression of emotion.

\*At the end of assessment, individual and primary caregiver should be informed and have a discussion of diagnosis, prognosis, recovery process, and available treatments

Individuals with comorbidities (SCI, musculoskeletal) should have timely access to TBI services



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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Assessment of Consciousness**

Individuals with disorders of consciousness require regular medical and neurological assessments and serial monitoring

Diagnosis of vegetative state or minimally conscious state following TBI should be based on assessment by appropriately trained clinicians, under suitable conditions, using validated assessment tools, in a series of observations, and in conjunction with clinical reports and interviews with family members/healthcare professionals

### **Post-Traumatic Amnesia (PTA)**

PTA assessment should be performed on a serial basis using a validated tool

To minimize agitation and confusion, individuals should remain in a secure and supervised environment until they have emerged from PTA

Recommend: quiet and consistent environment, low-stim room, visitor restrictions, minimize restraints, consistent staff, frequent reassurance, family education, reliable means of communication

### **Evaluation of Cognitive Functions**

Clinicians should consider other factors possibly contributing to cognitive performance impairments and functional limitations (personal factors, pre-injury medical conditions, injury-related factors and conditions)

### **Cognitive Rehab Principles**

Individuals should be offered functionally-oriented cognitive rehab

Cognitive rehab should be managed in a structured and distraction free environment (acute phase)

Daily activities should focus on activities that are perceived as meaningful by the person and therapy interventions should be provided in the person's own environment or adapted to the person's own life

### **Medication for Arousal and Attention**

Methylphenidate (initiated at a dose of approximately 0.10mg/kg and increased gradually to a target of 0.25–0.30 mg/kg bid) is recommended to enhance attentional function and speed of information processing

Dextroamphetamine should be considered to enhance attentional function when methylphenidate is not tolerated Consider amantadine to improve attention in individuals who are out of post-traumatic amnesia and who have not responded to other medications

Amantadine may be considered to enhance arousal and consciousness and accelerate the pace of functional recovery in individuals in vegetative or minimally responsive state

### **Attention/Information Processing**

Metacognitive strategy training using functional everyday activities should be considered , especially for those with mild-moderate attention deficits

Training in dual-tasking can be used to improve dual-task performance, only on tasks similar to those trained

Cognitive behavior therapy should be considered for improving attentional functioning in individuals with attentional deficits thought to be secondary to sleep-wake disorders, pain, fatigue, polypharmacy or anxiety and/or depression Alterations to the environment and tasks may be used to reduce the impact of attentional problems on daily activities

Reliance on repeated exposure and practice on de-contextualized computer-based attentional tasks are NOT recommended because of lack of

demonstrated impact on everyday attentional functions

Training with periodic random auditory alerting tones for individuals with attentional deficits should NOT be conducted in therapy

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Learning and Memory**

Teaching internal compensatory strategies may be used for individuals who have memory impairments

Cognitive skill training for individuals with traumatic brain injury should be strategy-focused and conducted with an experienced therapist

Environmental supports and reminders (e.g., mobile/smartphones, notebooks and whiteboards) are recommended for individuals who have memory impairment

Recommended practices to promote learning: clearly defined goals, sufficient time and opportunity for practice, integrate methodologies for breaking down tasks, use distributed practice, teach strategies using variation of stimuli/information presented, promote strategies for more effortful processing of information/stimuli, use strategies that constrain errors

Group-based interventions may be considered for enhancing memory capacity with individuals with mild to moderate memory deficits

### **Medication for Memory**

Rivastigmine may be considered for individuals with moderate-to-severe memory impairment in the sub-acute to chronic phase of recovery

Donepezil (5–10 mg/day) is recommended to enhance aspects of memory

### **Executive Functions**

Metacognitive strategy instructions (e.g., goal management training, plan-do-check-review, prediction performance) should be used with individuals for difficulty with problem-solving, planning and organization. These strategies should be focused on everyday problems and functional outcomes of personal relevance to the person.

Strategies to improve the capacity to analyze and synthesize information should be used with individuals who have impaired reasoning skills

Strategies that encourage monitoring of performance and feedback should be used with individuals who have impaired self-awareness

Group-based interventions should be considered for remediation of executive and problem-solving deficits

### **Cognitive Communication Assessment**

Assessment should include: broad variety of communication situations, complexities and environments; case history; standardized and

non-standardized assessments

Specific assessments in the following areas: attention and concentration, orientation, verbal memory and new learning, linguistic organization,

auditory comprehension and information processing, hearing and vision, oral expression and discourse, reading comprehension and reading rate,

written expression, social communication and pragmatics, reasoning and problem-solving, executive functions, insight, awareness, adjustment to disability, speech, nonverbal communication

Cognitive communication evaluation and rehab program should take into account the person's pre-morbid physical and psychosocial variables, native language, literacy and language proficiency, cognitive abilities, and communication style

Rehab staff should recognize that levels of communication may vary as a function of communication partner, environment, communication demands, communication priorities, fatigue, physical variables, psychosocial variables, and other personal factors

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Cognitive Communication Rehabilitation**

Cognitive communication therapy goals should be set collaboratively with the patient and their family and should be functionally and personally relevant

\*A reliable yes/no response should be established as soon as possible

Individuals with severe communication disability should be provided with and trained in the use of appropriate AAC

Social skills training should be offered to address interpersonal and pragmatic conversational skill problems

A cognitive communication rehabilitation program should provide the opportunity to rehearse communication skills in situations appropriate to the context in which the person will live, work, study and socialize

Intervention for social communication should include role playing to improve a variety of social communication skills as well as self-concept and self-confidence in social communications

Clinicians should consider group therapy as an appropriate context for social skills training when social communication impairments exist

### **Assessment of Swallowing (Dysphagia)**

Individuals who present with one or more of the following risk factors for aspiration should be referred in a timely fashion to an appropriately trained and certified professional for a complete assessment: presence of tracheostomy, poor cognitive functioning, hypoactive gag reflex, reduced pharyngeal sensation, brainstem involvement, difficulty swallowing oral secretions, coughing/throat clearing or wet/gurgly voice quality after swallowing water, choking more than once while drinking 50ml of water, weak voice and cough, wet-hoarse voice quality, recurrent lower respiratory infections, unexplained low-grade fever or leukocytosis, immunocompromised state

Instrumental assessment should be considered when: effectiveness of compensatory strategies and techniques are being evaluated, bedside assessment indicates possibly pharyngeal stage problems, risks of proceeding on basis of bedside assessment outweigh the possible benefits, the bedside assessment alone does not permit the development of an adequate plan

MBS or VMBS should be used in patients who are able to physically and cognitively able to tolerate it

Individuals with tracheotomy should be assessed for Passy Muir Valve placement or capping of trachea tube

### **Management of Swallowing (Dysphagia)**

Individuals with dysphagia, should have access to specialized oral and dental care.

Individuals requiring enteral feeding should be converted from nasogastric feeding to gastrostomy feeding as soon as possible if the patient's condition allows

The dysphagia intervention plan should incorporate an interdisciplinary approach and consider positioning, feeding strategies, medical status,

pharmacological profile, cognitive impairments, behavior, comfort and nutritional status

Where possible, it is recommended that individuals should be encouraged to self-feed

### **Assessment and Management of Nutrition**

\*All patients should have nutrition and hydration assessment

Where appropriate, professionals trained in low-risk feeding strategies should provide feeding assistance or supervision to individuals

Enteral and parenteral nutrition are recommended for providing increased calories to individuals

Total parenteral nutrition (TPN) is recommended, when appropriate

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### **Assessment and Management of Nutrition (continued)**

Early enhanced enteral nutrition is recommended when appropriate

Initiating enteral feeding for individuals at goal rate is recommended to increase the percentage of prescribed energy and protein actually received

Metoclopramide has NOT been shown to be effective as a gastric emptying aid and should NOT be used in individuals with traumatic brain injury

Individuals should be screened for zinc deficiencies. If needed, zinc supplementation should be considered to promote neurological recovery post TBI.

High nitrogen feedings of approximately 2 g protein/kg is recommended to restore the substantial nitrogen losses that occur

Supplementation of branched-chain amino acids (BCAAs) in individuals is recommended to enhance recovery of cognitive function, without negatively effecting tyrosine and tryptophan concentrations

### **Motor Function and Control Assessment**

\*A trained professional with neurological expertise should assess, design, implement, and supervise therapy to improve motor function

### **Motor Function and Control Rehabilitation**

Any physical treatment approaches provided should take into account any associated orthopedic or musculoskeletal injuries

Motor therapy programs should target the preservation of functional range of motion (ROM) in all phases of care, but particularly in the acute and sub-acute phases, to allow for future motor recovery, functional activities and positioning. Regardless of prognosis, potential for recovery may be adversely affected if contractures are allowed to develop

Motor therapy programs should be adapted to accommodate the normal environment and activities of the person as much as possible

Strength and endurance training should be performed, within the context of functional tasks when possible

Individuals should be given opportunities to practice their motor skills outside of formal therapy

Individuals should be given the opportunity to experience upright positions regardless of their level of responsiveness or level of severity and

recovery, provided they are medically stable. For example, progressive upright sitting or supported standing for head, neck and trunk control should be a part of the postural control interventions.

Individuals with complex postural/seating needs should be referred to a specialized interdisciplinary team with expertise in specialized seating

Specific repetitive training interventions to increase functions are recommended, such as sit-to-stand, functional reaching and balance, and gross

motor coordination of the lower extremities

Either virtual-reality-based balance retraining program or a conventional balance retraining program can be used to improve balance

Gait re-education is recommended to improve mobility

Partial body weight supported gait training does NOT provide any added benefit over conventional gait training in ambulation, mobility or balance

For individuals who are unable to ambulate over ground, gait training with partial support with a harness and/or hydrotherapy should be considered

Functional fine motor control retraining activities should be considered to improve fine motor coordination

Constraint-induced therapy should be considered for individuals who have upper extremity motor impairments with some active wrist and finger movements and can cognitively engage in the therapy

Please refer to the full CPG for details of each recommendation

Mod/Severe TBI

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### **Motor Function and Control Rehabilitation (continued)**

The following therapies could be considered to improve upper and lower extremity motor and sensory impairments: functional electrical stimulation, contrast baths, mirror therapy, cycle ergometry with or without motor assistance depending on the person's level of functioning

A program must be in place to prevent shoulder trauma for individuals with flaccid upper extremities. This includes bed positioning, arm support in sitting and use of a hemi arm sling for standing and transfers

Orthoses should be individually fitted by a health professional or orthotist with expertise in traumatic brain injury

Casts, splints and passive stretching may be considered for individuals in cases where contracture and deformity are progressive

Exercise training is recommended to promote cardiorespiratory fitness

### **Assessment of Spasticity**

Individuals with spasticity should be assessed and provided with a coordinated plan for interdisciplinary management including:

- Identification and management of aggravating factors such as pain, bladder or bowel distention, skin irritation and infection

- Use of specific treatment modalities such as serial casting or removable splints

- Use of anti-spasticity medications

- Rehabilitation interventions that consider a range of motion, flexibility and positioning routine

### **Management of Spasticity**

Botulinum neurotoxin therapy (BoNT) may be considered to reduce tone and deformity in individuals with focal spasticity

Botulinum neurotoxin therapy (BoNT) for individuals should be used in an interdisciplinary setting with physiotherapist/occupational therapist and orthotist inputs where appropriate

Oral baclofen, tizanidine or dantrolene sodium may be considered for treatment of spasticity

A trial of intrathecal baclofen for the treatment of severe spasticity in individuals may be considered after other treatment options have been exhausted, i.e. antispasticity medications (e.g. baclofen, dantrolene, tizanidine, botulinum toxin), casting, splinting or stretching. The trial should be carefully monitored for possible complications, including pump malfunction. Consideration must also be given to the individual's ability to access ongoing follow-up, for example to get refills, in case of a malfunction or for troubleshooting

### **Assessment for Assistive Technology**

Individuals should be assessed to determine whether equipment or adaptations could increase their safety, independence, communication and quality of life.

This assessment should: Be conducted by professionals with expertise in these areas and be conducted on an individual basis and in the environment in which the equipment will be used

### **Prescription of Assistive Technology**

The prescription of equipment for individuals should take into account cognitive, communicative and behavioral deficits and how these may constrain the person's ability, or their family/caregivers' ability, to use the equipment safely and appropriately. Where this is in doubt, arrangements should be in place for regular review

When an item of equipment has been identified as required, it should be provided as quickly as possible. If safety is at issue, it should be provided before the person is discharged to the community

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### **Prescription of Assistive Technology (continued)**

The person with traumatic brain injury and their family or caregivers should be given clear written information on who to contact for repairs, replacement or future help and advice regarding the equipment

The ongoing effectiveness of the equipment should be reviewed on a regular basis and in accordance with the manufacturers' guidelines

Individuals should have timely provision of an appropriate wheelchair and suitable supportive seating package, with regular review of the seating system as their needs change

Walking or standing aids for individuals with traumatic brain injury should be considered only after a full assessment of the potential benefits and harms of the walking aid in relation to the individual's physical status and cognitive ability

### **Vision Assessment**

Individuals should be screened for visual impairment and/or perceptual deficits and, if present, should undergo rehabilitation to address the specific visual impairment/deficit

Individuals with any visual impairment/deficit should be assessed by a team which includes, but is not limited to: Ophthalmologists, Orthoptists where there are problems with eye movement/double vision, professionals with expertise in rehabilitation for the visually impaired

### **Management of Vision Impairment**

All individuals who present with persistent visual neglect or field defects should be offered specific retraining strategies

Visual feedback force training should be used with individuals who present tracking and transfer deficits

### **Assessment of Vestibular Function**

Individuals with should be screened, and if needed, formally assessed for vestibular dysfunction and, if present, should undergo a vestibular retraining program

The screening should be conducted by a professional specializing in vestibular function

### **Assessment of Fatigue and Sleep**

\*All individuals should be assessed for fatigue and sleep disorders and offered appropriate treatment

Clinicians should consider the possibility of sleep disorders related to traumatic brain injury as a cause of cognitive and other behavioral changes

### **Management of Fatigue and Sleep**

Non-pharmacological interventions should be considered in the treatment of fatigue and sleep disorders

Interventions may include: cognitive behavior therapy (CBT) [for insomnia], light therapy, regular exercise, energy conservation strategies and sleep hygiene

Consider use of melatonin 2–5 mg for insomnia

Consider use of trazodone 25–100 mg for insomnia

Benzodiazepines (lorazepam) and other non-benzodiazepine hypnotic (zopiclone) medications should be considered as last resort for the treatment of sleep disorders in individuals, and it should be prescribed for no longer than 7 days

Consider short-term treatment with methylphenidate to reduce excess daytime sleepiness in individuals



# Brain Injury CPG Summary

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Assessment of Pain and Headaches**

Pain should always be considered if an individual presents agitation or has cognitive/communication issues, non-verbal psychomotor restlessness or worsening spasticity, with particular attention paid to non-verbal signs of pain (e.g., grimacing)

### **Management of Pain and Headaches**

Rehabilitation programs for individuals should have pain management protocols in place, which include:

- Regular review and adjustment mechanisms

- Handling, support and pain relief modalities appropriate to the person's needs

- Education of healthcare professionals and caregivers about appropriate handling of paretic upper limbs during transfers, hypersensitivity and neurogenic pain

Cognitive behavior therapy (CBT) can be considered to reduce pain symptoms in individuals with post-traumatic headaches

Biofeedback can be considered to reduce pain symptoms in individuals with post-traumatic headaches

Pregabalin may be considered for reducing central neuropathic pain caused by injuries to the brain or spinal column

### **Psychosocial/Adaptation Issues**

Rehabilitation programs aimed at improving social adaptation and a sense of well-being should actively encourage physical exercise, leisure activities, self-regulation, coping skills, and participation in social support groups

Participation in personally relevant and meaningful productive activities, including work, should be included as early as possible in the individualized treatment planning while considering the person's actual capacities

A discussion about sexuality should be carried out with individuals. The discussion should be initiated by an appropriately trained clinician and should cover the following aspects of sexuality:

- Physical aspects (e.g., positioning, sensory deficits, erectile dysfunction, drugs, disruption to menstrual cycle)

- Psychological aspects (e.g., communication, fears, altered roles, disinhibition, threats to safety, and sense of attractiveness)

Intervention and education about sexuality in individuals should take into account cultural identity, gender, age, sex and sexual orientation

### **Neurobehavioral Assessment**

During the sub-acute phase of traumatic brain injury, if the neurobehavioral status of the individual is deteriorating or not progressing as expected, an assessment by a licensed specialist should be made to differentiate neurobehavioral difficulties from symptoms of a comorbid illness or medication side effects

In general, an assessment of neurobehavioral issues must address pre-injury vulnerability factors, injury-related factors and post injury factors

Clinicians should carefully define and characterize the presenting neurobehavioral issue through a combination of diagnostic interviews (including close relatives and the health care team) and direct observation

Any behavioral management plan for individuals must include a consideration of the precipitating factors or triggers possibly leading to the behavior and reinforcing events

Individuals who have sustained a traumatic brain injury after a known or suspected incident of self-harm or a suicide attempt should have a risk assessment performed and should be referred as appropriate



# Brain Injury CPG Summary

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Neurobehavioral Interventions**

Individuals with significant behavioral problems that interfere with daily functions should be provided with access to specialized behavioral management services and interventions to assist in the management of their behavioral difficulties, including substance abuse

Individuals with significant behavioral problems, especially those with a tendency to wander, the interdisciplinary team should develop an integrated approach to manage behavior and refer to specialist behavioral management services when necessary and where available

### **Management of Sexual Behavior**

Family, caregivers, and healthcare professionals should be provided with education and training on change management strategies regarding persistent inappropriate sexual behavior and how to avoid reinforcing this behavior

### **Assessment of Mood and Depression**

Individuals should be screened on a regular basis for depression using an appropriate screening tool.

Depression screening tools should not be used as the sole indication for initiation of treatment. Diagnosis should always involve a full assessment as well as the clinical judgment of a specialist experienced in managing individuals with TBI

### **Management of Mood and Depression**

Individuals who have been diagnosed with a depressive disorder should receive appropriate treatment, which can consist of non-pharmacological treatments including psychological intervention/counseling and exercise  
Mindfulness-based cognitive therapy, adapted for brain injury, should be considered for individuals with depressive symptoms

Teaching coping skills in groups to reduce depressive symptoms should be considered for individuals who have good awareness of their difficulties

Cognitive behavior therapy (CBT) should be considered for individuals with depressive symptoms, in individual, group, and modified telephone-based formats

### **Medication for Depression**

Selective serotonin reuptake inhibitors (SSRIs) are recommended as a first-line treatment for depression following traumatic brain injury (TBI). A limited body of evidence supports the efficacy of sertraline (starting at 25 mg; aiming for 50–200 mg/day) and citalopram (starting at 10 mg; aiming for 20–40 mg/day)

Stimulants such as methylphenidate may be considered for depression after traumatic brain injury over the shorter term; they may also be used to augment a partial response to selective serotonin reuptake inhibitors (SSRIs), especially in the setting of cognitive impairments, apathy, and/or fatigue

Consider use of tricyclic antidepressants (TCAs) (desipramine) as a third-line option for depression following traumatic brain injury, although possible reduced efficacy and a higher risk of side effects (e.g., seizures) may limit their use

### **Therapy for Anxiety**

Cognitive behavior therapy (CBT) is recommended to reduce anxiety post traumatic brain injury

### **Medication for Anxiety**

Selective serotonin reuptake inhibitors (SSRIs) may be considered for anxiety treatment of individuals

Use of benzodiazepines as first-line therapy for anxiety in individuals is NOT recommended due to potential effects on arousal, cognition, and motor coordination. The potential for abuse/dependency associated with these agents is also of concern, given the elevated rates of pre-injury substance use disorders observed among individuals with TBI. Nonetheless, short-term use of these agents may be helpful during periods of crisis or acute distress

Please refer to the full CPG for details of each recommendation

Mod/Severe TBI

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Medication for Psychoses**

The use of second generation neuroleptics is recommended for the treatment of psychosis as they are associated with fewer extrapyramidal symptoms (EPS) than first generation neuroleptics and exert their effects at sites other than the D2 receptor

### **Medication for Agitation/Aggression**

For severe acute life threatening agitation and aggression that threatens staff or patient safety, the use of neuroleptic medications or intramuscular benzodiazepine can be considered

For severe agitation and aggression that threatens staff or patient safety, consider the use of oral neuroleptic medications (while taking into consideration the onset of action). Second generation neuroleptic medications like quetiapine, ziprasidone, olanzapine and risperidone are preferred as older agents may have more side effects though methotrimeprazine have been used with limited side effects

Either propranolol or pindolol is recommended for the treatment of aggression after traumatic brain injury, particularly for individuals in post-traumatic amnesia (PTA). Studies have reported the efficacy of both propranolol (maximum dose 420–520 mg/day) and pindolol (maximum dose 40–100 mg/day) in the treatment of aggression in this population, if there are no medical contraindications

The use of valproate (750–2250 mg/day and/or carbamazepine (200–1200 mg/day) to reach therapeutic range should be considered as an option for the treatment of aggression in individuals, particularly those who have a concomitant seizure disorder

The use of amantadine 100 mg bid or methylphenidate can be considered for individuals when impaired arousal and attention is suspected as a factor in agitation

The use of sertraline may be considered as an option for the treatment of individuals with moderate agitation and irritability. The use of other selective serotonin reuptake inhibitors (SSRIs) may be considered as an alternative if sertraline is not tolerated

Tricyclic antidepressants may be considered as a third-line option for the treatment of aggression, particularly for those who have an associated sleep-wake disorder. When used, nortriptyline or desipramine are preferable based upon their tolerability

The use of first generation neuroleptics and benzodiazepines to treat agitation or aggression in individuals with traumatic brain injury should be minimized, as these medications may slow recovery after brain injury and may have a negative effect on cognition

### **Medication for Bipolar Disorder/Mania**

The use of commonly used medications such as lithium, anticonvulsants and neuroleptics in the management of symptoms resembling bipolar disorder (i.e., mania and depressed mood) should be considered, although insufficient evidence supports or refutes their use in individuals with traumatic brain injury. Lithium requires careful monitoring, as side effects may limit its use in this population

### **Family Education in Neurobehavioral Issues**

The family should receive timely information in writing on how to manage behavior and emotions and should be invited to play a role in providing feedback and behavioral data

### **Assessment of Substance Use Disorders**

All individuals should be screened for history of substance use, intoxication at time of injury, and current substance use. An appropriate screening tool should be used as indicated along the continuum of treatment

Positive screening should lead to full assessment by a qualified professional

Education and training should be provided to healthcare professionals in drug and alcohol misuse programs in relation to traumatic brain injury, its sequelae, and effects on drug and alcohol use

Please refer to the full CPG for details of each recommendation

Mod/Severe TBI

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Management of Substance Use Disorders**

Management for co-occurring substance use disorders and brain injury should be concurrent (not sequential)  
Substance-use-related goals and interventions should be integrated within the traumatic brain injury rehabilitation plans

Substance use should not be an exclusionary criterion for traumatic brain injury rehabilitation.

Healthcare professionals should use treatment incentives to assist individuals with both traumatic brain injury and substance use disorder

### **Assessment of Incontinence**

Full assessment of bowel and bladder function should be completed during admission process

Assessment should consider cognitive, emotional, and physical function of the individual

### **Management of Incontinence**

Rehab plan for urinary incontinence: monitoring, strategies for requesting assistance, toileting regimen, bladder re-education

Individuals should not be discharged home until continence aids and services have been arranged and caregivers prepared

Anticholinergic medication should only be prescribed after demonstration of overactive bladder. Use of urodynamic assessment is optimal

Intermittent catheterization should be considered for individuals with elevated post-micturition residual volume

Long-term catheters can be considered; suprapubic catheters are preferred

Bowel regimen for constipation: fluid intake, natural laxatives, stimulants, simple bulk laxatives, exercise and standing, avoid medications which slow gut motility, maximum privacy and comfort during defecation, supported sitting for defecation at a regular time each day, rectal stimulation as indicated

Bowel and bladder management plans should be developed with full knowledge and support of primary caregiver

Asymptomatic bacteriuria should only be treated with antibiotic therapy in exceptional circumstances

### **Seizures**

Seizures should be managed according to established protocols

Anticonvulsants, particularly phenytoin and levetiracetam, are indicated to reduce the incidence of post-traumatic seizures in the first 7 days post-injury

Routine use of anticonvulsants to prevent late post-traumatic seizures after 7 days post-injury is NOT recommended

Consideration should be given to choosing medications with the most favorable side effect profiles

### **Deep Vein Thrombosis**

Venous thromboprophylaxis should be initiated as soon as medically appropriate

Low-molecular-weight heparin (LMWH) is preferred over unfractionated heparin (UFH) for venous thromboprophylaxis

When pharmacological venous thromboprophylaxis is contraindicated or delayed, physical methods (i.e., intermittent pneumatic compression stockings) should be utilized

Screening for Neuroendocrine Complications

Screening of the hypothalamic pituitary axis should occur at 3-6 months post TBI or when symptoms are suggestive of a hormonal imbalance or deficiency

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Neuroendocrine Complications**

Hyponatremia: assess hydration status, serum electrolytes with urinary electrolytes and sodium excretion  
Consider restriction of fluid intake and salt supplementation in those with SIADH or hyponatremial due to cerebral salt wasting  
Refer to endocrinologist familiar with TBI as indicated

### **Screening for Heterotopic Ossification**

\*Regular assessment for possible HO (frequent sites—hips, elbows, shoulders, knees)  
Early diagnosis should involve a three-phase bone scan

### **Treatment of Heterotopic Ossification**

Once HO is identified, treatment should include etidronate and/or NSAIDs  
PROM is important to maintain joint ROM; ROM must be gentle and within available range  
Manipulation of joints under anesthesia can be considered  
Surgical excision of HO should be considered at a later stage

### **Principles of Medication Management**

\*Pharmacological treatment should be based on individual factors, symptom severity and comorbidity  
\*Specific target symptoms/behaviors should be clearly defined and monitored during treatment  
\*The serial use of validated rating scales appropriate for TBI and other methods of objective assessment are recommended  
\*Minimize potential adverse effects on arousal, cognition, motivation and motor coordination following traumatic brain injury  
Use of medications that target more than one brain-injury-related symptom/syndrome is recommended, if possible (e.g., one agent targeting both mood and insomnia, or headache and insomnia)  
Inform individuals and surrogate decision makers when use of medication is "off label"  
The introduction of medications for individuals be started at the lowest effective dose and be titrated slowly upwards, based upon tolerability, clinical response and situational urgency  
Drug trials should allow adequate duration and dosing  
Therapeutic goals should be clearly established and serve as indicators for the efficacy. If those goals are not met, ending the use of medication must be considered  
Serum drug levels in the person should be monitored as necessary to prevent toxicity  
Clinicians should avoid making more than one medication change at a time for a person with traumatic brain injury  
Collaboration with family and/or significant others, if possible and accepted by the patient, may be useful to monitor the efficacy and side effects of treatment.  
Pharmacological treatment of neurobehavioral/mental health or other symptoms should be used with caution and with the knowledge that studies suggest that many medications, including neuroleptics, anxiolytics, and anticonvulsants are associated with slowed recovery after brain injury  
If the decision is made to prescribe medication to enhance arousal/awareness in a person with traumatic brain injury, a therapeutic trial (A-B-A design), should be employed, using a single agent at a time, with emphasis on formal monitoring to observe the impact of the medication

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## **ONF: CPG for the Rehabilitation of Adults with Moderate to Severe TBI**

### **Principles of Medication Management (continued)**

A person with traumatic brain injury with significant challenging behaviors may require a combination of non-pharmacological and pharmacological approaches for optimal treatment

If possible, a sequenced approach should be used to avoid confounding data and to determine effective components

\*Physicians are directed to consult their funder's formulary for each medication under consideration to determine access to medication and eligibility for funding

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### **Patient, Family, Caregiver Education**

Information should be adapted to age, culture and linguistics in both written and verbal format

Common physical, cognitive, behavioral, and emotional consequences of TBI

Reassurance about symptoms and signs which might be expected

The possibility of long-term problems

Advice on high-risk situations, safety, and self-care measures

Rehab services and resources

Proper oral care

Dysphagia, safe swallowing and safe feeding

How cognitive impairments resulting from TBI can impact safe swallowing (e.g., impulsivity, neglect, verbosity, distractibility, fatigue, etc.)

Appropriate handling of paretic upper limbs during transfers, hypersensitivity and neurogenic pain

Safe and effective use of equipment and equipment management

Use of environmental supports for memory

Formal and informal resources and how to access them (support groups, services)

Information relevant to caregiver role: need for support, training and education; practical and emotional support regarding stress, mental health issues and their own quality of life; need to plan respite care

Difficulty of detecting TBI-related problems by those who do not know about the injury

Advice on the interactions between alcohol and psychoactive drugs

Advice on alcohol or drug misuse, if applicable

Substance use prevention

Community resources

Potential causes for behavior and emotional disorders after traumatic brain injury, possible antecedents and triggers, appropriate management

strategies, as well as possible side effects of medication.

The family should receive timely information in writing on how to manage behavior and emotions and should be invited to play a role in providing feedback and behavioral data

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Please refer to the full CPG for details of each recommendation:  
 VA/DoD: Management of concussion-mild TBI (2016); <https://www.healthquality.va.gov/guidelines/Rehab/mtbi/>

Ontario Neurotrauma Foundation (ONF): CPG for the rehab of adults with moderate to severe TBI (2016) <https://braininjuryguidelines.org/>

SIGN: Brain injury rehabilitation in adults (2013); <http://www.sign.ac.uk/assets/sign130.pdf>