

# 7 Sleep-Wake Disturbances

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More than 50% of patients report sleep disturbances following mTBI, specifically insomnia, hypersomnia, obstructive sleep apnea, poor sleep maintenance, poor sleep efficiency, early awakening, delayed sleep onset, or alterations in circadian cycle. (see [Appendix 7.1](#)).<sup>1-5</sup> In the immediate acute stage of mTBI, there may be an increased need for sleep<sup>6</sup> however this decreases over time and insomnia is the most common form of sleep disturbance reported in the subacute and chronic stages of mTBI. Insomnia is characterized by problems with sleep initiation and/or sleep maintenance that can lead to increases in daytime sleepiness and fatigue.<sup>3,4</sup> Although some research has shown a discrepancy between subjective sleep complaints and objective evidence of sleep disturbance (e.g., obtained via polysomnography), recent data has provided evidence of objectively measured alterations in sleep both in the acute stage and chronic stages of injury.<sup>6,7</sup> Sleep disturbance itself has been shown to be a prognostic factor for functional and social outcomes up to one year post-injury.<sup>8</sup> Patients may experience circadian rhythm sleep disorders, specifically delayed sleep phase syndrome and irregular sleep-wake patterns. Patients experiencing sleep disturbances after mTBI commonly find these symptoms to interfere with mood, mental capacities, communication, social or leisure activities, or their principal occupation.<sup>9,10</sup> It has also been suggested that sleep disturbance among this population may be associated with impairments on neuropsychological and cognitive-communication tests.<sup>10,11</sup> As is the case with many persistent symptoms following mTBI, sleep disturbances can be secondary to other conditions such as depression, anxiety, PTSD or pain. Recent studies by Suzuki et al 2017<sup>12</sup> and Lavigne et al 2015,<sup>13</sup> found that patients experiencing pain in the acute phase of mTBI may require more sleep than those without pain.<sup>12</sup> Management strategies should take this potential interaction of symptoms into account as it may exacerbate poor attention, memory, language processing and learning capabilities.<sup>9,14-18</sup>

A key feature of diagnosis is obtaining a history from the patient to record the TBI, to rule out pre-existing sleep disorders and to document symptoms after the injury.<sup>19</sup> Once a thorough evaluation has been conducted, treatment of sleep disorders within the mTBI population may take the form of both non-pharmacologic and pharmacologic methods. For insomnia, cognitive behavioural therapy (CBT) is recommended as it addresses factors perpetuating insomnia, such as unhealthy sleep hygiene, maladaptive sleep habits, autonomic and cognitive arousal, and dysfunctional beliefs and attitudes about sleep.<sup>20,21</sup> Referral to a professional with training and expertise in CBT for insomnia is ideal, however, while waiting for formalized CBT treatment for insomnia, or if this treatment is not available, behavioral recommendations (restriction of time in bed and stimulus control) can still be implemented by primary care providers with weekly monitoring of the patient for the first few weeks (see [Appendix 7.5](#)).<sup>2,22,23</sup> Referral to a sleep specialist is essential to evaluate and treat less common sleep problems associated with mTBI, such as sleep-related breathing disorder (e.g., obstructive sleep apnea), circadian rhythm shift, restless leg syndrome, periodic limb movement disorder, and REM sleep behaviour disorder.

Some benefits of melatonin have been documented for insomnia, daytime alertness, or circadian rhythm difficulties after mTBI,<sup>2,16,23</sup> however recent guidelines for the treatment of insomnia<sup>24</sup> do not encourage use of melatonin for sleep onset or sleep maintenance issues. There is still very limited data about the efficacy and safety of sleep medications on patients with neurological impairment, and more controlled trials are needed.<sup>2,25</sup> Caution is therefore recommended when prescribing sleep medications, and the aim should be to use pharmacological agents that will improve sleep-wake patterns but will not produce dependency or adverse side-effects, particularly adverse effects on cognition.<sup>26</sup> When prescribing medications the patient should be advised not to drive after taking the medication, and recommended that the patient not have to be somewhere early the next day.<sup>19</sup> Patients should also be advised not to have alcohol in conjunction with the medications.

See [Algorithm 7.1](#), which outlines the key steps for assessment and management of persistent sleep-wake disturbances following mTBI.

Table 7.1 Important Components to Include in the Sleep-Wake Disturbance Screen

<b>Medical Conditions</b>	e.g., endocrine dysfunction, metabolic, pain-provoking
<b>Current Medication Use</b>	e.g., verify if used prescribed or non-prescribed medications impact on sleep because of inadequate type, dosage or timing of administration <b>See <a href="#">Appendix F</a> for useful references regarding specific classes of medications and their impact on sleep.</b>
<b>Comorbid Psychopathology</b>	e.g., mood or anxiety disorder
<b>Unhealthy Habits</b>	e.g., lack of exercise, variable sleep-wake schedule, excessive napping, excessive time spent in bed, exercising close to bedtime, use of nicotine, caffeine, energy drinks, processed foods and processed sugars, alcohol, drugs, medications
<b>Physical</b>	e.g., alterations in menstrual cycle, comorbid physical and pain

<b>RECOMMENDATIONS FOR ASSESSMENT OF SLEEP-WAKE DISTURBANCES</b>		
		GRADE
7.1	Patients should be educated and reassured about the fact that sleep alterations are very common in the acute stages of concussion/mTBI.	<b>B</b>
7.2	Patients who have identified sleep alterations should be monitored for sleep/wake disturbances. Patients who have persisting sleep disturbances should be monitored for sleep-wake disorders (e.g., insomnia, excessive daytime sleepiness). (see <a href="#">Appendices 7.2</a> and <a href="#">7.3</a> ).	<b>C</b>
7.3	Screen for pre-existing sleep disturbances/ disorders, medical conditions, current medication use, comorbid psychopathology and risk factors for sleep disturbances, which may influence the sleep/wake cycle (see <a href="#">Table 7.1</a> ).	<b>C</b>
7.4	Referral for a sleep specialist consultation and polysomnography (e.g., sleep study, Multiple Sleep Latency Test, Maintenance of Wakefulness Test) should be considered if sleep disturbances persist or if there is suspicion of sleep-related breathing disorders, nocturnal seizures, periodic limb movements, or narcolepsy.	<b>C</b>
<b>RECOMMENDATIONS FOR NON-PHARMACOLOGIC TREATMENT OF SLEEP-WAKE DISTURBANCES</b>		
		GRADE
7.5	It is recommended to treat sleep-wake disturbances in patients with concussion/mTBI. Treatment of sleep disorders may help with: <ul style="list-style-type: none"> <li>• Mood</li> <li>• Anxiety</li> <li>• Pain</li> <li>• Fatigue</li> <li>• Cognitive Problems</li> </ul>	<b>B</b>
7.6	All patients with persistent sleep-wake complaints should be placed on a program of sleep hygiene. Behavioural interventions for sleep (e.g., cognitive-behavioral therapy techniques, mindfulness-based therapies) should also be considered. See <a href="#">Appendix 7.4</a> for a sleep hygiene program and <a href="#">Appendix 7.5</a> for behavioral recommendations for optimal sleep.	<b>C</b>
7.7	Cognitive behavioural therapy (CBT) for insomnia is established as the treatment of choice for either primary insomnia or insomnia comorbid to a medical or psychiatric condition.	<b>B</b>
7.8	Other non-pharmacologic treatment options that have been found to be useful in the treatment of insomnia include: <ul style="list-style-type: none"> <li>• Melatonin (taken 2 hours before bedtime in conjunction with reduced evening light exposure and light therapy in the morning)</li> <li>• Magnesium and zinc supplementation</li> <li>• Acupuncture and mindfulness-based stress reduction therapy</li> </ul>	<b>C</b>

## RECOMMENDATIONS FOR PHARMACOLOGIC TREATMENT OF SLEEP-WAKE DISTURBANCES

		GRADE
7.9	When pharmacologic interventions are used, the aim is to establish a more routine sleep-wake pattern using agents with minimal risk of dependency and adverse effects in patients with concussion/mTBI. Medications to be considered include low-dose trazodone and tricyclic antidepressants (e.g., Amitriptyline, Doxepine), as well as mirtazapine. Prazosin may be considered in patients with nightmares and PTSD. Benzodiazepines should generally be avoided; however, non-benzodiazepine medications (e.g., Zopiclone, Exzopiclone) may have fewer adverse effects and may be considered for short-term use.	<b>C</b>
7.10	The use of Modafinil and Armodafinil can be considered in patients with excessive daytime sleepiness.	<b>A</b> <b>Armodafinil</b>

## RESOURCES

### APPENDICES

1	Brief Definitions of Sleep Disorders Most Frequently Reported Following TBI	Appendix 7.1
2	Short Clinical Interview for Sleep after Head Injury	Appendix 7.2
3	Sleep and Concussion Questionnaire	Appendix 7.3
4	Sleep Hygiene Program	Appendix 7.4
5	Behavioural Recommendations for Optimal Sleep	Appendix 7.5
6	Sleep Diary	Appendix 7.6
7	Limiting Time Spent in Bed	Appendix 7.7
8	Recreating a Time and Place for Sleep	Appendix 7.8
9	Other Useful Links/References for Resources to Consider	Appendix F

### TABLES

1	Important Components to Include in the Sleep-Wake Disturbances Screen	Table 7.1
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### ALGORITHMS

1	Assessment and Management of Persistent Sleep-Wake Disturbances Following mTBI	Algorithm 7.1
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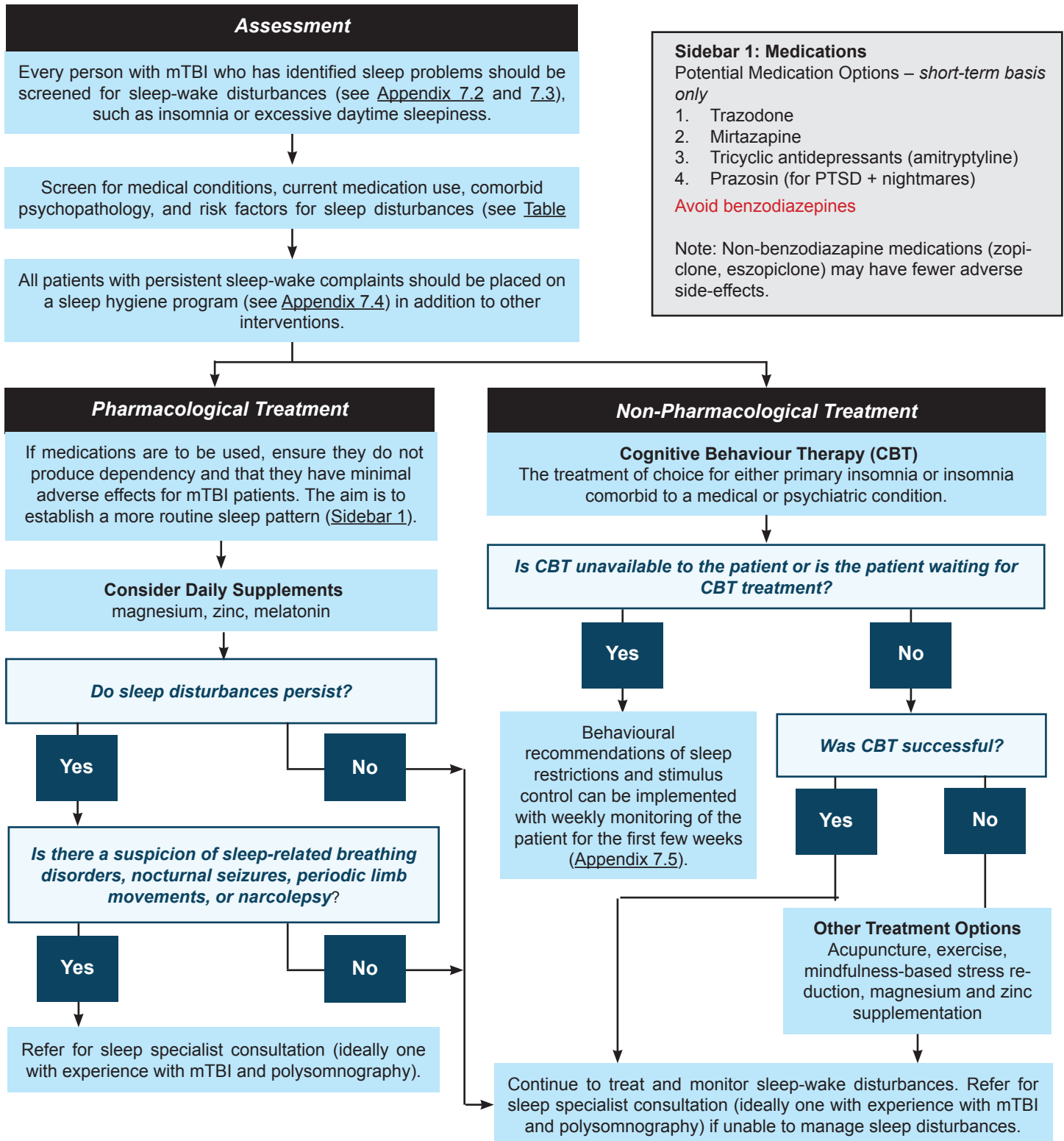
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# Algorithm 7.1

## Assessment and Management of Sleep-Wake Disturbances Following mTBI



For a narrative description and guideline recommendations related to this algorithm, please refer to **Section 7**.