



DEFENSE CENTERS
OF EXCELLENCE

For Psychological Health
& Traumatic Brain Injury

Management of Sleep Disturbances Following Concussion/Mild Traumatic Brain Injury:

Guidance for Primary Care Management in Deployed and Non-Deployed Settings



Learning Objectives



Understand the occurrence of sleep disturbances following concussion

Identify focused screening and evaluation methods for insomnia, circadian rhythm sleep-wake disorders and obstructive sleep apnea

Recognize co-morbid conditions and associated symptoms that may contribute to sleep disturbances

Identify the treatments for insomnia, circadian rhythm sleep-wake disorders and obstructive sleep apnea following concussion

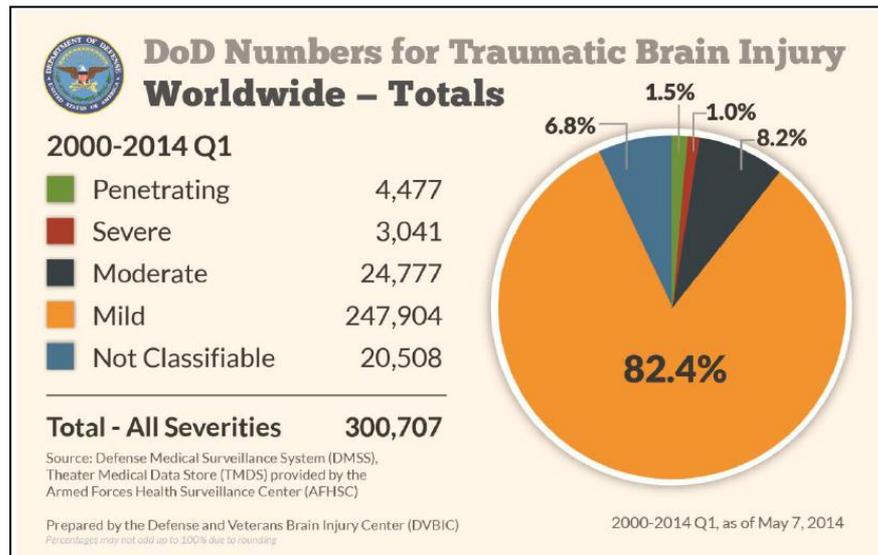
Understand treatment guidelines for sleep disturbances in deployed and non-deployed settings

Purpose and Scope of Clinical Recommendation

- The Management of Sleep Disturbances Following Concussion/Mild Traumatic Brain Injury: Guidance for Primary Care Management in Deployed and Non-Deployed Settings clinical recommendation (CR) and companion clinical support tool (CST) offers Military Health System (MHS) providers guidance on primary care evaluation and management of sleep disturbances following concussion in the deployed and non-deployed primary care setting.
- The CR development followed a process that included evidence reviews, an analysis of the applicability of current clinical practice guidelines and multidisciplinary expert panel input.
- This recommendation does not replace the provider's clinical judgment on the appropriateness of applying patient-specific procedures and interventions.

Defense Department TBI Statistics

- 300,707 total diagnoses of TBI within the Defense Department between 2000 and the first quarter of 2014
 - 247,904 (82.4 percent) of those are classified as concussion



Source: <http://dvbic.dcoe.mil/dod-worldwide-numbers-tbi>

Overview of Sleep Disturbances

- Four common sleep disturbances following concussion
 - Short-term insomnia (previously known as acute insomnia)
 - Chronic insomnia
 - Circadian rhythm sleep-wake disorders (CRSWD) (previously known as circadian rhythm sleep disorder)
 - Obstructive sleep apnea (OSA)
- Insomnia is the most commonly occurring sleep disturbance following concussion

Overview of Sleep Disturbances

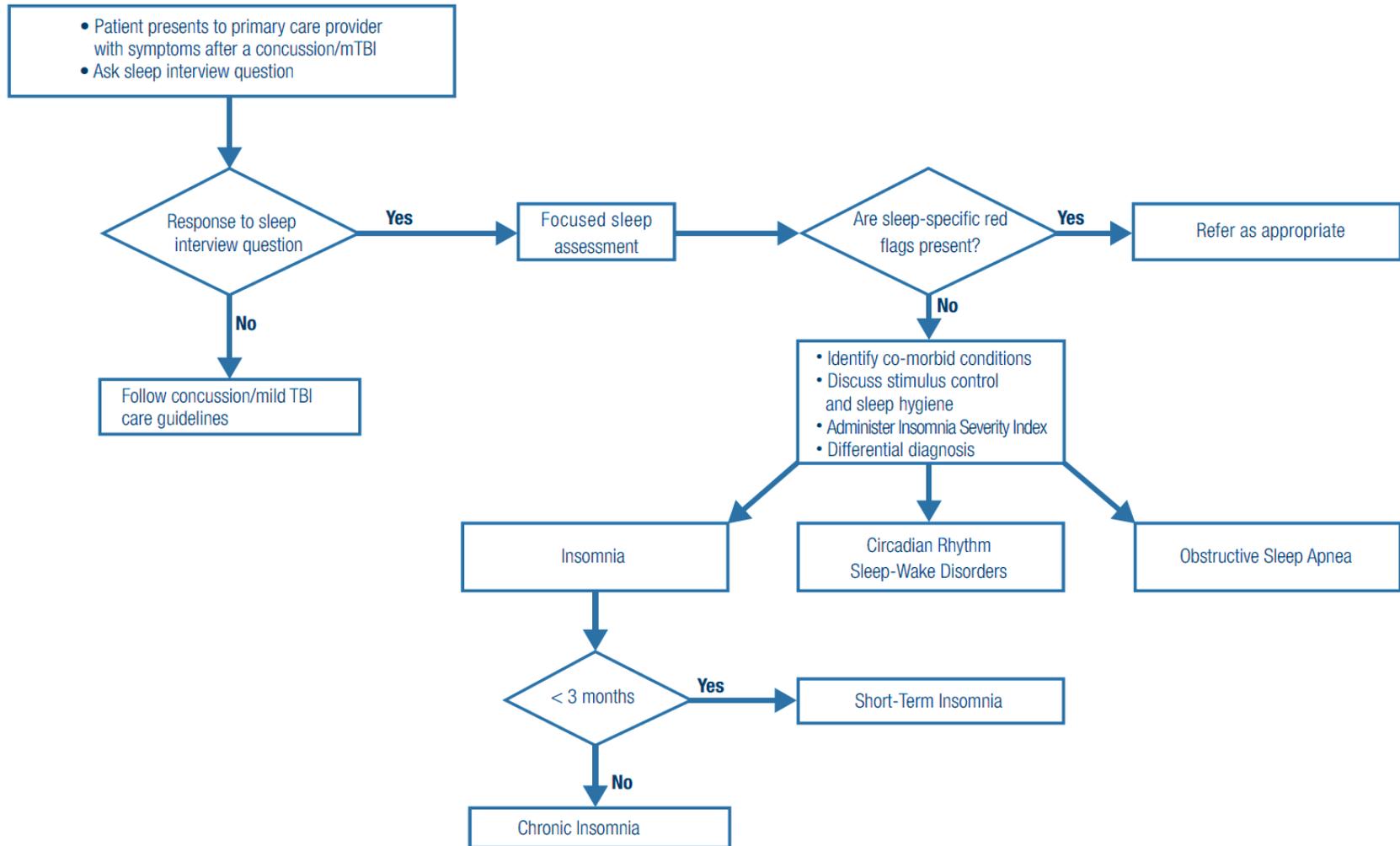
Prevalence

- The prevalence rates of insomnia, CRSWD and OSA following mTBI are higher compared with other TBI severity levels and the general population.
- Nearly all service members (SM) with combat-related TBI report a sleep disturbance initially.

Effects

- Negative impact on recovery from TBI (impedes restorative processes that occur during sleep)
- Symptom exacerbation (pain, irritability and cognitive/memory dysfunction)
- Functional deficits (e.g., social functioning, response to rehabilitation, return to work, etc.)

Clinical Algorithm



Clinical Algorithm

- If a SM is diagnosed with a concussion and has sleep complaints
 - Complete a focused sleep assessment
 - If sleep-specific red flags are present, refer to a sleep medicine specialist, emergency department or psychiatry
 - Identify co-morbid conditions
 - Discuss stimulus control and sleep hygiene
 - Administer the Insomnia Severity Index (ISI)
 - Complete differential diagnosis
 - Manage the sleep disturbance accordingly

Screening for Sleep Disturbances

- All patients presenting with symptoms following a concussion should be screened for the presence of a sleep disturbance
 - Given the high incidence of sleep disturbances in patients after a concussion and the potential benefits of improved sleep on a wide range of symptoms
- Patients may have a sleep disturbance that existed prior to a concussion, as a consequence of concussion or diagnosed after a concussion

Sleep Interview Question

- Recommended sleep screening question:

Are you experiencing frequent difficulty falling or staying asleep, excessive daytime sleepiness or unusual events during sleep?

Focused Sleep Assessment

- Used to determine whether a sleep disturbance is due to one or more primary sleep disorder(s) or other factors
- Components
 - Clinical sleep interview
 - Physical examination
 - Objective findings
 - Self-report measures
 - Sleep diary to track patterns

Focused Sleep Assessment

- Establishes important information relevant to the sleep disturbance:
 - Duration
 - Severity
 - Consequences
 - Etiology
 - Predisposing factors
 - Precipitating factors
 - Perpetuating factors
- } The “Three Ps” of insomnia
- Disturbed sleep may adversely affect familial, social, academic or occupational roles, as well as mood and cognition.

Focused Sleep Assessment

Area of Assessment	Examples
Symptoms	Difficulty initiating and/or maintaining sleep, non-restorative sleep, nightmares, snoring, awakening with gasping and choking, fatigue, tiredness or drowsiness during the daytime
Consequences	Cognitive impairment, mood disturbances, irritability, decrease in functional ability, role interference (family, social, academic, occupational)
Predisposing factors	Pre-concussion sleep pattern, prior history of a sleep disturbance, excessive weight, increasing neck circumference, narrow upper airway, older age, genetic factors, mood disturbances, anxiety or preoccupation concerning sleep quality, medications, other co-morbid behavioral health or medical conditions
Precipitating factors	Concussion, deployment, acute stress
Perpetuating behavioral factors	Napping, excessive caffeine/stimulant use, irregular sleep schedule Watching TV, reading, working on a computer, or playing video games while in bed
Perpetuating environmental factors	Light, noise, travel and time zone changes
Perpetuating psychosocial factors	Familial stress, inadequate social support system, financial stress, safety concerns or other worries
Perpetuating occupational factors	Shift work, standing watch, duty schedule incompatible with preferred sleep schedule, work stressors
Perpetuating physical factors	Pain, discomfort, tinnitus
Perpetuating lifestyle factors	Alcohol use, diet, smoking, limited physical activity, family and community obligations

Focused Sleep Assessment

- Patients with sleep disturbances usually describe one or more of the following symptoms:
 - Difficulty initiating sleep
 - Difficulty maintaining sleep
 - Excessive daytime sleepiness
 - Unusual events during sleep (e.g., behaviors, sensations, abnormal movements, nightmares)

Sleep-Specific Red Flags

- Subjective complaints of significant sleepiness in occupations where somnolence would jeopardize the safety of themselves or others
 - Priority referral to a sleep medicine specialist
- SMs with emotional or behavioral symptoms and severe sleep disturbance
 - Assess for risk of harm to self or others and immediately refer to emergency department or psychiatry if necessary

Co-Morbid Conditions and Associated Symptoms

- Common co-morbid medical conditions
 - Headache, chronic pain, endocrine abnormalities
- Common co-morbid psychological health conditions
 - Posttraumatic stress disorder (PTSD), generalized anxiety disorder, panic disorder, major depressive disorder, adjustment disorders, substance use/dependence/withdrawal

Co-Morbid Conditions and Associated Symptoms

- A post-concussion anxiety disorder is a strong predictor of a sleep disturbance
- PTSD, whether diagnosed or undiagnosed, may lead to a sleep disturbance such as insomnia or adult nightmare disorder
- Medications and diet can impact the sleep-wake cycle, sedation levels and circadian rhythms

Differential Diagnosis

- The initial assessment will assist in the differential diagnosis of the most common sleep disturbances following concussion
- If the focused sleep assessment is insufficient for differential diagnosis, refer the patient to a sleep medicine specialist
- Some patients with CRSWD or OSA initially present with insomnia complaints
- Other sleep disturbances may exist in combination with insomnia, CRSWD or OSA (e.g., sleep-related movement disorders, parasomnias, hypersomnia)

Insomnia Evaluation

- Insomnia Severity Index
 - Brief, validated, seven-item self-report questionnaire
 - Useful for the initial assessment of insomnia symptom severity
 - Useful for ongoing monitoring of treatment response
 - Access the ISI:
 - myhealth.va.gov/mhv-portal-web/anonymous.portal?nfpb=true&pageLabel=healthyLiving&contentPage=healthy_living/sleep_insomnia_index.htm
- A precipitating factor usually can be identified in short term insomnia, where as perpetuating factors are found in chronic insomnia

Short-Term Insomnia Evaluation

Diagnosis of Short-Term Insomnia Disorder
<p>Short-term insomnia disorder: ICD-9-CM: 307.41 (ICD-10-CM: F51-02)</p> <ul style="list-style-type: none"> • Sleep disturbance and associated daytime symptoms are present several days per week and for less than three months
Criteria A-D must be met for short-term insomnia.*
<p>A. The patient reports one or more of the following:</p> <ul style="list-style-type: none"> • Difficulty initiating sleep • Difficulty maintaining sleep • Waking up earlier than desired • Resistance to going to bed on appropriate schedule • Difficulty sleeping without parent or caregiver intervention
<p>B. The patient reports one or more of the following related to the nighttime sleep difficulty:</p> <ul style="list-style-type: none"> • Fatigue/malaise • Attention, concentration, or memory impairment • Impaired social, family, vocational, or academic performance • Mood disturbance/irritability • Daytime sleepiness • Behavioral problems (e.g., hyperactivity, impulsivity, aggression) • Reduced motivation/energy/initiative • Proneness for errors/accidents • Concerns about or dissatisfaction with sleep
<p>C. The reported sleep/wake complaints cannot be explained purely by inadequate opportunity (i.e., enough time is allotted for sleep) or inadequate circumstances (i.e., the environment is safe, dark, quiet and comfortable) for sleep</p>
<p>D. The sleep/wake difficulty is not better explained by another sleep disorder</p>

*Criteria adapted from: American Academy of Sleep Medicine. (2014). International classification of sleep disorders, (3rd ed.). Darien, IL: American Academy of Sleep Medicine

Short-Term Insomnia Evaluation

Short-Term Insomnia Considerations:

- Patients with significant concerns about their symptoms warrant clinical attention regardless of symptom frequency
- Many conditions such as grief, acute pain, or other acute stress are quite often associated with poor sleep. When such conditions are the sole cause of the sleep difficulty, a separate insomnia diagnosis may not apply.
- Insomnia Severity Index (ISI) ≥ 10
- Two-week sleep diary

Chronic Insomnia Evaluation

Diagnosis of Chronic Insomnia Disorder
<p>Chronic insomnia disorder: ICD-9-CM: 307.42 (ICD-10-CM: F51.01)</p> <ul style="list-style-type: none"> • Sleep disturbance and associated daytime symptoms that occur at least three times per week and have been present for at least three months
Criteria A-D must be met for chronic insomnia.*
<p>A. The patient reports one or more of the following:</p> <ul style="list-style-type: none"> • Difficulty initiating sleep • Difficulty maintaining sleep • Waking up earlier than desired • Resistance to going to bed on appropriate schedule • Difficulty sleeping without parent or caregiver intervention
<p>B. The patient reports one or more of the following related to the nighttime sleep difficulty:</p> <ul style="list-style-type: none"> • Fatigue/malaise • Attention, concentration, or memory impairment • Impaired social, family, vocational, or academic performance • Mood disturbance/irritability • Daytime sleepiness • Behavioral problems (e.g., hyperactivity, impulsivity, aggression) • Reduced motivation/energy/initiative • Proneness for errors/accidents • Concerns about or dissatisfaction with sleep
<p>C. The reported sleep/wake complaints cannot be explained purely by inadequate opportunity (i.e., enough time is allotted for sleep) or inadequate circumstances (i.e., the environment is safe, dark, quiet and comfortable) for sleep</p>
<p>D. The sleep/wake difficulty is not better explained by another sleep disorder</p>

*Criteria adapted from: American Academy of Sleep Medicine. (2014). International classification of sleep disorders, (3rd ed.). Darien, IL: American Academy of Sleep Medicine

Chronic Insomnia Evaluation

Chronic Insomnia Considerations:

- Recurrent episodes of sleep/wake difficulties lasting several weeks at a time over several years does not meet the specified three-month duration criterion for any single such episode, however such patients may be assigned a diagnosis of chronic insomnia related to the prolonged re-occurring sleep difficulties
- Regular use of sedative-hypnotic medications may result in good sleep leading to the patient not meeting the outlined diagnostic criteria for an insomnia disorder. However, without medications these patients may meet the diagnostic criteria and maintain the diagnosis of chronic insomnia
- Co-morbid conditions such as chronic pain disorders and others may cause sleep/wake complaints. If sleep/wake complaints cannot be attributed to the co-morbid condition, the diagnosis and treatment of insomnia should be considered
- Insomnia Severity Index (ISI) ≥ 10
- Two-week sleep diary

Insomnia Treatment

First-Line Non-Pharmacological Treatment

- Stimulus Control and Sleep Hygiene are the most effective treatments for insomnia in the primary care setting

Stimulus Control	Sleep Hygiene
Remove TV, radio, smartphone, electronic tablet, computer and other electronic devices from bedroom	Avoid caffeine/stimulant intake within six hours of bedtime
Relax before bedtime; avoid going to bed worried or angry; use the bedroom only for sleep and intimacy	Engage in exercise daily during the morning or afternoon; avoid exercise close to bedtime
Go to bed only when tired and sleepy	Avoid alcohol and nicotine use, large/heavy meals and excessive fluid close to bedtime
If unable to fall asleep within 15-20 minutes, get up, go to another room with the lights dim and do something relaxing while avoiding electronic use (TV, computers, phone); return to bed when sleepy -Repeat above, as needed throughout the night, even after awakenings	Promote a sleep friendly environment, minimize noise and light, maintain a cool but comfortable temperature
	Get up at the same time every morning (regardless of the amount of sleep obtained), even on the weekends; avoid daytime naps
	Get exposure to natural light every morning

Short-Term Insomnia Treatment

Treatments for Short-Term Insomnia in the Primary Care Setting	
<ul style="list-style-type: none"> • First-line non-pharmacologic 	<ul style="list-style-type: none"> • Pharmacologic
<ul style="list-style-type: none"> - Reassure 	<ul style="list-style-type: none"> - Low-dose, short-duration non-benzodiazepine sedative-hypnotic drugs (zapelon, zolpidem, eszopiclone, and zopiclone) – follow new dosing guidelines <ul style="list-style-type: none"> - e.g., zolpidem 5mg qhs for 2 weeks, may repeat once for no more than 30 days total
<ul style="list-style-type: none"> - Educate 	
<ul style="list-style-type: none"> - Implement stimulus control + sleep hygiene 	<ul style="list-style-type: none"> - If co-morbid depression, pain, headache, consider low dose antidepressant (amitriptyline or trazodone)
<ul style="list-style-type: none"> - Follow weekly until resolution 	<ul style="list-style-type: none"> - If co-morbid PTSD/nightmares (prazosin)

Short-Term Insomnia

Pharmacological Treatment

- Contraindicated:
 - Benzodiazepines
- Not recommended:
 - Antihistamines, antipsychotics, melatonin receptor agonists (ramelteon)

Short-Term Insomnia

Other Treatment Options

Applications & Assistive Technologies

- Incorporate National Center for Telehealth and Technology smartphone apps (CBT-i Coach) and interactive websites (e.g., afterdeployment.t2.health.mil) to educate about the relationship between sleep and concussion recovery and provide self-management tools as an adjunct to treatment

Referral

Evaluation and treatment of co-morbid condition with appropriate specialty

Sleep Medicine:

- Non-response or inadequate response to primary care treatment (e.g., patient remains symptomatic or a decrease in ISI score < 8 points after four weeks)

Other:

- Consider acupuncture as adjunct to first-line treatment based on patient preference for complementary and alternative therapy modalities

- Daily exposure to natural sunlight or short wavelength (blue) light via a portable box can reduce fatigue and daytime sleepiness
- Consider ear plugs, a sleep mask or a white noise machine

Chronic Insomnia Treatment

Treatments for Chronic Insomnia in the Primary Care Setting	
<ul style="list-style-type: none"> • First-line non-pharmacologic 	<ul style="list-style-type: none"> • Pharmacologic
<ul style="list-style-type: none"> – Implement stimulus control + sleep hygiene 	<ul style="list-style-type: none"> – Only if patient has not attained relief with CBT-I by a specialty provider
<ul style="list-style-type: none"> – Provide progressive muscle relaxation training (Information is available on the Healthy Sleep patient education sheet at dvbic.dcoe.mil) 	<ul style="list-style-type: none"> – Low-dose, short-duration non-benzodiazepine sedative-hypnotic drugs (zaleplon, zolpidem, eszopiclone, and zopiclone) – follow new dosing guidelines, e.g., zolpidem 5mg qhs for 2 weeks, may repeat once for no more than 30 days total – Consider a melatonin receptor agonist (ramelteon) as an alternative
<ul style="list-style-type: none"> • After first-line non-pharmacologic treatment, refer for Cognitive Behavioral Therapy for Insomnia (CBT-I) 	<ul style="list-style-type: none"> – If co-morbid depression, pain, headache, consider low dose antidepressant (amitriptyline or trazodone)
	<ul style="list-style-type: none"> – If co-morbid PTSD/nightmares (prazosin)

- Training in progressive muscle relaxation may be helpful for patients with chronic insomnia (decreases hyper-arousal and anticipatory anxiety associated with sleep)

Chronic Insomnia

Other Treatment Options

Applications & Assistive Technologies

- Incorporate National Center for Telehealth and Technology smartphone apps (CBT-i Coach) and interactive websites (e.g., afterdeployment.t2.health.mil) to educate about the relationship between sleep and concussion recovery and provide self-management tools as an adjunct to treatment

Referral

Evaluation and treatment of co-morbid condition with appropriate specialty

Sleep Medicine:

- Non-response or inadequate response to primary care treatment (e.g., patient remains symptomatic or a decrease in ISI score < 8 points after four weeks treatment with primary care stimulus control and sleep hygiene)
- Sleep interventions/sleep specialty trained occupational therapist or behavioral health provider - CBT-I
- Consider acupuncture as adjunct to CBT-I based on patient preference for complementary and alternative therapy modalities

Short-Term and Chronic Insomnia

Pharmacological Treatment: FDA Guidance

- Immediate-release zolpidem
 - The FDA recommends an initial dose of 5 mg for women
 - The FDA recommends an initial dose of 5-10 mg for men
 - In both men and women, the dose can be increased to 10 mg if 5 mg is not effective

Short-Term and Chronic Insomnia

Pharmacological Treatment: FDA Guidance

- Extended-release zolpidem
 - Recommended initial dose is 6.25 mg for women and either 6.25 mg or 12.5 mg for men
 - In both men and women, the dose can be increased to 12.5 mg if 6.25 mg is not effective

Short-Term and Chronic Insomnia

Pharmacological Treatment: FDA Guidance

- Women are at a greater risk of decreased mental alertness due to the extended half-life of zolpidem as there is typically a slower elimination in women
- Patients should be warned not to engage in driving or other activities requiring complete mental alertness the day after taking immediate- or extended-release zolpidem
 - Available as short-acting, long-acting, sublingual and spray formulations

Short-Term and Chronic Insomnia

Pharmacological Treatment: FDA Guidance

- Non-benzodiazepine sedative-hypnotic drugs should be used with caution
 - **Can interfere with cortical plasticity and are not FDA approved for chronic insomnia or other persistent symptoms of concussion**
 - **Use of these drugs for longer than 30 days can lead to tolerance or dependence**
- Benzodiazepines are contraindicated as their use may impede neuronal recovery

Circadian Rhythm Sleep-Wake Disorders (CRSWD) Evaluation

Diagnosis of Circadian Rhythm Sleep-Wake Disorders (CRSWD)

Circadian Rhythm Sleep Wake Disorders (CRSWD): Unspecified

ICD-9-CM: 327.30 (ICD-10-CM: G47.20)

- Subtypes of CRSWD have specific criteria that can be determined through Sleep Medicine evaluation and actigraphy

General criteria A-C must be met*

- A. Chronic or recurrent pattern of sleep-wake rhythm disruption primarily due to alteration of the endogenous circadian timing system or misalignment between the endogenous circadian rhythm and the sleep-wake schedule desired or required by an individual's physical environment or social/work schedules
- B. The circadian rhythm disruption leads to insomnia symptoms, excessive sleepiness, or both
- C. The sleep and wake disturbances cause clinically significant distress or impairment in mental, physical, social, occupational, educational, or other important areas of functioning

*Criteria adapted from: American Academy of Sleep Medicine. (2014). International classification of sleep disorders, (3rd ed.). Darien, IL: American Academy of Sleep Medicine

CRSWD Evaluation

CRSWD Presentation
<ul style="list-style-type: none">• Difficulty initiating sleep
<ul style="list-style-type: none">• Difficulty maintaining sleep
<ul style="list-style-type: none">• Excessive sleepiness
CRSWD Considerations
<ul style="list-style-type: none">• It is important to differentiate between poor sleep hygiene and intentional maintenance of irregular sleep schedules and CRSWD
<ul style="list-style-type: none">• Presentation symptoms may lead to poor health outcomes, decreased functional ability in social, occupational and educational roles as well as safety concerns
<ul style="list-style-type: none">• Discordance between physiological sleep preference and environmentally imposed sleep-wake schedule
<ul style="list-style-type: none">• External issues-shift work, standing watch, jet lag, time zone changes
<ul style="list-style-type: none">• Quality of sleep on preferred sleep schedule
<ul style="list-style-type: none">• Daytime impairments
<ul style="list-style-type: none">• Neurologic exam and OSA screening exam if indicated by history
<ul style="list-style-type: none">• Morningness-Eveningness Questionnaire (MEQ): http://www.latustraining.com/pdfs/ModifiedMEQ-SA-Terman.pdf
<ul style="list-style-type: none">• Two-week sleep diary

CRSWD

Treatment

Treatments for CRSWD in the Primary Care Setting	
Non-Pharmacologic	<p>First-line treatment:</p> <ul style="list-style-type: none"> • Assist patient in identifying and scheduling optimal sleep-wake schedule; adjust patient activity schedule (as feasible) to meet preferred sleep-wake cycle; encourage patient adherence to good sleep hygiene practices; and get exposure to natural light every morning <p>Follow-up care following specialty treatment:</p> <ul style="list-style-type: none"> • Stimulus control and sleep hygiene for residual insomnia complaints, reinforcement of protocols recommended by specialty care for light exposure/restriction and use of equipment such as blackout shades • Liaison with command to adjust duty schedule for consistency of sleep-wake schedule if possible
Pharmacologic	<p>Treatment for Delayed Sleep-Wake Phase Disorder (DSWPD) only, while awaiting specialty care appointment:</p> <ul style="list-style-type: none"> • Melatonin 0.5-5 mg dose; prescribed 5-6 hours before the time that the patient would usually go to sleep
Applications and Assistive Technologies	<ul style="list-style-type: none"> • Short wavelength light (blue) therapy

CRSWD

Other Treatment Options

Referral	
Sleep Medicine	<ul style="list-style-type: none">• All patients with possible CRSWD for definitive diagnostic workup• Actigraphy, chronotherapy, short wavelength light (blue) therapy

- For patients suspected of having CRSWD, simultaneously begin first-line non-pharmacological treatment and refer to a sleep medicine specialist for a diagnostic workup and further management recommendations

OSA Evaluation

- Patient history and physical exam establish a presumptive diagnosis of OSA

Diagnosis of Obstructive Sleep Apnea (OSA)	
ICD-9-CM: 327.23	(ICD-10-CM: G47.33)
Diagnostic Criteria: (A and B) or C satisfy the criteria for diagnosis*	
A. The presence of one or more of the following: <ul style="list-style-type: none">• The patient complains of sleepiness, non-restorative sleep, fatigue, or insomnia symptoms• The patient wakes with breath holding, gasping, or choking.• The bed partner or other observer reports habitual snoring, breathing interruptions, or both during the patient's sleep• The patient has been diagnosed with hypertension, a mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type 2 diabetes mellitus	
B. Polysomnography (PSG) or out-of-center sleep testing (OCST) reports: <ul style="list-style-type: none">• Five or more predominantly obstructive respiratory events (obstructive and mixed apneas, hypopneas, or respiratory effort related arousals [RERAs]) per hour of sleep during a PSG or per hour of monitoring (OCST)	
C. PSG or OCST demonstrates: <ul style="list-style-type: none">• Fifteen or more predominantly obstructive respiratory events (apneas, hypopneas, or RERAs) per hour of sleep during a PSG or per hour of monitoring (OCST)	

*Criteria adapted from: American Academy of Sleep Medicine. (2014). International classification of sleep disorders, (3rd ed.). Darien, IL: American Academy of Sleep Medicine

OSA Evaluation

OSA Presentation
<ul style="list-style-type: none">• Excessive sleepiness
<ul style="list-style-type: none">• Repetitive episodes of complete (apnea) or partial (hypopnea) upper airway obstruction
<ul style="list-style-type: none">• Witnessed pauses in breathing and gasping or choking
<ul style="list-style-type: none">• Physical exam:<ul style="list-style-type: none">– including an assessment of obesity (as indicated by neck circumference > 17" for males, > 16" for females and body mass Index > 25)– airflow obstruction– cardiovascular risk factors– blood pressure– retrognathia (overbite, recessed chin, small jaw)
Additional Considerations
<ul style="list-style-type: none">• Patients with OSA may have a normal examination and BMI within normal limits. PSG, a formal sleep study conducted in a sleep lab, is the gold standard for a confirmatory diagnosis of OSA and assessment of OSA severity
<ul style="list-style-type: none">• Other causes of excessive sleepiness such as narcolepsy, idiopathic hypersomnia, and insufficient sleep may present in a similar manner. These other conditions are usually identified on the basis of history and PSG
Lab/Studies
<ul style="list-style-type: none">• Polysomnography for definitive diagnosis
Self- Report Measures
<ul style="list-style-type: none">• Epworth Sleepiness Scale, STOP-BANG questionnaire or Berlin questionnaire*

*Links to the questionnaires on the following slide

OSA Evaluation

Links to OSA Self-Report Measures

- Epworth Sleepiness Scale: <http://epworthsleepinessscale.com/epworth-sleepiness-scale.pdf>
- STOP-BANG questionnaire: <http://www.anesthesia.utoronto.ca/Assets/Anesthesia+Digital+Assets/Anesthesia/Anesthesia+Digital+Assets/CME/stop+bang+questionnaire.jpg>
- Berlin questionnaire: http://img.medscape.com/article/771/425/berlin_questionnaire.pdf

OSA Treatment

Treatments for OSA in the Primary Care Setting	
Non-Pharmacologic	<ul style="list-style-type: none">• Body position therapy• Oral appliances• Positive Airway Pressure therapies (CPAP, APAP, BiPAP)
Pharmacologic	<ul style="list-style-type: none">• No role for pharmacology as stand-alone treatment
Combination	<ul style="list-style-type: none">• If compliant with positive airway pressure (PAP) therapies, consider use of modafinil or armodafinil as adjunctive therapy for residual hypersomnia
Applications and Assistive Technologies	<ul style="list-style-type: none">• None

OSA

Treatment

- Patients with risk factors for OSA or a presumptive diagnosis of OSA are recommended to have polysomnography or be referred to a sleep medicine specialist

Referral	
Urgent Referral	<ul style="list-style-type: none"> Patients with concussion associated behavioral or emotional symptoms and a severe sleep disturbance should be assessed for danger to themselves or others and immediately referred to the emergency department or psychiatry if suicidal risk or other similar concerns are present.
Referral to Sleep Medicine	<ul style="list-style-type: none"> Subjective complaints of significant sleepiness by patients in occupations in which somnolence would jeopardize the safety of themselves or others require a priority referral to a sleep medicine specialist Initial management of patients suspected with OSA Polysomnography New, persistent, recurrent or worsening signs/symptoms after initiation of treatment or non-efficacy of treatment Oropharyngeal surgery
Referral to Behavioral Health	<ul style="list-style-type: none"> Behavioral or psychological interventions to facilitate PAP compliance, smoking cessation, weight reduction or alcohol reduction

Sleep Disturbances in Deployed Settings

- Sleep disturbance screening is recommended as a routine component of concussion management in the deployed setting
- Use the Neurobehavioral Symptom Inventory (NSI) for assessment of continued symptoms 24-hours post-concussion
 - Pay close attention to how the SM rates *difficulty falling or staying asleep*
- Reassurance, education and an optimal sleep environment are the cornerstones of insomnia management

Sleep Disturbances in Deployed Settings

- Sleep hygiene and stimulus control instruction is recommended for short-term insomnia at 7 days post-concussion
- SMs experiencing clinical signs and symptoms of CRSWD or OSA need to be evaluated for operational functionality and safety

Sleep Disturbances in Deployed Settings

- Suspected (unconfirmed) OSA treatment
 - Patient education about avoidance of sleep deprivation and discontinuation of smoking
 - Body position therapy (non-supine), nasal decongestant relief, discontinuation of sedative/hypnotic medications to reduce snoring, nasal expiratory positive airways pressure (EPAP)

Sleep Disturbances in Deployed Settings

- Post-deployment evaluation for sleep disturbances is recommended for SMs with persistent (>3 months) post-concussive symptoms
- An OSA-specific evaluation is recommended if there are OSA risk factors

Knowledge Check

Question One

Question: What is a differentiating factor between short-term and chronic insomnia?

- a) Short-term insomnia typically occurs in 18-25 year olds
- b) A precipitating factor usually can be identified in short term insomnia, where as perpetuating factors are found in chronic insomnia
- c) In chronic insomnia, symptoms are present for at least 2 months
- d) Short-term insomnia lasts for a few days, while chronic insomnia lasts for a few weeks

Knowledge Check

Question One

Question: What is a differentiating factor between short-term and chronic insomnia?

- a) Short-term insomnia typically occurs in 18-25 year olds
- b) A precipitating factor usually can be identified in short term insomnia, where as perpetuating factors are found in chronic insomnia
- c) In chronic insomnia, symptoms are present for at least 2 months
- d) Short-term insomnia lasts for a few days, while chronic insomnia lasts for a few weeks

Answer: b) A precipitating factor usually can be identified in short term insomnia, where as perpetuating factors are found in chronic insomnia

Knowledge Check

Question Two

Question: What is the most commonly occurring sleep disturbance following concussion?

- a) OSA
- b) CRSWD
- c) DSWPD
- d) Insomnia

Knowledge Check

Question Two

Question: What is the most commonly occurring sleep disturbance following concussion?

- a) OSA
- b) CRSWD
- c) Chronic insomnia
- d) Insomnia

Answer: d) Insomnia

Knowledge Check

Question Three

Question: What are common patient complaints indicating a possible diagnosis of OSA?

- a) Excessive daytime sleepiness
- b) Cognitive changes
- c) Difficulty maintaining sleep
- d) All of the above

Knowledge Check

Question Three

Question: What are common patient complaints indicating a possible diagnosis of OSA?

- a) Excessive daytime sleepiness
- b) Cognitive changes
- c) Difficulty maintaining sleep
- d) All of the above

Answer: d) All of the above

Case Study

- Cpl Buchanan is a 22-year-old USMC CBRN Defense Specialist (5711) who was the gunner in a Military All-Terrain Vehicle when it struck a 40-lb Improvised Explosive Device
- Cpl Buchanan lost consciousness for 5 seconds and experienced 15 seconds of post-traumatic amnesia
- He was diagnosed with a concussion
 - Reported symptoms on the Neurobehavioral Symptom Inventory (NSI): headache, poor concentration, dizziness and nausea all rated as moderate (2)

Case Study

- Cpl Buchanan was given 24 hours of mandatory recovery (rest) and acetaminophen for headache
- He entered stage one (rest) for 24 additional hours, then advanced through the following stages of the progressive return to activity clinical recommendation:
 - Stage two: Light routine activity
 - Stage three: Light occupation-oriented activity
 - Stage four: Moderate activity
 - Stage five: Intensive activity

Case Study

- After 5 days, Cpl Buchanan presented as follows:
 - All symptoms have resolved, except for an ongoing difficulty with sleep which he minimized and denied on the NSI
 - Automated Neuropsychological Assessment Metrics scores returned to baseline
 - Passed exertional testing
- Returned to unrestricted duty

Case Study

- Cpl Buchanan's tour ended 4 months after his injury and he returned home
- Upon his return home, the Cpl reported to his primary care manager (PCM) with the following complaints:
 - 4 months of difficulty sleeping (2 hours or more to fall asleep and difficulty staying asleep)
 - Using daily energy drinks to stay awake
 - Difficulty remembering information
 - Difficulty paying attention to conversations
 - Increased irritability

Case Study

- The PCM completed a clinical sleep interview, physical examination and administered a self-report measure

Clinical Sleep Interview

- Difficulty falling asleep, daytime fatigue and nightmares
- No complaints of snoring or gasping for air during sleep
- Reports excessive daily caffeine intake (600-700 mg/day)
- No sleep-specific red flags

Physical Examination

- Body mass index (BMI) and blood pressure are within normal limits

Self-report Measure

- ISI reveals a score of 17

Case Study

- The PCM diagnosed Cpl Buchanan with chronic insomnia and instructed him in the following:
 - Stimulus control
 - Sleep hygiene
 - Progressive muscle relaxation training
- After 2 weeks of treatment and weekly PCM appointments, Cpl Buchanan reported only mild improvement
- The PCM referred him to a specialty trained occupational therapist or behavioral health provider for CBT-I

Case Study

- Cpl Buchanan reported only mild improvement after 4 weeks of CBT-I
- The PCM administered the ISI again, which revealed a score of 14 (three point improvement)
- The PCM referred Cpl Buchanan to a sleep medicine specialist
 - Further diagnostic workup confirmed chronic insomnia
 - Recommended treatment included:
 - Acupuncture
 - Behavioral health evaluation and treatment

Case Study

- After 3 weeks, Cpl Buchanan reported the following improvements:
 - Decreased daytime fatigue
 - Significantly improved ability to fall asleep
 - Decreased frequency of nightmares
 - Improved ability to pay attention and remember information
 - Decreased irritability

Knowledge Check

Question Four

Question: In Cpl Buchanan's case, how did the PCM determine the diagnosis of chronic insomnia?

- a) Cpl Buchanan had an abnormal BMI
- b) Cpl Buchanan complained of cognitive symptoms
- c) Sleep symptoms persisted >3 months
- d) None of the above

Knowledge Check

Question Four

Question: In Cpl Buchanan's case, how did the PCM determine the diagnosis of chronic insomnia?

- a) Cpl Buchanan had an abnormal BMI
- b) Cpl Buchanan complained of cognitive symptoms
- c) Sleep symptoms persisted >3 months
- d) None of the above

Answer: c) Sleep symptoms persisted >3 months

Knowledge Check

Question Five

Question: What applications or assistive technology could the PCM have recommended to Cpl Buchanan as an adjunct to treatment?

- a) Progressive muscle relaxation
- b) CBT-i Coach
- c) Acupuncture
- d) All of the above

Knowledge Check

Question Five

Question: What applications or assistive technology could the PCM have recommended to Cpl Buchanan as an adjunct to treatment?

- a) Progressive muscle relaxation
- b) CBT-i Coach
- c) Acupuncture
- d) All of the above

Answer: d) All of the above

Knowledge Check

Question Six

Question: Which of the following factors is a strong predictor of sleep disturbance?

- a) A post-concussion anxiety disorder
- b) The number of times a SM has been deployed
- c) Headache
- d) None of the above

Knowledge Check

Question Six

Question: Which of the following factors is a strong predictor of sleep disturbance?

- a) A post-concussion anxiety disorder
- b) The number of times a SM has been deployed
- c) Headache
- d) None of the above

Answer: a) A post-concussion anxiety disorder

Knowledge Check

Question Seven

Question: If a SM is symptomatic 24-hours post-concussion while deployed, what tool should be administered?

- a) STOP-BANG Questionnaire
- b) Neurobehavioral Symptom Inventory
- c) Epworth Sleepiness Scale
- d) Berlin Questionnaire

Knowledge Check

Question Seven

Question: If a SM is symptomatic 24-hours post-concussion while deployed, what tool should be administered?

- a) STOP-BANG Questionnaire
- b) Neurobehavioral Symptom Inventory
- c) Epworth Sleepiness Scale
- d) Berlin Questionnaire

Answer: b) Neurobehavioral Symptom Inventory

Clinical Support Tools

- Links to provider training materials, quick reference cards, patient self-report measures and patient educational materials can be accessed at dvbic.dcoe.mil
- Additional resources, such as mobile applications, can be found at:
 - afterdeployment.t2.health.mil
 - mobilehealth.va.gov/content/cbt-i-coach

Conclusion

- Sleep disorders are common after concussion
 - SMs with symptoms following concussion should be screened for the presence of a sleep disorder
- Insomnia is the most common sleep disturbance following concussion
 - Primary care diagnosis and management is facilitated by a focused sleep assessment
 - Non-pharmacological measures are the foundation for care, to include stimulus control and sleep hygiene

Conclusion

- Sleep disturbances can significantly exacerbate or impact other concussion symptoms
- Referral to a sleep medicine specialist may be necessary or likely
 - Especially for chronic insomnia (after initial management), CRSWD and OSA
- The Defense Centers of Excellence Clinical Recommendation does not replace clinical judgment

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