

Management of Comorbid Sleep Disorders in Patients With Posttraumatic Stress Disorder

Scott G. Williams, MD; Jacob Collen, MD; Vincent Mysliwiec, MD; Emerson Wickwire, PhD; Barbara Ryan, MS; and Ingrid Lim, PsyD

Patients with posttraumatic stress disorder have unique barriers to restful sleep, which may result in chronic conditions and decreased mental performance.

Sleep in the military has traditionally been thought of as a luxury and is sometimes considered at odds with optimal productivity. Every minute that a service member is asleep, he or she is not performing a primary duty, and getting a minimal amount of sleep is often seen as a badge of honor and strength. Research has recently been conducted, underscoring the importance of sleep management as an operational variable that must be accounted for in order to achieve optimal performance and promote resiliency. Both the quality and the duration of sleep must be considered, particularly given the increasingly complicated tasks that every service member must perform during both war and peace.

It has been well established that higher order mental tasks are the most vulnerable to sleep loss, as are those with little mental or physical

stimulation, such as guard duty.^{1,2} Because service members are expected not only to perform in combat, but also to behave and operate ethically in spite of the challenges of war, the importance of adequate sleep must be considered. Many challenges are commonly encountered by service members when attempting to get adequate sleep (Table).³ This review highlights the recent diagnostic and treatment advances with respect to the overlap of sleep disorders and posttraumatic stress disorder (PTSD).

CULTURE OF SLEEP LOSS

At the United States Military Academy in West Point, New York, a culture of poor sleep is instilled during initial military training; students typically get less than the recommended 7 to 8 hours of sleep per 24 hours.^{4,5} This sleep restriction continues for most of the time served on active duty: Military members get

less sleep on average than does the rest of the U.S. population.⁶

Studies performed on pilots and during deployment have consistently shown a trend toward inadequate sleep, but only recently has inadequate sleep gained the attention of senior leadership.^{7,8} The Army Performance Triad, a public health campaign launched in 2013 by the Office of the U.S. Army Surgeon General, equally values sleep, nutrition, and activity. The goal of the Army Performance Triad is to influence behaviors by promoting healthy sleep, activity, and nutrition. Sleep is the apex of the Army Performance Triad.⁸

Those with chronic sleep restriction may not understand how impaired they are until objective testing is performed.⁹ In the civilian population, fatal sleep-related traffic accidents have been shown to exceed fatalities due to alcohol and illicit drug use combined.¹⁰ When poor sleep is combined with the trauma of war, symptoms exponentially worsen, and treatment becomes more complicated.¹¹ Therefore, even before a formal sleep disorder or psychiatric condition develops, service members put themselves at risk by practicing poor sleep behaviors.¹¹

Dr. Williams is the chief of sleep medicine at the Womack Army Medical Center in Fort Bragg, North Carolina, and an assistant professor in the Department of Medicine at the Uniformed Services University in Bethesda, Maryland. **Dr. Collen** is a staff pulmonologist, intensivist, and sleep disorders physician at the San Antonio Military Medical Center in Fort Sam Houston, Texas, and an assistant professor in the Department of Medicine at the Uniformed Services University. **Dr. Mysliwiec** is chief of pulmonary, critical care, and sleep disorders in the Medical Specialties Clinic at the 121 Combat Support Hospital in Korea. **Dr. Wickwire** is an assistant professor for the departments of psychiatry and medicine at the University of Maryland School of Medicine in Baltimore. **Ms. Ryan** is a health strategist and lead communicator and **Dr. Lim** is a psychologist, both in the Office of the United States Army Surgeon General in Falls Church, Virginia.

Once insomnia develops, however, the potential negative health consequences are much more significant. Chronic insomnia, characterized by difficulty initiating or maintaining sleep or by waking too early, is the most common sleep disorder among adults. Thirty percent of adults experience occasional or transient insomnia, and between 9% and 12% of adults have severe chronic insomnia.^{12,13} This number is likely higher in the military and is much higher in those with PTSD.¹³

The etiology of chronic insomnia is multifactorial and is best conceptualized within a biopsychosocial framework. Physiologic abnormalities, such as increased activity in the central nervous system, hyperarousal of the hypothalamic-pituitary axis, and activation of proinflammatory cytokines, predispose individuals to developing insomnia. In addition, personality traits, such as anxious temperament or an internalizing stress-management style, make it more likely for individuals to respond negatively to stress, the most common precipitating cause of chronic insomnia.

Behavioral factors are also paramount. For example, individuals who experience acute sleep disturbance during deployment might develop maladaptive compensatory behaviors, such as spending excessive time in bed, “trying harder” to sleep, or overusing stimulants. These sleep behaviors can become a chronic condition.¹⁴

COMORBIDITIES

Patients with insomnia are at increased risk for medical consequences, such as cardiovascular disease and mortality as well as psychiatric sequelae.^{15,16} Insomnia is also common among people who have attempted suicide.¹⁷ In the military,



there was nearly a 20-fold increase in the rate of chronic insomnia among service members between 2000 and 2009, coincident with the dramatic uptick in operations tempo.¹⁸

Insomnia is one of the most common reports of returning Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veterans and is associated with the development of PTSD.¹⁹ Soldiers who reported symptoms of insomnia predeployment were more likely to develop anxiety, depression, and PTSD during deployment than were soldiers who did not report these symptoms.²⁰

Empirically supported and evidence-based treatment options exist. Further, a robust evidence base supports the conclusion that treating insomnia improves not only sleep and quality of life (QOL), but also health-related outcomes in comorbid conditions, including depression,

PTSD, chronic pain, and alcohol dependence.²¹⁻²⁴ One historical barrier to effective treatment has been poor recognition of the scope of the problem. The army is looking to implement a more robust assessment of sleep in the primary care setting as part of the Army Performance Triad in order to intervene as early as possible. Other government organizations may also follow suit.

Although several FDA-approved medications for insomnia exist, the gold standard treatment for insomnia is cognitive behavioral therapy (CBT).²⁵ Specific behavioral patient preferences that can be used to tailor treatment have been identified within a military population.²⁶ Unfortunately, the most commonly used treatment for chronic insomnia in the military remains sedative-hypnotic medication. Multiple estimates suggest that 15% to 20% of

Table. Factors Related to Poor Sleep in Military Service Members

Operational factors. Night operations, high mission tempo, long duty days, inadequate recovery time, monotonous tasks, family separation
Psychosocial factors. Emotional trauma, anxiety/posttraumatic stress disorder, depression, substance misuse
Medical and physiologic factors. Traumatic brain injury, chronic pain, medication adverse effects
Sleep-related contributors. Acute or chronic sleep deprivation, shift work, poor sleep environment

all deployed service members have been prescribed a sedative-hypnotic to aid with sleep initiation, including many off-label antidepressants, antipsychotics, and antihistamines. Indeed, within VA, the use of quetiapine (an antipsychotic used off-label to treat insomnia) increased > 7-fold between 2001 and 2010, making it the second largest single drug expenditure in 2010. Many off-label medications have questionable risk-benefit ratios when used for sleep, and adverse effects can include infection,²⁷ motor vehicle accidents,²⁸ falls,²⁹ and mortality.³⁰ Further, some medications can limit deployability.

There are substantial challenges to incorporating behavioral approaches into the military armamentarium. There is a shortage of behavioral sleep specialists, although training initiatives seem promising.³¹ Most military facilities now have a medical home model of care with behavioral health providers as intrinsic team members. Their presence makes it easier to refer patients while reducing the stigma associated with behavioral health care. Leveraging technology will also facilitate the provision of quality, physician-directed insomnia treatment to an increasing number of military beneficiaries.

NIGHTMARE DISORDER

When patients with PTSD are able to get sleep, nightmares are a frequent occurrence and have been seen in up to 80% of individuals with this disorder.³² Nightmares usually occur during rapid eye movement (REM) sleep and are characterized by distressing dreams that threaten survival or security. They are often well remembered.³³ After the nightmare, individuals typically wake up rapidly and report symptoms of distress, which can result in avoiding sleep (thereby perpetuating comorbid insomnia), daytime sleepiness, and fatigue.

Posttraumatic nightmares may have different dream mentation than do other disturbing dreams. The nightmare theme may involve actual events or reliving a prior traumatic experience. Most nightmares, however, have no associated movements or other complex behaviors, because during REM sleep, normal individuals are paralyzed, and thus do not move or act out their dreams.

TRAUMA-ASSOCIATED SLEEP DISORDER

In some cases though, nightmares are accompanied by parasomnia activity.³⁴ Parasomnias are abnormal and unintentional activities that occur dur-

ing incomplete transitions between sleep stages and are seen more often in military personnel returning from deployment than in the general population. There is limited data regarding parasomnia activity in military personnel and veterans, although a study assessing sleep in 24 OIF/OEF veterans reported that 38% had either non-REM or REM parasomnia.³⁴ Although in some instances these behaviors are simply a combination of genetics and insufficient sleep, in the majority of cases the clinical presentation is more complex.

In the authors' clinical experience, patients described disruptive nocturnal behaviors (DNBs), which consisted of abnormal vocalizations (screaming, yelling), abnormal movements (tossing, turning, thrashing, sleep walking), or combative behaviors (striking the bed partner). These behaviors were strongly linked to symptoms of autonomic hyperarousal (night sweats, increased heart rate, or fast breathing). The DNBs often mimicked the content of the nightmares. The bed partner or spouse reported many of the cases after they had sustained unintended physical trauma from the combative behaviors.

Initially, REM behavior disorder (RBD) or nightmare disorder were considered potential diagnoses. However, RBD tends to occur in elderly males with neurodegenerative disorders (such as Parkinson disease). Dreams are relatively similar among patients with this disorder.³⁵ Non-REM parasomnias are more common in young children and usually resolve prior to adolescence, although individuals who experienced parasomnias as children may see a reemergence during adulthood as a result of sleep fragmentation, medications, sleep-disordered breathing (SDB), recovery from sleep debt, or recreational drug or alcohol use.^{36,37}

Since these posttraumatic nocturnal behaviors are not formally classified, a condition termed trauma-associated sleep disorder (TSD) was recently proposed.³⁸ Trauma-associated sleep disorder is distinct from other parasomnias, because the onset must relate to a potentially traumatic event. On an overnight polysomnogram, increased muscle activity is seen during REM, and nightmares are almost invariably reported. Trauma-associated sleep disorder seems to involve not only DNB and traumatic dream enactment, but also insomnia and obstructive sleep apnea (OSA).

For patients who present with symptoms of TSD, a sleep study is recommended to evaluate for SDB as well as to characterize whether the patient has abnormal movements in REM sleep (lack of paralysis). There are currently no evidenced-based guidelines for treatment of this newly proposed sleep disorder. Behavioral and environmental modifications are the mainstay of treatment for individuals with any parasomnia. Obtaining an adequate quantity of sleep, avoiding triggers, and promoting a safe sleep environment are critical.

Substances that can lead to sleep fragmentation or impaired cognition, such as drugs and alcohol, should be avoided. Medical conditions that fragment sleep or cause nocturnal awakenings, such as sleep apnea, gastroesophageal reflux disease, and rhinitis should be treated to promote better sleep continuity.

When possible, medications with the potential to cause sleep fragmentation or disruption of normal sleep architecture should be reduced or discontinued. Weapons or objects that could be used as weapons should be removed from the bedroom, and padding should be placed on the sharp corners of furniture.

Door and bed alarms, locks, and heavy curtains can minimize the risk of patients leaving the bedroom.

When these interventions are insufficient, medical therapy to suppress these events may be necessary. Some patients respond well to combined treatment with prazosin for nightmares and DNB, CBT for insomnia, and continuous positive airway pressure (CPAP) for OSA.³⁹ Benzodiazepines, particularly clonazepam, may be effective for both slow-wave sleep parasomnias and RBD, but they should be used with caution in those with comorbid PTSD. Melatonin may also be effective, but there is a paucity of high-quality evidence supporting its use.

OBSTRUCTIVE SLEEP APNEA

Another common sleep disorder that overlaps with PTSD is SDB. Obstructive sleep apnea is characterized by repetitive oxygen desaturations and arousals from sleep resulting from periodic upper airway collapse. Among middle-aged U.S. adults, about 9% of females and 24% of males have been estimated to have OSA, and rates increase with age and obesity.⁴⁰ During the past decade, OSA in the military has risen dramatically, from 3,563 to 20,435 cases, with a 4-fold increase among those aged 20 to 24 years.¹⁷ Similar to the insomnia data, the increased rate of diagnosis during the recent wars in Southwest Asia coincides with an increase in the prevalence of traumatic brain injury (TBI) and PTSD. Additional reasons for the diagnostic increase may be heightened awareness of the diagnosis, increased availability of sleep disorders centers in the military, and even financial incentives for those undergoing a disability evaluation.

Obstructive sleep apnea is significantly more common in patients with PTSD compared with that in

the general population, with rates of OSA ranging from 11.9% to 90%, depending on the study.⁴¹⁻⁴³ Prevalence rates for OSA have been reported in several PTSD populations (violent crime, sexual assault, disasters, and combat). Military studies evaluating recent veterans have found OSA rates between 35% and 67%.⁴⁴⁻⁴⁶ In a recent study looking at SDB in those with PTSD, 53.8% had OSA (67.3% among those with polysomnograms).⁴⁷ Although the other studies evaluated mixed populations of recent combat veterans, they were enriched for patients with PTSD.

Sleep disorders and PTSD have a “bidirectional” relationship.⁴⁸ Sleep complaints preceding or temporally related to traumatic events increase the likelihood of subsequent mental health disorders, including PTSD.⁴⁹⁻⁵¹ Sleep disorders are common in PTSD and are associated with symptoms of depression, relapse of depression, greater reductions in QOL, and suicide.⁵² Higher rates of OSA among patients who are not physically injured compared with the OSA rates of those with PTSD who also had physical injury (72.9% vs 38%) have also been seen, raising the possibility of different phenotypes of combat-related PTSD and a hypothetical role for premorbid OSA as a risk factor for PTSD.⁴⁷

The pathophysiology linking SDB and PTSD is based on theories that poor sleep quality limits the ability to manage stress, promotes hyperarousal, confounds environmental stressors (trauma), and hinders the restorative qualities of sleep.⁴⁹ Rapid eye movement sleep is believed to consolidate emotional memory, which may assist in recovery from traumatic events.^{53,54} Disrupted sleep architecture from OSA can diminish REM and hinder this process. Sleep fragmentation has been shown to cause upper airway instability and

promote SDB.⁵⁵ In addition, nighttime anxiety may induce hyperventilation with resultant hypocapnia, triggering apneic events.⁵⁶ Taken together, disrupted sleep architecture, hyperarousal, respiratory instability, and nightmares may exacerbate one another and create a vicious cycle.⁵⁷

Untreated OSA is associated with worse outcomes in PTSD. Continuous positive airway pressure has been shown to improve symptoms in this group.⁵⁸⁻⁶⁰ A study by Tamanna and colleagues evaluated clinical outcomes related to CPAP use, demonstrating improvements in nightmares, daytime sleepiness, and PTSD symptom severity with increasing adherence.⁶¹ Unfortunately, patients with PTSD generally have suboptimal medical adherence, and CPAP adherence decreases in psychiatric disease.^{62,63} Two recent studies have shown significantly lessened adherence in patients with both PTSD and OSA (compared with OSA alone), in both younger and older veteran populations.^{64,65} Limited insight and atypical clinical presentations of OSA also limit patient acceptance of treatment. Continuous positive airway pressure usage is decreased by comorbid insomnia, common in PTSD.⁶⁶ Similarly, nightmares, mask discomfort, air hunger (the feeling of not being able to get a satisfying breath), and claustrophobia have all been associated with poor CPAP adherence in patients with PTSD.

Continuous positive airway pressure adherence is determined early (days to weeks), and initial use predicts long-term adherence.⁶⁷⁻⁷⁰ Patients are most likely to abandon therapy or fail to initiate therapy during this period. Given the potential adverse outcomes of comorbid mental illness and sleep disorders, including suicide, interventions should begin early.⁷¹ Continuous

positive airway pressure devices with heated humidification, group education, peer success stories, and telephonic follow-up are all methods that improve adherence.⁷² There is conflicting evidence regarding the efficacy of nonbenzodiazepine sedative-hypnotics for improving diagnostic accuracy and CPAP adherence.⁷³⁻⁷⁶

Given this population's high rate of comorbid insomnia, polypharmacy, and potentially pharmacotherapy refractory insomnia, the approach should be used cautiously in patients with PTSD OSA.⁷⁷ Emerging efforts incorporate a biopsychosocial approach with an individualized focus on a patient's unique barriers to adherence. Incorporating approaches such as motivational enhancement (for those ambivalent about change), educational approaches, and CBT may all be useful adjuncts.⁷⁸⁻⁸⁰

Ongoing VA trials have been designed to evaluate the impact of CPAP therapy on symptoms of PTSD and to compare CPAP and mandibular advancement devices with regards to efficacy in reducing the apneas and/or hypopneas per hour of sleep and improving symptoms.^{81,82}

DISCUSSION

Service members, like most adults, need about 8 hours of quality sleep per night to function at optimal levels and maximize operational readiness. The medical community is increasingly recognizing that sleep disturbances are inextricably linked to psychiatric disorders, particularly PTSD, depression, and anxiety.^{83,84} Balancing occupational performance and the demand of military missions with service member health remains a difficult leadership challenge.

Recent evidence suggests that disordered sleep may precede other PTSD symptom clusters.^{43,85} Sleep ar-

chitecture in PTSD is disrupted, and abnormalities in both REM and non-REM sleep have been described.^{86,87} Insomnia not only is a component of depressive and anxiety disorders, but also impacts the course of disease severity.⁸⁸ Sleep deprivation has been shown to be a risk factor for major depression in adolescents.⁸⁹ In those with comorbid sleep problems, PTSD, and TBI, each disorder worsens QOL in an additive fashion.⁹⁰

Severe mental illness impacts the military through a service member's lost workdays, decreased productivity, impaired social relationships, and even suicide. Given that sleep quality is related to outcomes for patients with mental illnesses, access to medical professionals with specific training in sleep disorders becomes an integral part of a multidisciplinary approach to military health care. Encouragingly, treatment of insomnia and nightmares has been shown to improve PTSD symptom severity as well as headaches in veterans with mild TBI, even if neurologic deficits remain static.⁹¹ Similarly, treatment of insomnia is known to improve depressive symptoms in those with comorbid conditions.

CONCLUSION

The importance of sleep as a combat multiplier is increasingly recognized. The U.S. Army Surgeon General has acknowledged the interplay between inadequate sleep and impairments in other functional areas and placed specific emphasis on sleep as part of the Army Performance Triad. A corollary of the Army Surgeon General's message is that army medicine is on a mission to transform from a health care system to a system for health. The Army Wellness Centers, Army Medical Homes, Soldier-Centered Medical Homes, and embedded behavioral health are supporting

the health of the force in these capacities. These functional areas treat behavioral health and sleep-related concerns across the continuum of disease from prevention, timely initial intervention once a condition has been identified, long-term treatment programs, and rehabilitative services.

Getting the proper quantity and quality of sleep, in addition to healthy activity and nutrition, increases readiness so that when called on to perform, soldiers are ready. A recent article by Wesensten and Balkin from the Walter Reed Army Institute of Research summarizes some guidelines for sleep from the Army Performance Triad Working Group to include sleep hygiene tips and judicious use of naps and caffeine.⁹² Efforts to improve soldier resiliency by improving sleep-related disorders have yet to be studied in a meaningful way, so additional research is needed to determine best practices and evidence-based guidelines. ●

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