

# Sleep Problems, Posttraumatic Stress, and Mood Disorders Among Active-Duty Service Members

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**Context:** Sleep problems among active-duty service members are pervasive and complicate the recovery from comorbid posttraumatic stress and mood disorders.

**Objective:** To better understand chronic sleep problems among active-duty service members.

**Methods:** Medical records for active-duty service members who completed enhanced sleep assessments during an 18-month period beginning in October 2010 at the Walter Reed National Military Medical Centers' Psychiatry Continuity Service were retrospectively reviewed. Sleep assessment measures included the Pittsburgh Insomnia Rating Scale, the Alcohol Use Disorders Identification Test, the Zung Self-Rating Depression Scale, the Zung Self-Rating Anxiety Scale, the Posttraumatic Stress Disorder Checklist – Military Version, the Epworth Sleepiness Scale, the Pre-Sleep Arousal Scale, and a home sleep study.

**Results:** A total of 76 records met the study criteria. Twenty-two participants (29%) had an apnea/hypopnea index that suggested mild to moderate sleep apnea. Service members with higher self-reported posttraumatic stress scores also reported a higher degree of both somatic and cognitive factors interfering with sleep initiation. Compared with those who had low self-reported posttraumatic stress scores, service members with high posttraumatic stress scores also had less total sleep time (mean difference, 38 minutes) and higher scores on the apnea/hypopnea index, the respiratory disturbance index, and the oxygen saturation index.

**Conclusion:** Enhanced sleep assessments that include traditional self-report tests and a home sleep study can help identify previously undiscovered behavioral and respiratory problems among service members, particularly those with higher posttraumatic stress scores.

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The Psychiatry Continuity Service (PCS) at Walter Reed National Military Medical Center in Bethesda, Maryland, provides care for service members with a variety of diagnoses, predominantly posttraumatic stress disorder (PTSD) and depression. A common observation of the clinical staff, repeatedly confirmed by the patients, is the near universal presence of unrelenting sleep problems among service members.

A study by McLay et al<sup>1</sup> revealed that insomnia was the most commonly cited problem among a group of service members returning from a combat deployment.

Insomnia tends to be chronic; in a study of 388 adults with insomnia, Morin et al<sup>2</sup> found that nearly half of the participants reported persistent sleep problems during the 3-year study period. Poor sleep is also correlated with many medical disorders, including hypertension, diabetes mellitus, migraines, asthma, and menstrual problems.<sup>3</sup> Short sleep duration, defined as less than 6 hours, also contributes to the severity of insomnia.<sup>4</sup> Roughly half of all individuals with chronic insomnia have a psychiatric disorder, usually depression or anxiety.<sup>5</sup> Of particular concern is the accumulating evidence that suggests that insomnia might be an independent risk factor for suicidal ideation.<sup>6-9</sup> A study by Ribeiro et al<sup>10</sup> revealed that insomnia may be an important risk factor for suicidal tendencies among recent military veterans. Of note, the presence of nightmares is also associated with a heightened risk of suicidal ideation.<sup>11-13</sup>

Unrelenting sleep problems have been tied to PTSD.<sup>14-16</sup> One PTSD-related sleep problem is hypervigilance, which interferes with sleep initiation and produces daytime sleepiness.<sup>17</sup> Emerging evidence suggests that sleep problems may be more than just symptoms of PTSD—they may actually delay recovery.<sup>18</sup> To better understand this relationship, researchers are examining the sleep architecture of patients with PTSD. In a polysomnographic study, for example, Kobayashi et al<sup>19</sup> found that patients with PTSD had less deep sleep and more light sleep than patients without PTSD.

In an effort to better understand the sleep problems of patients and ultimately provide more precise interventions, the PCS staff developed a focused sleep-assessment process that included patient self-report tests and home sleep studies. In the present article, I report findings of these focused sleep assessments performed at the PCS during an 18-month period.

## Methods

The present retrospective medical record review was approved by the Walter Reed National Military Medical

Center Institutional Review Board. Included in the study were medical records of service members who participated in an enhanced sleep assessment at the PCS during an 18-month period beginning in October 2010. Medical records were obtained by searching the PCS's electronic and paper records.

Service members were included in the enhanced sleep assessment if they were diagnosed as having clinically significant insomnia as determined with the Pittsburgh Insomnia Rating Scale (PIRS).<sup>20</sup> The PIRS is a 20-item self-report instrument that assesses a person's sleep over the preceding 7-day period. The PIRS is used in the initial assessment of all service members who present to the PCS. Typical questions on the PIRS include, "From the time you tried to go to sleep, how long did it take to fall asleep on most nights?" and "If you woke up during the night, how long did it take to fall back to sleep on most nights?"<sup>20</sup> Scores on the PIRS range from 0 to 60, with scores above 20 suggesting insomnia. Service members who scored above 20 were referred for enhanced sleep assessment, and those who scored less than 20 (ie, those without insomnia) were not referred and thus excluded from the present study.

Data collected included age, body mass index, whether the patient had a combat deployment, the patient's primary clinical diagnosis, and all findings from the enhanced sleep assessment, including scores from the Alcohol Use Disorders Identification Test (AUDIT),<sup>21</sup> the Zung Self-Rating Depression Scale,<sup>22-24</sup> the Zung Self-Rating Anxiety Scale,<sup>25</sup> the Posttraumatic Stress Disorder Checklist – Military Version (PCL-M),<sup>26</sup> the Epworth Sleepiness Scale,<sup>27</sup> the Pre-Sleep Arousal Scale,<sup>28</sup> and a home sleep study.

## PCS Enhanced Sleep Assessment Measures

### AUDIT

The AUDIT consists of 10 questions and 5 response options per question. Questions include, "How often do you have a drink containing alcohol?" and "How often do

you have six or more drinks on one occasion?”<sup>21</sup> Responses to each question are scored from 0 (indicating “never”) to 4 (indicating “4 or more times a week”). Scores exceeding 7 are associated with harmful drinking.

### *Zung Self-Rating Scales*

The Zung Self-Rating Depression Scale is a 20-item self-report instrument that asks respondents to indicate how often a statement describes how they have been feeling. For example, “I feel down-hearted and blue” and “Morning is when I feel the best.”<sup>22</sup> The Zung Self-Rating Anxiety Scale is also a 20-item self-report instrument with questions about statements such as, “I feel more nervous and anxious than usual” and “I fall asleep easily and get a good night’s rest.”<sup>25</sup> Both instruments ask respondents to select “a little of the time,” “some of the time,” “good part of the time,” or “most of the time” for each statement, with responses scored as 1, 2, 3, or 4, respectively. Scores above 49 on the depression scale suggest clinical depression, and scores above 49 on the anxiety scale suggest clinical anxiety.<sup>22</sup>

### *PCL-M*

The PCL-M is a 17-item self-report instrument in which respondents choose among 5 descriptions (ie, “not at all,” “a little bit,” “moderately,” “quite a bit,” and “extremely,” scored as 1, 2, 3, 4, and 5, respectively) in answering questions regarding stressful life experiences. A typical question on the PCL-M asks the service member if he or she had “physical reactions...when something reminded [him or her] of a stressful military experience.” Scores above 49 suggest clinical PTSD.

### *Epworth Sleepiness Scale*

The Epworth Sleepiness Scale is an 8-item self-report instrument that asks respondents to choose among 4 descriptions (ie, “No chance of dozing,” “Slight chance of dozing,” “Moderate chance of dozing,” “High chance of dozing,” scored as 0, 1, 2, and 3 points, respectively) in answering questions regarding activities such as “Sitting

and reading,” “Watching TV,” and “Sitting inactive in a public place.”<sup>27</sup> Scores greater than 10 are indicative of excessive sleepiness.

### *Pre-Sleep Arousal Scale*

The Pre-Sleep Arousal Scale contains 16 questions with possible responses on a sliding scale ranging from “not at all” (scored as 1) to “extremely” (scored as 5). Half of the items focus on somatic issues such as “a jittery, nervous feeling in your body,” whereas the balance of the items focus on cognitive issues such as “worry about falling asleep.” The Pre-Sleep Arousal Scale’s 2 subscales, somatic and cognitive, can each be scored from 8 to 40. There are no threshold scores for the Pre-Sleep Arousal Scale. Higher scores indicate greater arousal before falling asleep. The clinician or researcher simply correlates higher scores with increasing somatic or cognitive factors that interfere with sleep initiation.<sup>29</sup>

### **Home Sleep Studies**

In the home sleep study portion of the enhanced sleep assessment, the WatchPAT 200 (Itamar Medical, Caesarea, Israel), a commercially available wrist-worn device, was used to detect sleep arousals. Specifically, the WatchPAT 200 calculates the severity of sleep apnea using 3 measurements: the apnea/hypopnea index (AHI), the oxygen desaturation index (ODI), and the respiratory disturbance index (RDI). The AHI represents the total number of complete cessations (apneas) and partial obstructions (hypopneas) of breathing per hour of sleep. The ODI measures changes in blood oxygenation from baseline. The RDI assesses the severity of sleep apnea by measuring respiratory efforts, or respiratory effort–related arousals. A respiratory effort–related arousal is an arousal from sleep that follows 10 seconds or more of increased respiratory effort that does not meet the criteria for apnea or hypopnea.<sup>30</sup>

Although the WatchPat 200 and similar devices are sophisticated instruments, polysomnography is still the most comprehensive method for diagnosing sleep prob-

lems. With that in mind, service members who exceeded an AHI of 5 were referred to a sleep center for further investigation of possible obstructive sleep apnea and, if indicated, subsequent treatment.

The WatchPat 200 also measured sleep architecture and calculated percentage of the night spent in total sleep, light sleep, deep sleep, rapid eye movement

(REM) sleep, and awake. Service members were considered high risk when their percentage of light sleep and awake exceeded and their percentage of deep sleep and REM sleep was less than the total group mean for those respective measurements.

### Statistical Analysis

Data were collected and analyzed using SPSS statistical software (version 20, SPSS Inc). Analyses included descriptive statistics and a comparison of means. Data for participants with high-risk sleep assessment scores were grouped and analyzed using independent *t* tests. Statistical significance was defined as  $\alpha$  set at .05 or less.

**Table 1.**  
**Enhanced Sleep Assessment Findings Among Active-Duty Service Members (N=76)**

Measure	Threshold Score <sup>a</sup>	Findings, mean (SD)
Pittsburg Insomnia Rating Scale	>20	42.3 (10.0)
AUDIT <sup>b</sup>	>7	4.7 (7.7)
<b>Zung Self-Rating Scale<sup>c</sup></b>		
Depression	>50	49.6 (11.2)
Anxiety	>45	43.0 (13.2)
PCL-M <sup>c</sup>	>49	50.7 (18.0)
Epworth Sleepiness Scale	>10	9.4 (5.8)
<b>Pre-Sleep Arousal Scale</b>		
Somatic	NA	17.7 (6.5)
Cognitive <sup>d</sup>	NA	27.2 (6.9)
Total Sleep Time, min	NA	377 (82)
<b>Sleep Time, %</b>		
Awake	>20%	21 (12.0)
Light sleep <sup>e</sup>	>58%	58 (10.5)
Deep sleep <sup>e</sup>	<20%	20 (5.9)
REM sleep <sup>e</sup>	<20%	21 (8.0)

<sup>a</sup> Participants with scores above the threshold for a particular measure were considered high risk for that category.

<sup>b</sup> n=68

<sup>c</sup> n=71

<sup>d</sup> n=75

<sup>e</sup> n=74

**Abbreviations:** AUDIT, Alcohol Use Disorders Identification Test; NA, not applicable; PCL-M, Posttraumatic Stress Disorder Checklist – Military Version; REM, rapid eye movement; SD, standard deviation.

## Results

Medical records for 76 active-duty service members (48 men and 28 women) met the study criteria. The mean (standard deviation [SD]) age of all participants was 31 (8), and the mean (SD) body mass index was 28.8 (4.0) (n=73). Data for some measures were not available for all service members.

In terms of combat deployments, 59 of 73 participants (80.8%) reported serving in either Iraq or Afghanistan. Of those, 22 were women and 37 were men. Among the entire group, the most common clinical diagnosis was PTSD (35 of 74 participants [47.3%]), followed closely by a major depressive disorder (29 of 74 participants [37.8%]).

For all 76 participants, the mean (SD) total sleep time per night was 6.28 (1.4) hours. The mean (SD) percentage of the night spent awake was 21% (12.0%) among all participants. In terms of sleep architecture, mean (SD) findings were as follows: participants spent 58% (10.5%) of the night in light sleep (n=74), 20% (5.9%) in deep sleep (n=74), and 21% (8.0%) in REM sleep (n=74) (Table 1). Of 76 participants, 22 (29%) had an AHI score that exceeded 5, the screening threshold for potential sleep apnea.

Table 2 includes findings for service members with high-risk assessment scores, or those that exceed established thresholds. For example, 14 of 76 participants (18.4%) had an AUDIT score exceeding 7, 37 (48.7%) had a PCL-M score exceeding 49, and 34 (44.7%) had an Epworth Sleepiness Scale score greater than 10. In addition, 33 service members (43.4%) had less than 6 hours of total sleep per night. Findings for sleep architecture are reported in Table 2.

Of the 37 participants who had a PCL-M score exceeding 49, mean (SD) scores for the Zung Self-Rating Anxiety Scale and the Zung Self-Rating Depression Scale were 50.3 (8.8) ( $P=.00$ ) and 54.0 (8.9) ( $P=.00$ ), respectively. The mean (SD) score on the Pittsburgh Insomnia Rating Scale for this subgroup was 44.5 (8.9) ( $P=.02$ ). On the Pre-Sleep Arousal Scale, mean (SD) scores in this subgroup were 20.8 (6.0) for the somatic factors and 28.7 (6.6) for the cognitive factors ( $P=.00$ ). Service members with higher PCL-M scores also had less total sleep time (mean, 38 minutes) and higher scores on all 3 respiratory measurements (AHI, RDI, ODI) than those with low PCL-M scores (Table 3).

## Comment

Results of the current study provide objective evidence supporting a common clinical observation: service members have substantial and enduring sleep problems. Even more important for clinicians, the current study adds a bit more clarity describing the nature of these problems. For example, approximately one-third of the service members in the current study had less than 6 hours of sleep per night. In addition, the service members spent, on average, slightly more than one-fifth of the night awake. Cognitive factors such as worrying about falling asleep contributed to wakefulness. Participants spent approximately two-fifths of the night in combined deep and REM sleep; this finding is borderline low considering that participants' mean total sleep time was approximately 6 hours.

The findings from the current study support the implementation of enhanced assessments at other institutions that provide care to active-duty service members referred for psychiatric treatment of depression and PTSD. The current findings also give clinicians clarity for refining treatment interventions. For example, the service members in the current study were, in the main, sleep deprived. In addition, they reported worrying about their sleep, which can perpetuate anxiety and in turn prevent sleep. Aside from medication, clinicians could refine their management of insomnia by using nonpharmacologic treatment interventions such as sleep restriction.<sup>31</sup>

**Table 2.**  
**Enhanced Sleep Assessment Findings Among Active-Duty Service Members With and Without High-Risk Scores (N=76)**

Measure	Threshold Score <sup>a</sup>	Respondents With High-Risk Scores, No. (%)	
		Yes	No
<b>AUDIT<sup>b</sup></b>	>7	14 (18.4)	54 (71.1)
<b>Zung Self-Rating Scale<sup>c</sup></b>			
Depression	>49	41 (53.9)	30 (39.5)
Anxiety	>49	25 (32.9)	46 (60.5)
<b>PCL-M<sup>c</sup></b>	>49	37 (48.7)	34 (44.7)
<b>Epworth Sleepiness Scale<sup>d</sup></b>	>10	34 (44.7)	41 (53.9)
<b>Total Sleep</b>	<6 h	33 (43.4)	43 (56.6)
<b>Sleep Time</b>			
Awake	>20%	26 (34.2)	50 (65.8)
Light sleep <sup>e</sup>	>58%	36 (47.4)	38 (50.0)
Deep sleep <sup>e</sup>	<20%	36 (47.4)	38 (50.0)
REM sleep <sup>e</sup>	<20%	34 (44.7)	40 (52.6)

<sup>a</sup> Participants with scores above the threshold for a particular measure were considered high risk for that category.

<sup>b</sup> n=68

<sup>c</sup> n=71

<sup>d</sup> n=75

<sup>e</sup> n=74

**Abbreviations:** AUDIT, Alcohol Use Disorders Identification Test; PCL-M, Posttraumatic Stress Disorder Checklist – Military Version.

**Table 3.**  
Enhanced Sleep Assessment Findings for Active-Duty Service Members With and Without High-Risk PCL-M Scores

Measure	Mean (SD)		P Value
	PCL-M >49 (n=37) <sup>a</sup>	PCL-M ≤49 (n=34)	
<b>Pittsburgh Insomnia Rating Scale</b>	44.5 (8.9)	39.0 (10.1)	.02
<b>AUDIT</b>	5.7 (9.4)	3.5 (4.8) <sup>b</sup>	.26
<b>Zung Self-Rating Scale</b>			
Anxiety	50.3 (8.8)	35.1 (12.7)	.00
Depression	54.0 (8.9)	44.9 (11.6)	.00
<b>Epworth Sleepiness Scale</b>	10.2 (6.4)	9.2 (5.1)	.49
Somatic	20.8 (6.0)	14.5 (5.6)	.00
Cognitive	28.7 (6.6)	25.8 (6.8) <sup>c</sup>	.08
<b>Total Sleep Time, min</b>	358 (88)	396 (8)	.05
AHI	4.8 (4.6)	2.5 (3.0)	.02
RDI	11.4 (7.1)	8.4 (5.5)	.05
ODI	2.3 (3.2)	1.1 (1.4)	.04

<sup>a</sup> Participants with scores above 49 were considered high risk for posttraumatic stress disorder.

<sup>b</sup> n=31

<sup>c</sup> n=33

**Abbreviations:** AUDIT, Alcohol Use Disorders Identification Test; ODI, oxygen desaturation index; AHI, apnea/hypopnea index; PCL-M, Posttraumatic Stress Disorder Checklist – Military Version; RDI, respiratory disturbance index.

Nearly one-third of the participants in the current study had an AHI score that exceeded 5. This finding suggests that clinicians should carefully consider sleep apnea among service members referred for treatment of PTSD. A chronic history of snoring, obesity, and daytime sleepiness should increase the clinician's concern.<sup>32</sup> Using the Epworth Sleepiness Scale and AUDIT in combination with the PCL-M will further help clinicians in conducting sleep assessments.

The current study was conducted among active-duty service members at a tertiary care military medical

facility, which might limit the applicability of the current findings. Additional research among non-active-duty service members is warranted.

## Conclusion

Insomnia is a common condition that sometimes gets too little clinical attention. A few simple patient self-report tests can efficiently increase the likelihood of clinicians detecting a treatable sleep problem. A home sleep study can provide even more diagnostic precision. Higher self-report test scores alone, however, can predictably screen for sleep apnea among active-duty service members referred for psychiatric care. Generalizing the results beyond this population would require additional research.

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