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Authors

Song, Yeonsu
Carlson, Gwendolyn C
McGowan, Sarah Kate
[et al.](#)

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Sleep Disruption due to Stress in Women Veterans: A Comparison Between Caregivers and Noncaregivers

Yeonsu Song, PhD, RN, FNP^{1,2,3}, Gwendolyn C. Carlson, PhD⁴, Sarah Kate McGowan, PhD², Constance H. Fung, MD, MSHS^{2,3}, Karen R. Josephson, MPH², Michael N. Mitchell, PhD², Susan M. McCurry, PhD⁵, Edmond Teng, MD, PhD⁶, Michael R. Irwin, MD⁷, Cathy Alessi, MD^{2,3}, Jennifer Martin, PhD^{2,3}

¹School of Nursing, University of California, Los Angeles, Los Angeles, CA

²Geriatric Research, Education and Clinical Center, VA Greater Los Angeles Healthcare System, North Hills, CA

³David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA

⁴Health Services Research & Development Center for the Study of Healthcare Innovation, Implementation, and Policy, VA Greater Los Angeles Healthcare System, North Hills, CA

⁵Department of Child, Family, and Population Health Nursing, School of Nursing, University of Washington, Seattle, WA

⁶School of Medicine, Stanford University, Palo Alto, CA

⁷Cousins Center for Psychoneuroimmunology, Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, Los Angeles, CA

Abstract

Objective/Background: Sleep problems are common in women and caregiving for an adult is a common role among women. However, the effects of caregiving on sleep and related daytime impairment are poorly understood among women veterans. This study compared stress-related sleep disturbances, insomnia symptoms, and sleep-related daytime impairment between women veterans who were caregivers and those who did not have a caregiving role.

Participants: Of 12,225 women veterans who received care in one Veterans Administration Healthcare System, 1,457 completed data on a postal survey (mean age=51.7±15.9 years). Two hundred forty three (17%) respondents (mean age 53.8±12.7 years) were caregivers for an adult, predominantly for a parent, providing transportation.

Address correspondence to Jennifer L. Martin, Geriatric Research, Education, and Clinical Center (11E), VA Greater Los Angeles Healthcare System, 16111 Plummer Street, North Hills, CA 91343, Fax: 818-895-9519, Phone: 818-891-7711, Jennifer.Martin@va.gov.

Conflict of Interest: No conflicts of interest have been declared by the authors.

Data Availability Statement: Derived data supporting the findings of this study are available from the corresponding author [JM] on request.

Methods: The survey included items that addressed insomnia symptoms, total sleep time, sleep-related daytime impairments, caregiving characteristics, self-rated health, pain, stress, body mass index, and demographic information.

Results: In adjusted analyses, caregiver status did not directly predict sleep complaints alone. However, in multiple regression analyses, being a caregiver (odds ratio 1.7, $p=0.001$) significantly predicted stress-related sleep disturbance, even after adjusting for age, pain, self-rated health, and other characteristics. Furthermore, being a caregiver ($\beta=3.9$, $p=0.031$) significantly predicted more symptoms of sleep-related daytime impairment after adjusting for age, pain, self-rated health, and other factors.

Conclusions: Compared to noncaregivers, women veterans who were caregivers for an adult were more likely to report stress causing poor sleep, and more daytime impairment due to poor sleep. These findings suggest the need to target stress and other factors when addressing sleep disturbance among women veterans who are caregivers.

Keywords

sleep; daytime impairment; stress; caregiving; women veterans

INTRODUCTION

According to the National Alliance for Caregiving, roughly 60% of caregivers in the United States are women (National Alliance for Caregiving, 2015). Female caregivers provide the majority of care to a parent or a spouse, spend more time on caregiving (National Alliance for Caregiving, 2015) and on average, are involved in more caregiving tasks and personal care activities (e.g., bathing, dressing) than male caregivers (del-Pino-Casado, Frias-Osuna, Palomino-Moral, & Ramon Martinez-Riera, 2012; Dwyer & Coward, 1991; Navaie-Waliser, Spriggs, & Feldman, 2002; Tennstedt, Crawford, & McKinlay, 1993). These situations may lead to increased burden (Chou, Fu, Lin, & Lee, 2011; del-Pino-Casado et al., 2012; Swinkels, Tilburg, Verbakel, & Broese van Groenou, 2019) and negative health issues such as stress (Fredman, Cauley, Hochberg, Ensrud, & Doros, 2010), depression (Friedemann & Buckwalter, 2014; Piquart & Sorensen, 2006), sleep problems (Castro et al., 2009; Song et al., 2017; Willette-Murphy, Toderro, & Yeaworth, 2006), and increased risk of mortality (Fredman et al., 2010), which may disproportionately impact women's health.

Sleep problems are common experience for caregivers (Beaudreau et al., 2008; Peng, Lorenz, & Chang, 2019; Taylor et al., 2015; Willette-Murphy et al., 2006). These problems include nighttime awakenings, shorter sleep duration, and lower sleep efficiency and are significantly associated with other characteristics of caregivers (e.g., depression, stress) and care recipients (e.g., behavioral problems) (Beaudreau et al., 2008). Studies identified caregivers are at risk of developing sleep problems similar to those with high levels of depression or stress (Fredman et al., 2010; Kochar, Fredman, Stone, & Cauley, 2007). This suggests a critical need to identify caregiver subgroups that may experience sleep problems and benefit from treatment.

Sleep issue and related factors specifically among women veterans who are caregivers have received less attention. Women veterans, especially those who are caregivers, may be at high risk of poor sleep. In general, women veterans have higher rates of poor sleep and other negative health issues (e.g., posttraumatic stress disorder, depression) than women who are not veterans (Martin et al., 2017; Rissling et al., 2016). Additionally, women veterans report more lifetime trauma events than non-veteran women, and more past-year stressful life events than both men veterans and non-veteran women (Lehavot et al., 2018). Although evidence is limited, prior studies of women veteran caregivers found more days of sleep problems or more symptoms of daytime impairment that resulted from poor sleep than non-veteran caregivers or veterans without caregiving responsibilities (Lavela, Etingen, & Louise-Bender Pape, 2013; Song et al., 2018).

Unfortunately, prior studies of women veteran caregivers generally have not defined “caregiving” in a precise way; most simply asked participants if they provided care to a friend or family member, or had no definition at all for the term, “caregiver” (Lavela et al., 2013; Song et al., 2018). This limits the ability to extrapolate from research findings into clinical interventions for caregivers. Our current study used an explicit definition of “caregiver” (described below) and collected information on whether caregivers actually helped with activities of daily living (ADLs; i.e., basic self-care tasks) or instrumental activities of daily living (IADLs; i.e., activities related to independent living) (Brown et al., 2009; Fredman et al., 2010; Schulz & Beach, 1999). Another limitation in the literature relates to how the care recipient is defined. In this study we have defined the care recipient as an adult for whom the caregiver provides assistance with ADL or IADL activities. This approach allowed for a more thorough understanding of how specific caregiving roles and activities may impact sleep and stress-related poor sleep.

To understand how caregiving may impact sleep among women veterans, the aims of the current study were as follows: 1) to test whether poor sleep due to stress could be explained by caregiver status (i.e., caregivers versus noncaregivers). 2) to test whether caregiver status would be a significant predictor for self-reported sleep complaints and sleep-related daytime impairment. We hypothesized that women veteran caregivers are more likely to experience poor sleep due to stress than those who are not caregivers. We also hypothesized that being a caregivers among women veterans is a significant factor for sleep complaints and daytime impairment due to poor sleep.

This study was guided by the modified Stress Process Model (Pearlin, Mullan, Semple, & Skaff, 1990) and Spielman’s 3P model (Spielman et al., 2000) adapted to chronic sleep problems among caregivers (McCurry, Song, & Martin, 2015). The modified Stress Process Model explains how background factors (e.g., age, caregiving history), stressors (e.g., care recipient factors, caregiving overload), and mediators of stress (e.g., coping, social support, resources) can impact each other and ultimately caregivers’ health (e.g., sleep, daytime impairment) and wellbeing. In the modified Spielman’s 3P model, a combination of three factors (i.e., predisposing, precipitating, and perpetuating factors) causes insomnia. For example, older age and female sex are viewed as predisposing factors of insomnia, precipitating factors include stressors related to caregiving situation or other life events, and perpetuating factors include inadequate sleep hygiene and social isolation. The goal of this

work was to inform future caregiver support interventions focused on improving both sleep problems and stress.

METHODS

Study Design

Our study used a cross-sectional design and involved secondary data analysis. Data were obtained from a regional postal survey of women veterans completed during the screening phase of a randomized controlled trial on insomnia treatments in woman veterans ([ClinicalTrials.gov Identifier: NCT02076165](https://clinicaltrials.gov/ct2/show/study/NCT02076165)). The survey was designed for use with women veterans and the core items addressed the diagnostic criteria for insomnia disorder (Martin et al., 2017). That survey's original goals were to understand the participants' sleep habits and types of sleep problems, and to identify individuals likely to have insomnia disorder for the trial. The version of the survey that included caregiving items had a total of 48 questions. Those questions consisted of items addressing the diagnostic criteria for insomnia disorder (Martin et al., 2017), caregiving variables, demographics, and health-related factors (described below). Overall, the survey questionnaire was mailed in 31 batches of approximately 350 per batch from October 2014 through June 2017.

Study Sample

Survey recipients were identified in two ways. First, a database of women who had at least one health care visit in the past 6 months and resided within 50 miles of one Veterans Administration (VA) Healthcare System site was obtained from the VA Health Eligibility Center. Second, women who had been referred for clinical insomnia treatment within the sleep disorders center at this healthcare system were added to the dataset, even if they did not meet the above criteria (i.e., lived more than 50 miles away or had not been seen within the past 6 months) since they were likely to receive care at the study clinical site.

In total, 12,225 women veterans with valid addresses were mailed the survey, which included a preaddressed, postage-paid envelope for completed survey return. The total response rate was 21.8% (2,669 surveys returned). Of the 2,669 who responded, 1,522 had a valid response to the caregiving question on whether the veteran was a caregiver or not (the caregiving items were removed during the final year of the survey). Out of the 1,522, an additional 65 surveys were omitted because the caregiving relationship did not meeting our definition (e.g., the respondent was a paid caregiver or was caring only for an infant or child younger than 18 years of age). The decision of excluding those for caring a child was based on findings that the effects of the caregiving experience of health and sleep differed between caregivers of adults and caregivers of children (Song et al., 2018). A final sample of 1,457 women provided complete data on the survey for variables included in the current analyses.

In our study, a caregiver was defined as a person who (1) regularly provides unpaid care for another person (e.g., a spouse, parent, adult child, friend) because of physical illness, memory disorder, psychological disorder, or physical health decline, and (2) helps with at least one of the ADLs (i.e., eating, dressing, bathing) or IADLs (i.e., housework, managing money, preparing meals, taking medication, transportation, communicating with others,

learning or remembering, seeing or hearing, moving around at home, getting along with people, relieving/decreasing anxiety or depression) (U.S. Centers for Disease Control and Prevention (CDC), 2009–2010).

The study was approved by the Institutional Review Board at the VA Greater Los Angeles Healthcare System. A waiver of documentation of informed consent was granted for the postal survey.

Measures

Demographic characteristics included *age*, *race/ethnicity*, *marital status*, and *employment status*. Self-rated health was obtained from the single item on the *Short Form-12 Health Survey* (Jenkinson et al., 1997). A single question rating pain was obtained from the *Geriatric Pain Measure* (Ferrell, Stein, & Beck, 2000). *Body mass index* was also calculated based on self-reported weight and height.

Sleep complaints were measured with the following instruments. Six items of the *Insomnia Severity Index* (adapted for use in a postal survey) were used, including whether the respondent was satisfied with sleep; had difficulty falling asleep, trouble staying asleep, or waking up too early; had sleep problems interfering with daily functioning; and was worried or distressed about sleep (Morin, Belleville, Belanger, & Ivers, 2011). Severity of each symptom ranged from 0 (none) to 4 (very severe). A total score of the six items (range 0–24) was calculated for this study to assess severity of insomnia symptoms.

The *Pittsburgh Sleep Quality Index* measured bed time, rising time, and estimated total sleep time (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Sleep efficiency was calculated as a percentage of total sleep time in bed. Questions addressing the *Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition (DSM-5) diagnostic criteria for insomnia* (American Psychiatric Association, 2013; Martin et al., 2017) were also included in the postal survey. A dichotomous variable of insomnia disorder was created based on the DSM-5 criteria.

Finally, the *International Classification of Sleep Disorders - Third Edition (ICSD-3)* was used to define 11 items listed as symptoms of daytime impairment due to poor sleep, including feeling tired or fatigued; having trouble paying attention, concentrating, or remembering things; having difficulty with daily activities; having difficulty with social life; feeling irritable, depressed, or anxious; feeling sleepy; having less motivation, energy or drive; making mistakes or errors; having accidents or mishaps; feeling hyperactive, impulsive, or aggressive; and having concerns about or dissatisfaction with sleep (American Academy of Sleep Medicine, 2014). The percent of the 11 items endorsed was used to indicate the overall endorsement of daytime impairment symptoms (0–100% of symptoms).

Finally, a single item asked whether *stress* was a contributing factor to poor sleep over the past month, (i.e., “*Did you have trouble sleeping because of stress, yes/no?*”).

Questions on caregiving included *caregiver status* (i.e., caregiver vs. noncaregiver), *relationship to care recipient*, *care recipient’s age*, *whether the caregiver lived with the care recipient*, and caregiving tasks such as *ADLs* and *IADLs* performed by the caregiver (U.S.

Centers for Disease Control and Prevention (CDC), 2009–2010). The total number of caregiving tasks was calculated to indicate intensity of caregiving responsibility.

Data analyses

Descriptive statistics with means, standard deviations (SD), frequencies, and percentages were used to analyze the total population and subgroups (caregivers vs. noncaregivers). Student's t-test (for continuous outcomes) and the chi-square test (for categorical outcomes) were used to compare symptoms of sleep complaints and daytime impairment between caregivers and noncaregivers; and to test differences in sleep and daytime impairment by caregiving characteristics (i.e., living situation, relationship to a care recipient). Our statistical approaches were developed, based on the two conceptual frameworks described above (McCurry et al., 2015; Pearlin et al., 1990; Spielman et al., 2000).

Logistic regression was used to test whether caregiving status predicted poor sleep due to stress, after adjusting for age, pain, and self-rated health. Multiple regression models were also used to test whether caregiving status predicted sleep complaints and sleep-related daytime impairment, adjusting for age, pain, self-rated health, and other demographic characteristics (i.e., marital status, race, employment status) as covariates. The covariates in the regression models were selected based on prior literature on factors related to sleep (Adenekan et al., 2013; Finan, Goodin, & Smith, 2013; Ford et al., 2014; Lallukka et al., 2012; Ohayon, Carskadon, Guilleminault, & Vitiello, 2004; Shankar, Charumathi, & Kalidindi, 2011; Troxel et al., 2010). To provide a measure of effect size when the caregiving status variable was significant, we included a measure of effect size (R^2 change) reflecting the increase in R^2 comparing a model with and without the hypothesized predictor (i.e., caregiving status).

For all analyses, $P < .05$ was considered statistically significant. Since the main hypothesis-driven analysis included only two statistical tests, we did not employ type 1 error adjustment. The additional statistical comparisons (e.g., bivariate comparisons) are provided as context to facilitate interpretation of the main findings. The analyses were performed using Stata statistical software (version 15.0, StataCorp LLC, College Station, Texas, USA).

RESULTS

Respondent characteristics

Of the 1,457 respondents (mean age = 51.7 ± 15.9 years), 441 women veterans (30%) were married or living as married, and 568 (39%) were employed for wages. Two hundred forty-three respondents (17%) reported serving as caregivers for adults. Table 1 compares characteristics of caregivers and noncaregivers. Women veteran caregivers were significantly older (53.8 ± 12.7 vs. 51.2 ± 16.4 years old), had higher body mass indices (29.1 ± 6.8 vs. 27.9 ± 6.4), and reported more with having stress as a cause of their poor sleep (67.8% vs. 57.6%) than noncaregivers ($P < .05$).

Caregiving characteristics

Of 243 caregivers, 42% (n=102) were providing care for parent(s) or parent(s)-in-law, and 68% of caregivers provided care for persons aged 65 years or older. Sixty-three percent of the caregivers lived with the care recipients. On average, caregiver respondents endorsed providing assistance with 38% (SD= 21) of caregiving tasks, the most common being helping with transportation (n = 165, 69%), housework (n = 133, 56%), preparing meals (n = 132, 55%), managing money (n = 121, 51%), and overseeing medication use (n = 120, 50%).

Characteristics of sleep

Only 20% of respondents reported no sleep problems, meaning no difficulty falling asleep, staying asleep, or waking up too early, during the past month. Roughly 70% (n = 1,018) met insomnia criteria as defined by the DSM-5. More than 80% of the respondents worried or were distressed about their sleep or believed that their sleep problems interfered with their daily functioning. Only half of the women veterans were satisfied with their sleep over the past month. On average, women veterans endorsed 61% (SD 30.9) of the daytime impairment symptoms due to poor sleep at night during the past month, and experienced at least one symptom for an average of 4.8 days (SD 2.4) per week. Among the caregiver subgroup, caregivers living together with the care recipient experienced fewer daytime impairments related to sleep ($60.1 \pm 29.9\%$ vs $70.9 \pm 27.2\%$, $p=0.0085$). However, there were no differences when we compared the two groups in terms of the actual sleep variables. No significant relationships were also found in sleep variables or daytime impairments related to sleep with other caregiving characteristics (e.g., numbers of ADL/IADL tasks, relationship to a care recipient).

Factors associated with poor sleep due to stress

In a logistic regression model, the probability of experiencing poor sleep due to stress was associated with being a caregiver, after adjusting for age, self-rated health status, pain, and others (e.g., marital status, employment). The odds for reporting stress as a cause of poor sleep was 1.7 times greater for caregivers versus noncaregivers (odds ratio 1.7, 95% confidence interval=1.2, 2.4, $p=0.001$; Table 3A).

Sleep complaints and symptoms of daytime impairment between caregivers and noncaregivers

Caregivers reported significantly shorter total sleep time (5.5 ± 1.7 hours vs. 5.7 ± 1.8 hours) than noncaregivers ($P < .05$; Table 2). No significant differences in other sleep measures (i.e., severity of insomnia symptoms, sleep efficiency) were found between the two groups. The average daytime impairment rate was greater for caregivers than noncaregivers ($64.8 \pm 28.9\%$ vs. $60.2 \pm 31.2\%$; $P < .05$). Compared with noncaregivers, caregivers were more likely to experience more tiredness or fatigue during the day (88.4% vs. 82.9%), more likely to feel hyperactive, impulsive or aggressive (44.8% vs. 37.3%), and more likely to feel concerned about or dissatisfied with their sleep because of poor sleep at night (77.0% vs. 70.4%; all $P < .05$).

In multiple regression, being a caregiver was significantly associated with daytime impairment rate, even after adjusting for other variables such as age, self-rated health status, and pain (Table 3B). Being a caregiver corresponded to a 3.9% increase in daytime impairment ($P = .031$). Compared to a model including all variables except caregiver status, the addition of caregiver status increased the variance explained by 0.23%. In a regression model predicting total sleep time, this variable was no longer significant after accounting for other factors (results not shown).

DISCUSSION

We found that, among women veterans, caregiving for an adult was a significant risk factor for having poor sleep due to stress, over and above known risk factors for poor sleep. Women veteran caregivers were nearly twice as likely to report poor sleep due to stress compared to noncaregivers. Group differences in daytime impairment remained significant after controlling for other known risk factors for poor sleep (e.g., pain, health status); however, no significant group differences were observed for insomnia symptom severity or sleep efficiency.

Stress-related sleep disturbances

Previous studies have found stress levels serve a critical role on mortality rate both in caregivers and noncaregivers among women (Fredman et al., 2010). High-stress caregivers and noncaregivers have higher mortality than low-stress noncaregivers. Prior work has demonstrated the impact of stress (Song et al., 2017) and depression (Carter & Chang, 2000; Kochar et al., 2007; von Kanel et al., 2012) on sleep is significant among caregivers in the general population. Studies have also found that women veterans experience a variety of unique traumatic and stressful life events (Lehavot et al., 2018). Thus, stress-related sleep problems experienced by women veterans in the current study cannot be exclusively attributed to caregiver-related stress. It is possible that other events or psychological distress symptoms (e.g., posttraumatic stress disorder, depression) contribute to stress among women veteran caregivers. Future studies should explore how caregiver status contributes to the development of new stressors and/or exacerbates existing stressors.

Daytime impairment related to poor sleep

The current findings regarding elevated daytime impairment among women veteran caregivers build upon the results of previous studies. A cross-sectional study found that caregivers reported shorter sleep time and more functional consequences of daytime sleepiness than noncaregivers (McKibbin et al., 2005). Associations between caregiving status and sleep-related daytime impairment were also consistent with the findings of another survey of women veterans which found that those who had trouble sleeping because of caring for a sick or disabled adult experienced greater impairment in daytime function due to their poor sleep than other groups of veterans who had trouble sleeping because of caring for an infant or child or all other respondents (e.g., noncaregivers) (Song et al., 2018). Collectively, these findings suggest that caregiving status is a major risk factor for sleep-related daytime impairment, and interventions aimed at improving sleep are highly relevant to the caregiver population.

Sleep complaints and other sleep characteristics

An unexpected finding in the current study was the lack of significant difference in sleep complaints alone, reported total sleep time, or sleep efficiency, between women veteran caregivers and noncaregivers, after controlling for other known risk factors for poor sleep. Possible reasons for these findings might be explained by pre-existing poor sleep or medical conditions that our women veteran respondents may have had at the time of the survey. For example, both caregivers and noncaregivers reported less than six hours of total sleep time and low sleep efficiency (less than 80%). BMI of both groups was high especially among the caregivers, which increases risk of sleep disorders (e.g., sleep apnea) leading to sleep disruption due to arousal. Additionally, certain care-recipient medical conditions may affect caregivers' experiences more adversely, leading to more sleep problems (Clipp & George, 1993; Flakerud, Carter, & Lee, 2000). For example, studies reported poorer sleep quality and more stress among caregivers of patients with frontotemporal dementia compared to those caring for patients with Alzheimer's disease (Merrilees, Hubbard, Mastick, Miller, & Dowling, 2014; Uflacker, Edmondson, Onyike, & Appleby, 2016; Wong et al., 2012). Unfortunately, we did not ask about the medical condition of care recipients in the survey.

Although caregivers may not perceive their sleep to be worse in terms of falling or staying asleep, sleep may be affecting daytime function more negatively, perhaps through increased stress. Differences in caregiver and noncaregivers' sleep are not necessarily reflected in the severity of sleep complaints, but in their abilities to cope with disturbed sleep. Caregiving status is associated with increased stress levels and decreased coping resources (Gilhooly et al., 2016). Veteran caregivers may experience greater functional impairment than noncaregivers who report similar insomnia symptoms. Thus, caregivers without a formal diagnosis of insomnia may still benefit from behavioral strategies to improve sleep, prevent further deterioration of daily function and improve quality of life.

This study has several strengths. To our knowledge, it is the first study to explore types of sleep complaints and related daytime impairment between caregivers and noncaregivers in a large survey of women veterans. We also explored sleep disruption specifically caused by stress, which is highly relevant to the health of caregivers. We used a robust definition of caregiver that captured those who assisted family members and/or friends with ADLs and IADLs.

Despite our study's strengths, it had several limitations. The response rate to our postal survey was only 22 %. However, completion of postal surveys has fallen in recent years possibly due to methodology issue of the postal survey (Czajka & Beyler, 2016). Other reasons included failure of our survey delivered to some women veterans who frequently relocated and lack of follow-ups (e.g., by telephone) due to resource limitations. We also did not attempt to obtain complete survey data for those whose response indicated ineligibility for our clinical trial. Our sample of women veteran caregivers largely provided assistance with IADLs, so we are less able to address caregiving that focuses on assisting with ADLs, which may be associated with even higher levels of burden and stress. However, our finding that transportation was the most frequent caregiving task was similar to the type of caregiving activities in prior studies of the general population (AARP Public Policy Institute & National Alliance for Caregiving, 2015).

Due to space limitations on the postal survey, we also did not measure some important variables. They included time spent completing nighttime caregiving activities, caregiving burden, whether caregivers shared a bed/room with the care recipient, care recipients' characteristics and type of support received (e.g., respite care), history and treatment of post-traumatic stress disorder, military sexual trauma, depression, anxiety, history of sleep disorders (e.g., sleep apnea) or snoring, and whether caregivers were VA service connected disability themselves. Our measures of sleep complaints (i.e., the Insomnia Severity Index and the Pittsburgh Sleep Quality Index) included only selected items from the original instruments due to the need to limit the length of the survey. We measured symptoms related to daytime impairment that were derived from items of daytime consequences of insomnia disorders in the ICSD-3, and although our previous study demonstrated face validity of the items (Song et al., 2018), its psychometric validation may need to be established further. Information on self-rated health, pain, and stress contributing poor sleep was obtained from a single item each. Finally, because our survey was conducted among women who received care within one VA healthcare system, our findings may not be generalizable to women veterans in other VA settings, women veterans who do not use VA services, or men veterans.

The current findings demonstrate women veteran caregivers are at an increased risk of experiencing sleep-related daytime impairment and highlight the need for sleep interventions within this rapidly growing population. Cognitive behavioral sleep interventions focusing on reducing daytime symptoms may benefit those women veteran who are caregivers. Specific components would include management of caregiver stress and teaching coping skills, fatigue management, and time management skills. Further research on women veterans is needed to understand the relationship between complex caregiving experiences, levels of stress, and symptoms resulting from disturbed sleep. Additional research is also warranted to develop sleep interventions accounting for stress to address the needs of this growing population.

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Table 1.

Characteristics of women veteran caregivers and noncaregivers (N = 1,457)

| Respondent characteristics | Caregivers (n = 243) | Noncaregivers (n = 1,214) | p value |
|---|----------------------|---------------------------|--------------|
| Age in years, M (SD) | 53.8 (12.7) | 51.2 (16.4) | 0.021 |
| Race/ethnicity, n (%) | | | |
| African American | 76 (31.5) | 316 (26.3) | 0.092 |
| Hispanic/Latina | 44 (18.3) | 266 (22.1) | 0.185 |
| White/Caucasian | 120 (49.8) | 588 (48.8) | 0.787 |
| Asian or Asian American | 13 (5.4) | 66 (5.5) | 0.956 |
| Native Hawaiian/Pacific Islander | 6 (2.5) | 19 (1.6) | 0.322 |
| American Indian/Alaskan Native | 14 (5.8) | 46 (3.8) | 0.158 |
| Other | 9 (3.8) | 48 (4.0) | 0.862 |
| Employment status, n (%) | | | |
| Employed for wages | 96 (39.8) | 472 (39.1) | 0.840 |
| Unable to work | 46 (19.2) | 226 (18.7) | 0.877 |
| Unemployed | 46 (19.1) | 198 (16.4) | 0.312 |
| Retired | 69 (28.6) | 308 (25.5) | 0.318 |
| Student | 28 (11.6) | 160 (13.3) | 0.487 |
| Homemaker | 27 (11.2) | 87 (7.21) | 0.036 |
| Marital status, n (%) | | | |
| Married or living as married | 82 (34.0) | 359 (29.8) | 0.198 |
| Divorced | 77 (32.0) | 383 (31.8) | 0.973 |
| Separated | 12 (5.0) | 49 (4.1) | 0.523 |
| Widowed | 11 (4.6) | 91 (7.6) | 0.097 |
| Never married | 60 (24.9) | 329 (27.4) | 0.434 |
| General health, n (%) | | | 0.051 |
| Poor | 18 (7.4) | 55 (4.6) | |
| Fair | 67 (27.7) | 324 (26.9) | |
| Good | 103 (42.6) | 467 (38.8) | |
| Very good | 47 (19.4) | 285 (23.7) | |
| Excellent | 7 (2.9) | 74 (6.1) | |
| Self-reported cognitive function, n (%) | | | 0.081 |
| Poor | 24 (9.9) | 113 (9.4) | |
| Fair | 56 (23.1) | 238 (19.7) | |
| Average | 83 (34.2) | 350 (29.0) | |
| Good | 61 (25.1) | 350 (29.0) | |
| Excellent | 19 (7.8) | 155 (12.0) | |
| Pain (0–10) | 4.75 (2.9) | 4.38 (3.0) | 0.085 |
| Body mass index | 29.1 (6.8) | 27.9 (6.4) | 0.013 |
| Stress as a cause of poor sleep | 164 (67.8) | 694 (57.6) | 0.003 |

Note: n = 1,431 for body mass index; n = 1,440 for pain; n = 1,444 for age, marital status; n = 1,447 for employment status and general health; n = 1,449 for self-reported cognitive function.

Student's t-test and chi-square test were used.

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Table 2.

Sleep problems and daytime impairment in women veteran caregivers and noncaregivers (N = 1,457)

| Types of sleep problem and daytime impairment | Caregivers (n = 243) | Noncaregivers (n = 1,214) | p value |
|---|----------------------|---------------------------|--------------|
| Total score of insomnia severity symptoms (0–24), M (SD) | 12.4 (0.4) | 11.6 (0.2) | 0.086 |
| Total sleep time, hours, M (SD) | 5.5 (1.7) | 5.7 (1.8) | 0.047 |
| Sleep efficiency, %, M (SD) | 71.2 (21.3) | 72.7 (20.1) | 0.320 |
| DSM-5 defined insomnia (yes/no), n (%) | 177 (72.8) | 841 (69.3) | 0.269 |
| Daytime impairment due to poor sleep, n (%) | | | |
| Feeling tired or fatigued during the day (yes/no) | 214 (88.4) | 1,000 (82.9) | 0.034 |
| Trouble paying attention, concentrating, or remembering things | 176 (73.0) | 831 (69.3) | 0.243 |
| Difficulty with daily activities (work, school, other responsibilities) | 151 (63.2) | 689 (57.6) | 0.107 |
| Difficulty with social life | 123 (51.5) | 564 (47.1) | 0.219 |
| Feeling irritable, depressed or anxious | 178 (74.5) | 821 (68.4) | 0.061 |
| Feeling sleepy during the day | 199 (82.2) | 978 (81.2) | 0.715 |
| Having less motivation, energy, or drive | 197 (81.4) | 908 (75.9) | 0.062 |
| Making mistake or errors | 137 (57.3) | 634 (53.1) | 0.237 |
| Having accidents or mishaps (e.g., car crashes, falls, other injuries) | 48 (20.1) | 223 (18.6) | 0.596 |
| Feeling hyperactive, impulsive, or aggressive | 108 (44.8) | 448 (37.3) | 0.028 |
| Having concerns about or dissatisfaction with sleep | 181 (77.0) | 836 (70.4) | 0.039 |
| % of endorsed rate of daytime impairment symptoms above | 64.8 (28.9) | 60.2 (31.2) | 0.035 |

Note: n = 1,436 for satisfaction with sleep; n = 1,453 for trouble falling asleep; n = 1,451 for trouble staying asleep; n = 1,442 for waking up too early; n = 1,348 for sleep problems interfering with daily functioning; n = 1,350 for sleep as worried or distressed; n = 1,414 for self-reported total sleep time; n = 1,355 for sleep efficiency; n = 1,449 for daytime impairment symptoms; DSM-5, Diagnostic and statistical manual of mental disorders-5th edition.

Table 3A.

A multiple logistic regression model predicting stress as a cause of poor sleep among women veterans (N=1,382)

| Independent variables | Poor sleep due to stress | |
|------------------------------|--------------------------|---------|
| | OR (95% CI) | P value |
| Age (years) | | |
| 30 | Reference | |
| 30–40 | 0.6 (0.4–1.1) | 0.078 |
| 40–50 | 0.4 (0.2–0.7) | <0.001 |
| 50–60 | 0.3 (0.2–0.5) | <0.001 |
| 60–70 | 0.2 (0.1–0.3) | <0.001 |
| >70 | 0.1 (0.1–0.2) | <0.001 |
| Caregiving status | 1.7 (1.2, 2.4) | 0.001 |
| Married | 1.1 (0.8, 1.4) | 0.637 |
| White vs. others | 1.7 (1.2, 2.2) | 0.001 |
| African Americans vs. others | 1.3 (0.9, 1.8) | 0.101 |
| Employed | 1.1 (0.8, 1.4) | 0.656 |
| Pain scale | 1.2 (1.1, 1.2) | <0.001 |
| Self-rated health | 1.3 (1.1, 1.5) | <0.001 |
| Body mass index | –0.2 (–0.4, –0.1) | 0.035 |
| >18.5 | Reference | |
| 18.5–24.9 | 1.3(0.6–3.0) | 0.478 |
| 25–29.9 | 1.1(0.5–2.6) | 0.737 |
| 30 | 0.9 (0.4–2.0) | 0.782 |

P < .001

Table 3B.

A multiple linear regression model predicting sleep-related daytime impairment among women veterans (N=1,391)

| Independent variables | Daytime impairment | |
|------------------------------|--------------------|----------------|
| | β (95% CI) | P value |
| Age | -0.6 (-0.7, -0.5) | < 0.001 |
| Caregiving status | 3.9 (0.3, 7.6) | 0.031 |
| Married | -1.6 (-4.6, 1.4) | 0.290 |
| White vs. others | 3.6 (0.3, 6.9) | 0.031 |
| African Americans vs. others | 1.5 (-2.1, 5.1) | 0.427 |
| Employed | -1.9 (-4.8, 1.1) | 0.208 |
| Pain scale | 3.0 (2.5, 3.5) | < 0.001 |
| Self-rated health | 8.6 (6.9, 10.2) | < 0.001 |
| Body mass index | -0.3 (-0.5, -0.1) | 0.004 |

F(9,1381) = 70.94; $P < .001$; $R^2 = 31.6\%$; Adjusted $R^2 = 31.7\%$

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