

Sleep Disturbance in Midlife Women

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ABSTRACT

Emphasizing midlife women, this review describes sleep and compares self-report sleep data with objective findings from laboratory studies of women. Sleep disturbance is a more prevalent complaint for women than men. Not due to chronologic age per se, it is associated with menopausal symptoms and most importantly with comorbidities and stress. Sleep problems in midlife women should not be attributed only to the menopausal symptom experience and should trigger a clinical evaluation. Assessment guidelines are included.

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Sleep issues are relevant to women across the lifespan. Problems with sleep are known to occur during key times in development, particularly during childbearing or menopausal transition, but sleep is also affected by major life transitions, such as retirement, chronic illness, and widowhood. Across the lifespan, women report more problems with their sleep when compared with men in large population-based surveys. In addition to developmental factors and health problems, social and psychological factors influence women's sleep.

About one third of the adult population reports insomnia symptoms (difficulty initiating sleep, difficulty maintaining sleep, early morning awakening, and nonrestorative sleep) and insomnia is more common among women, middle-aged and older adults, shift workers, and people with medical or psychiatric disorders (Morin et al., 2006; Ohayon, 2002). In clinical practice, insomnia may be treated as a minor complaint but it has been shown to have a negative impact on quality of life and is associated with elevated use of health care resources (Ancoli-Israel, 2006).

The purpose of this literature review is to describe women's sleep across the lifespan, with an emphasis on midlife women, to address sleep disturbance in relation to age, menopausal transition, stress, or other factors. Research using either self-report data

from valid and reliable sleep questionnaires or laboratory sleep studies using objective monitoring with polysomnography (PSG) is compared. Factors that affect women's sleep during the menopausal transition are reviewed and gaps in knowledge are identified for future research. Clinical implications are identified and guidelines for clinical assessment of sleep disturbances of midlife women are discussed.

Healthy Sleep Across the Lifespan

Sleep changes throughout the lifespan, with considerable differences between women and men, young and old, healthy and ill. Healthy sleep includes four to six cycles of sleep stages throughout the night when a person is allowed to sleep in their own natural circadian rhythm. Sleep stages are defined by PSG recording that consists of electroencephalography (EEG) to monitor brain activity, electro-oculography (EOG) to monitor eye movements, and electromyography to monitor facial muscle tone. The most well-known sleep stage is rapid eye movement (REM) with distinctive eye movements visually observed or monitored with EOG. However, this is not typically seen until about 90 minutes after falling asleep and is only about 20% to 25% of the night's total sleep time. Rapid eye movement sleep is preceded by light sleep and deep sleep stages only seen with EEG recordings (Vgontzas & Chrousos, 2002).

Stage 1 is very light sleep, with notable changes from an awake state on an EEG recording, but subjects awakened from this stage usually perceived it as a state of drowsiness or "drifting off." In healthy young adults, very little (5%-10%) of the entire night's sleep is spent in this stage. Most of the night's sleep (50%) is spent in Stage 2, which is considered light sleep. Stage 3 to 4 is deep sleep, also called slow wave sleep (SWS), because of the large delta waves seen on the EEG. Healthy young adults have about 20% SWS, which diminishes with age as well as chronic illness (Ohayon, Carskadon, Guilleminault, & Vitiello, 2004; Redline et al., 2004; Silber et al., 2007; Vgontzas & Chrousos, 2002).

Measuring Sleep

Polysomnography is the gold standard for measurement of sleep stages, latencies to specific stages of sleep and cycles of sleep, all collectively known as sleep architecture. Usually, PSG takes place in a sleep laboratory, but ambulatory monitoring is available for home use if there is no need to control the environment for temperature, light, and noise. Sleep architecture may differ between the familiar home setting and a laboratory, thus PSG usually requires a night of adaptation before collecting research data, and a home study usually requires more nights and controls for the day of the week due to uncontrolled variability in the home setting.

Actigraphy is the use of a monitor, typically worn on the wrist or ankle, to record physical movement. Compared with PSG, it can be worn for long periods of time to assess sleep-wake patterns, naps, and rhythms of activity over week days and weekends because electrodes are not necessary (Morgenthaler et al., 2006; Sadeh & Acebo, 2002). An actigraph is more easily acceptable to monitor time spent asleep, but cannot provide data about stages of sleep, and is likely to have poor validity for establishing latency to sleep onset when the chief complaint is difficulty falling asleep, because "light's out" is difficult to ascertain without an objective measure (such as a light meter or lux monitor) or a technician to document the clock time for turning out the light. A wrist monitor can underestimate sleep time in restless or active sleepers and overestimate sleep time in sedentary adults.

There may be disagreements between objective PSG or actigraphy measures of sleep and self-report or perception of sleep, whether in the laboratory or home setting, which often accounts for the poor validity between self-report and objective

monitoring. Some poor sleepers experience sleep state misperception, in which they perceive taking longer to fall asleep than PSG criteria would indicate, or sleep is less restful and lower quality than established PSG criteria would indicate. Still others may feel that they slept deeply all night when PSG reveals many brief episodes of awakening and no SWS (Perlis, Smith, & Pigeon, 2005).

Subjective sleep quality is measured using self-report instruments. Responses provide information that electronic monitoring cannot easily provide, such as usual time to go to sleep and get up and perception of sleep quality (Hays & Stewart, 1992). A variety of sleep diary or log formats exist. The St. Mary's Hospital Sleep Questionnaire was developed for use with hospitalized patients to assess sleep after each night and was adapted by Pien, Sammel, Freeman, Lin, and DeBlasis (2008) for a study of women's sleep described later. The Pittsburgh Sleep Quality Index is a widely used self-report measure that addresses sleep problems over the past month (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989).

Sex and Age Differences in Sleep

Researchers using population-based samples report that sleep architecture differs by age and sex. In the Sleep Heart Health Study, Redline et al. (2004) studied over 2,600 adults between 37 and 92 years of age using a single night of unattended home PSG. They documented poorer sleep with older men compared with younger men, and women had longer sleep time and twice the amount of SWS than men after controlling for age and other covariates like body mass index (BMI).

Women are reportedly higher users of medications for sleep than men (Bliwise, King, Harris, & Haskell, 1992). A population study of women in Sweden with a 24 year follow-up showed that the frequency of sleep problems and the use of sleep medications increased with age (Bjorkelund, Bengtsson, Lissner, & Rodstrom, 2002). The prevalence of sleep problems increased from about 20% at age 38 to about 45% to 50% at age 84. Less than half of the women who reported a sleep problem sought medical attention and, at all ages, less than half of those with sleep problems took sleep medication.

To identify age-related changes in sleep patterns across the lifespan in healthy individuals, Ohayon et al. (2004) conducted a meta-analysis of 65 studies published between 1960 and 2003, representing 3,577 adults ranging in age from 5 to 102 years who

were studied with objective measures. They concluded that “all sleep parameters significantly changed with age across the lifespan” (Ohayon et al., p. 1269). For adults, sleep latency (time to fall asleep), percentages of light sleep and wake after sleep onset significantly increased with age, while total sleep time and percentage of SWS decreased with age. From this meta-analysis, researchers concluded that women have more total sleep time and more SWS than age-matched men but longer sleep onset latency (Ohayon et al.). Another meta-analysis of 382 studies concluded that REM sleep declines about 0.6% with each passing age decade until the mid-70s (Floyd, Janisse, Jenuwine, & Ager, 2007). The time spent in REM sleep diminishes slightly (2%-3%), from middle to old age, but the pattern of decrease occurs approximately 5 years later in women than men (Bliwise, 2005; Brock, 1991).

Sleep efficiency (the time spent asleep as a proportion of the time in bed trying to get to sleep until final awakening) declines with age. A young child who falls asleep quickly and stays asleep the entire night is likely to have 98% to 99% sleep efficiency, while an older adult who takes more than 30 minutes to fall asleep and awakens several times during the night has lower sleep efficiency (75%-80%). Brief arousals during sleep are common, especially in those with sleep-disordered breathing or chronic pain (Bliwise, 2005; Van Cauter, Leproult, & Plat, 2000).

Comorbidities are important for understanding sleep in midlife and older women because sleep changes in older adults have been found to be affected by comorbid illnesses rather than merely chronologic aging. Ohayon and Vecchierini (2005) surveyed 1,026 Parisian subjects 60 years or older by telephone interview and found the median sleep time to be about 7 hours, with a range of 5 to 9 hours. The upper and lower 25th percentiles were more likely to lack physical exercise and be obese, and at both extremes of sleep duration, health risk increased and cognitive performance decreased. Thus, duration of sleep, both long and short, is associated with health problems in older people. Older adults who are healthy rarely have sleep complaints but difficulty sleeping in the elderly is associated with morbidity (Ancoli-Israel & Ayalon, 2006).

Subjective sleep complaints may adversely affect daily functioning and are often the reason for seeking treatment. However, perceived poor sleep may not match objective findings from PSG or actigraphy. Early studies reported that sleep complaints

Rapid eye movement sleep diminishes slightly (2%-3%), from midlife to old age, but the decrease occurs approximately 5 years later in women than men.

were more prevalent in women and increased with age. Yet more recent studies show that age explained little of the prevalence of poor quality sleep after accounting for other potential causes. Vitiello, Moe, and Prinz (2002) examined the relationships between clinical health screenings and sleep complaints and disorders in two large groups of volunteers. They concluded that careful health assessments will screen out most sleep problems, supporting evidence that most sleep complaints cosegregate with medical and psychiatric disorders and related burdens. These findings highlight the importance of clinical assessment of midlife women's sleep to identify primary sleep disorders, medical or psychiatric disorders, or related problems that influence sleep quality.

Studies of sleep and aging show that sleep complaints are associated with comorbid health problems. Rapid eye movement sleep and sleep efficiency decline gradually with age, and compared with men of the same age, women take longer to fall asleep but have longer total sleep time and sleep more deeply. In older adults, long and short duration of sleep is associated with comorbid health problems. Although healthy older adults rarely report sleep complaints, they are more likely to complain to a health care provider about poor sleep than about depression or anxiety.

Sleep and Midlife Women

While studies indicate that multiple factors related to comorbidity are the major cause of sleep complaints in older adults, midlife women's sleep difficulties are often attributed to menopausal transition, without consideration of other age-dependent factors that may affect sleep. In a series of studies, Shaver investigated the sleep of midlife women (Cheek, Shaver, & Lentz, 2004; Shaver, Giblin, Lentz, & Lee, 1988; Shaver, Johnston, Lentz, & Landis, 2002). Overall, these studies showed that sleep of healthy perimenopausal women did not differ from premenopausal women, but poor sleep was associated with hot flashes, cognitive or emotional arousal, and chronic stress. However, these studies did not clarify whether sleep disturbance caused stress or resulted from stress.

In the Wisconsin Sleep Cohort Study involving 589 premenopausal, perimenopausal, and postmeno-

Most sleep complaints are not due to chronological age per se but cosegregate with medical and psychiatric disorders and related burdens.

pausal women, Young, Rabago, Zgierska, Austin, and Laurel (2003) measured sleep with a one-night laboratory PSG and by self-report at baseline and follow-up at 4 and 8 years. Compared with premenopausal women, sleep quality was not worse in perimenopausal or postmenopausal women when age and BMI were controlled in the analysis. Total sleep time was longer with more SWS, and better sleep efficiency was found in postmenopausal women compared with premenopausal women. Compared with premenopausal women, perimenopausal women had significantly less light sleep and more SWS. Yet, for subjective sleep quality, perimenopausal and postmenopausal women were two times more likely to report being dissatisfied with their sleep compared with premenopausal women. Perimenopausal women were four times more likely to report difficulty initiating sleep compared with premenopausal women.

Hot flashes were not objectively measured in the Wisconsin Sleep Cohort laboratory study, but were self-reported. Similar to prior studies, women who reported hot flashes did not differ on PSG sleep parameters from women who reported no hot flashes (Young et al., 2003).

The major finding of Young et al.'s (2003) study was that objectively measured sleep quality did not diminish with menopause but the association of menopause with sleep quality differed for objective and subjective measures. Although their findings indicate that menopausal women, when compared with premenopausal women, were more dissatisfied with their sleep, they concluded that menopausal hormone changes were not implicated as the direct cause of difficulty sleeping when other factors were considered. They emphasized the need for more understanding of the complexity of perceived poor sleep. Further, they questioned whether lay media reports influenced women's expectations of poor sleep. Their findings indicate that sleep problems in midlife women should not routinely be treated as part of the menopausal symptom experience and should trigger a clinical evaluation for potential sleep disorders.

Other studies found that rates of self-reported sleep difficulty increase during the menopausal transition (Kravitz et al., 2003, 2008). One aim of the multicen-

ter, multi-ethnic "Study of Women's Health Across the Nation" (SWAN) was to compare age-adjusted and ethnic differences in prevalence of sleep difficulty during menopausal transition, and determine the contributing factors (Kravitz et al., 2003). The sample included 12,603 White, Black, Chinese, Japanese, and Hispanic women who were between 40 and 55 years of age when the study began. The overall prevalence of self-reported sleep difficulty was 38%; it was least prevalent in the premenopausal group (31%) and most prevalent in the surgical menopause group (48%). White ethnicity, higher education, vasomotor symptoms, psychological symptoms, increased perceived stress, poorer self-perceived health, lower quality of life, less physical activity, current smoking, and arthritis were associated with sleep difficulty. Age alone was not associated with difficulty sleeping. This study was important because this age cohort has been neglected in previous studies of sleep (Kravitz et al., 2003; Ohayon & Vecchierini, 2005) and few have included such a racially and ethnically diverse sample.

There have been seven annual SWAN assessments to examine changes in sleep with progression through menopause (Kravitz et al., 2008). Kravitz et al. found that difficulty falling asleep and staying asleep increased from late perimenopause to postmenopause. More frequent vasomotor symptoms (hot flashes/flushes, cold sweats, and night sweats) were associated with higher risk of each type of sleep difficulty. Declining estradiol level was associated with higher likelihood of self-reported trouble falling asleep and staying asleep. Increasing follicle-stimulating hormone (FSH) was associated with higher likelihood of self-reported trouble staying asleep. No ethnic differences were found for trouble falling asleep, but White women had higher rates of difficulty maintaining sleep and Hispanic women had lower rates of difficulty maintaining sleep. Kravitz et al. concluded that progression through the menopausal transition is associated with self-reported sleep disturbance.

In the Penn Ovarian Aging study, a population-based cohort of 436 late reproductive aged Black and White women from Philadelphia County was assessed over an 8 years period to determine changes in sleep quality associated with menopausal status, reproductive hormone levels, and menopausal symptoms (Pien et al., 2008). Specific types of sleep difficulty were not addressed but overall sleep quality was not associated with menopausal status. Independent predictors of sleep quality included specific symptoms and hormone

changes associated with menopausal transition, which were hot flashes, depressive symptoms, and lower levels of the reproductive hormone inhibin B. Inhibin B declines swiftly early in menopausal transition and is considered an early marker. Race was not a significant contributor to sleep quality in contrast to a previous study of this cohort over a 2 years period when Black race, unemployment, and low education were significantly associated with sleep quality (Hollander et al., 2001). Findings showed that women who experience other perimenopausal symptoms during the menopausal transition are likely to also perceive sleep problems in self-report methodologies. Yet, similar to Young et al.'s (2003) findings with objective sleep measures, these results challenge the popular belief that sleep problems are simply due to the menopausal transition (Pien et al.).

Studies on sleep in midlife women have inconsistent findings. Some indicate that menopausal status does not predict poor sleep while others find that progression through the menopausal transition is associated with subjective sleep disturbance. Findings differ for objective evaluation of sleep parameters showing that sleep is not worse in perimenopausal and postmenopausal women. Age and menopause status alone are not predictors of sleep quality, but obesity and sleep disordered breathing, hot flashes and night sweats, stress and hyperarousal, and depression are symptoms associated with menopausal changes and sleep disturbance. Midlife women who experience menopausal symptoms are likely to perceive and report sleep disturbance to their health care provider. Rather than focus attention on menopausal symptoms, it would be clinically important to assess and treat the broader aspects of health in midlife women and address sleep issues as well as social/family stressors.

Physiological Stress and Thermoregulation in Midlife Women's Sleep

Stress is often implicated in poor sleep although a scientifically based approach to relationships between sleep and stress has developed only in the last two decades. The main function of the stress system, including the hypothalamic-pituitary-adrenal (HPA) axis, is to maintain homeostasis in resting and stress states (Vgontzas & Chrousos, 2002). Sleep, particularly SWS, appears to have an inhibitory influence on the HPA axis, and SWS is associated with declining plasma cortisol levels.

Sleep disturbance in midlife women should not routinely be treated simply as a menopausal symptom and should trigger a clinical evaluation.

Mean 24 hours plasma cortisol level is significantly higher in subjects with shorter sleep time compared with those with longer sleep duration. Activation of the stress system can lead to arousal and sleeplessness. In normal adults, sleep disruption leads to wakefulness and more Stage 1 light sleep accompanied by increases in plasma cortisol (Vgontzas & Chrousos; Vgontzas et al., 1998). Clinical assessment of life stressors should be noted whenever midlife women report sleep disturbance.

Vgontzas et al. (2001) found that chronic persistent insomnia was associated with activation of the HPA axis and an overall hypersecretion of cortisol throughout the 24 hours day. Their data support the view that insomnia is a disorder of hyperarousal. They suggest that treatment should focus not on improvement of quality or quantity of sleep, but on reducing overall hyperarousal. Similar to the implications above, treatment aimed at midlife women's sleep problems with initiation or maintenance would benefit from consideration of stress reduction strategies.

Hyperarousal may be related to thermoregulation and hot flashes in women. Plasma level of the main metabolite of norepinephrine is significantly higher in symptomatic postmenopausal women and increases more during hot flashes. These findings suggest that elevated sympathetic activation plays a role in triggering hot flashes. Hot flashes accompany estrogen withdrawal at menopause, but estrogen level in the body does not correlate with hot flashes and does not explain the occurrence of hot flashes (Freedman, 2005b).

The hot flash is the most common symptom of menopause, and when it happens during the night, it is likely to disrupt sleep. However, well-controlled laboratory investigations have not found that a hot flash disrupts sleep, rather an EEG arousal occurs just before the hot flash (Freedman, 2005a; Freedman, Benton, Genik, & Graydon, 2006; Freedman & Roehrs, 2004). Freedman (2001, 2005a) found that hot flashes, measured with sternal skin conductance, were triggered by small elevations in core body temperature acting within a reduced thermoneutral zone in symptomatic menopausal women. Figure 1 depicts the thermoregulation process. At the upper limit of the thermoneutral zone, sweating

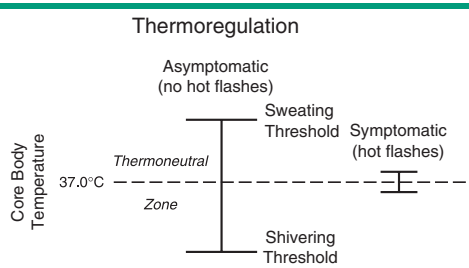


Figure 1. Thermoregulation. Small core body temperature elevations in a reduced thermoneutral zone trigger hot flashes. In symptomatic women with hot flashes, the thermoneutral zone is narrowed in comparison with asymptomatic women. Adapted from Freedman, R. R. (2005a). Hot flashes: Behavioral treatments, mechanisms, and relation to sleep. *American Journal of Medicine*, 118 Suppl 12B, 124-130. Reprinted with permission from Elsevier

removes heat, and at the lower limit shivering acts to conserve heat. The figure shows that the core body temperature is maintained within a wide thermoneutral zone in premenopausal women that becomes more narrow in symptomatic postmenopausal women. The more restricted thermoneutral zone may be partially a result of low estrogen as well as elevated sympathetic activation.

In the laboratory, Freedman and Roehrs (2004) excluded women with disorders likely to disturb sleep and found no sleep disturbances produced by hot flashes in postmenopausal women. In their study, the majority of awakenings preceded rather than followed hot flashes. Upon further analysis, Freedman and Roehrs (2006) found that women with hot flashes had significantly more arousals and awakenings in the first half of the night and these episodes were preceded by hot flashes. In the second half of the night, where there is a higher proportion of REM sleep in which there is no thermoregulation, this pattern was reversed. They concluded that in the second half of the night, REM sleep suppresses hot flashes and associated arousals. They suggested that this pattern may explain previous discrepancies between self-reported and PSG data in postmenopausal women with hot flashes. Overall, based on this research and other findings, Freedman (2005b) concluded that it should not be assumed that the "incidence of sleep disturbance increases at menopause, that hot flashes produce such disturbance, or that amelioration of hot flashes necessarily improves sleep" (p. 122). This conclusion differs from earlier studies that showed an association between symptoms such as hot flashes and poor sleep quality and

points to hyperarousal and stress as contributing factors.

Clinical Assessment of Sleep Difficulties in Midlife Women

Sleep patterns during menopausal transition can be influenced by sleep disorders, stress, hormonal changes, menopausal symptoms such as hot flashes and night sweats, social and family factors, depressive symptoms, and other comorbid health conditions. Table 1 provides a guideline for an initial clinical assessment for a midlife woman with sleep complaints and initial actions that may be necessary or beneficial.

The first step in assessment is to ask the woman to describe her sleep complaint and sleep habits to determine whether the sleep problem involves difficulty falling asleep, maintaining sleep, or an insufficient amount of sleep to feel rested or stay awake during the day. For difficulty falling asleep, further questioning should assess for uncontrollable leg movements or restless legs, uncontrollable thoughts or mind racing, and pain. These are prevalent problems in women's health. For restless legs, family history and anemia are etiologic factors. Difficulty falling asleep can also occur because of uncontrollable thoughts and mind racing, which requires a clinical assessment for anxiety or depressive disorder, evaluation of life stressors or health conditions and history of traumatic stress or abuse. Finally, the presence of pain may prevent sleep onset and needs to be assessed and managed. If falling asleep takes more than 30 minutes and occurs three or more nights each week, a referral to an accredited sleep center or mental health evaluation should be considered.

For the woman who falls asleep quickly but has difficulty maintaining sleep, assessment includes questions about herself, her bed partner, children, and pets. Falling asleep too quickly or "when the head hits the pillow" is a sign of chronic sleep deprivation and reasons for waking during the night or short sleep duration need to be ascertained. Asking about urinary frequency and bladder function at night as well as environmental noises is informative. Regularity of her sleep-wake schedule, especially following an initiating traumatic event or diagnosed health condition is essential to assess. It is important to ask about bed partner's behavior during the night that may be disturbing her sleep. If she has children, it is important to ask whether they are cosleeping or bed sharing. If they are bed sharing, reasons why and effects on her sleep quality

Table 1: Initial Clinical Assessment of Sleep Disturbance in Midlife Women

Sleep Problems	Initial Assessment	
	Areas	Initial Interventions
What is her sleep complaint?	Ask for description of sleep problem	
	Usual sleep habits? Presleep routine?	
	Daytime functioning? Sleep problems in past?	
Difficulty falling asleep	Reason?	
Leg movements or restless legs	Assess for anemia or family history	Possible referral to accredited sleep center for evaluation
	Ask about legs twitching, feeling of needing to move legs at night or get out of bed	
Mind racing	Assess for anxiety, depression, concurrent life stressors, usual coping, health conditions	Possible referral for mental health treatment, evaluation and treatment of pain
	Assess for traumatic stress or history of violence or abuse	
Pain	Describe pain experience	
Difficulty maintaining sleep	Reason?	
Herself	Assess urinary frequency and bladder function	Possible referral for urologic evaluation
	Ask about irregular sleep-wake schedule, possibly following an initiating event such as trauma or hot flashes	Evaluate for cognitive behavioral treatment for insomnia

Table 1. Continued

Sleep Problems	Initial Assessment	
	Areas	Initial Interventions
Her bed partner	Assess partner snoring or leg kicking	Refer partner for sleep evaluation
Her child	Assess for age of children, cosleeping or bed sharing. Cultural reason?	Consider recommendation children not share bed
Pets	Assess for pets sharing bed	Recommend pets not share bed
Insufficient amount of sleep to feel rested or stay awake during the day	Assess total sleep time for > 7 hrs	Refer to accredited sleep center for evaluation
	Assess sleepiness or falling asleep in hazardous situations such as driving	
	Assess for temporal-mandibular joint problems	Refer to oral medicine
	Ask bed partner or videotape to assess snoring, kicking, leg movements, teeth grinding, or symptoms of sleep-disordered breathing (breathing pauses, gasping)	If present, refer to accredited sleep center and/or oral medicine
Differential diagnoses		
Assess menopausal status and date of last menstrual period	Confirm menopausal status with follicle stimulating hormone level regardless of age	
Assess for hot flashes and other vasomotor symptoms associated with menopause	Ask about frequency and severity	

Table 1. Continued

Initial Assessment		
Sleep Problems	Areas	Initial Interventions
Assess for general health and health conditions such as obesity, diabetes, and esophageal reflux	Determine body mass index, fasting blood glucose, upper gastrointestinal study	Obtain nutrition or diet consultation
Evaluate lifestyle behaviors (amount and timing)	Smoking pattern	Provide information about healthy sleep habits
	Alcohol consumption	
	Caffeine consumption	
	Exercise	
Rule out depressive disorder	Daytime and evening napping	
	Amount of daylight exposure	
	Ask about depressed mood and interest in usual activities and interests in last 2 weeks	Possible referral for mental health treatment
	Ask about sources of stress	
	Ask about supportive relationships	
	Differentiate depressive symptoms from fatigue or sleepiness	

Note. Adapted from Lee, K.A. (2006). Sleep in midlife women. *Sleep Medicine Clinics*, 1, 197-205. Moline, M.L. Broch, L. and Zak, R. (2004). Sleep in women across the life cycle from adulthood through menopause. *Medical Clinics of North America* 88 (3), 705-736. Used with permission from Elsevier. Morin, C.M. and Espie, C.A. (2003). *Insomnia: A clinical guide to assessment and treatment*. NY: Kluwer Academic/Plenum Publishers. Used with permission of Springer.

need to be discussed. Pets sharing the bed can be disruptive but may need to be weighed against providing a sense of security that allows for less anxiety and better sleep. If sleep is disrupted three or more times during the night, for three or more nights each week, a urologic evaluation or sleep evaluation for her or her partner at an accredited sleep center may be warranted. Patient education may include recommendations that children or pets not share the bed.

For the woman whose sleep problem is insufficient amount of sleep to feel rested or awake during the day, begin with assessing usual bedtime and final wake time. If she is sleepy during the day or falling asleep in hazardous situations such as driving when she reports being in bed sleeping at least 7 hours, a referral to an accredited sleep center is critical. The likely culprit for her disrupted sleep may be occurring without her awareness when she is asleep. If possible, ask the bed partner for information or videotape the woman sleeping to observe for snoring, kicking, teeth grinding, or symptoms of sleep disordered breathing (breathing pauses, gasping). If these symptoms are present, refer to an accredited sleep center for evaluation.

Differential diagnoses include primary sleep disorders such as restless legs, insomnia or sleep disordered breathing, comorbid health conditions such as obesity, diabetes or esophageal reflux, menopausal status and symptoms such as hot flashes, lifestyle behaviors, and depressive disorder. For confirmation of primary sleep disorders, refer to accredited sleep center for evaluation. Menopausal status can be confirmed with a FSH level and changes occur in the early 40s. Frequency and severity of hot flashes and night sweats should be assessed. With the prominent association between poor sleep and metabolic function, clinical assessment of BMI for obesity and fasting blood glucose for diabetes is essential and may require a nutrition or endocrinology consultation if indicated to rule out night sweats due to thyroid or metabolic dysfunction.

Lifestyle behaviors occur during the day but affect sleep in many ways and should be assessed. Smoking, alcohol consumption, caffeine consumption, physical exercise, daytime and evening napping, and exposure to daylight are among the many factors that influence sleep quality. Information about healthy sleep habits (also known as sleep hygiene) is readily available from the National Sleep Foundation or American Academy of Sleep Medicine Web sites.

Because insomnia is highly associated with depression and anxiety, it is important to rule out these disorders. Asking a midlife woman about depressed mood or loss of interest in usual activities and interests within the last 2 weeks, sources of stress and the presence of supportive or stressful relationships can be more revealing than asking about hot flashes. It is important for clinicians to differentiate depressive symptoms from fatigue or sleepiness and refer for mental health evaluation and treatment when necessary.

Interventions to Consider

Interventions for sleep disturbance include options ranging from short-term use of hypnotics to long-term cognitive behavioral therapy (CBT) for insomnia (Dorsey, Lee, & Scharf, 2004; Perlis, Jungquist, Smith, & Posner, 2005). An excellent handbook describing an evidence-based treatment program for insomnia was developed for clinicians who are not sleep specialists and includes components of CBT for insomnia (Morin & Espie, 2003). These components include sleep hygiene, relaxation therapy, sleep scheduling, and principles and practice of cognitive therapy. In addition, the handbook includes sections on effective use of sleep medications, treatment implementation issues, and an appendix of questionnaires and other useful forms.

Interventions that may be beneficial for hot flashes and related sleep problems are hormonal and non-hormonal pharmaceutical therapies and life style changes that either improve thermoregulation or sleep quality. In selected postmenopausal women, hormonal therapies may be appropriate for severe menopausal symptoms (Cobin et al., 2006). In addition, low-dose estradiol transdermal spray has been found to be effective (Buster, Koltun, Pascual, Day, & Peterson, 2008). Antidepressants (selective serotonin reuptake inhibitors or serotonin norepinephrine reuptake inhibitors) are nonhormonal oral therapies for menopausal hot flashes that have evidence for efficacy. Clonidine and gabapentin are thought to work by widening the thermoneutral zone and may be useful for highly symptomatic women who cannot take estrogen, but they are not considered optimal therapy given the potential side effects (Freedman, 2005b; Nelson et al., 2006).

Nonpharmacologic therapies may also be helpful for hot flashes. Acupuncture, relaxation procedures, and paced respiration (slow, deep abdominal breathing) have been tested in small clinical trials (Cobin et al., 2006; Freedman, 2005b;

Zaborowska et al., 2007). These therapies may work by widening the thermoneutral zone. Other recommended strategies include avoiding warm environments and using cooling strategies such as dressing in layers, drinking cold drinks, holding a cold object, and using fans or air conditioning. Yawning has even been found to be an effective cooling mechanism (Gallup & Gallup, 2008) but more study is needed. Weight loss and smoking cessation are also strategies associated with fewer complaints of hot flashes (Freedman).

Summary

The purpose of this review was to describe women's sleep across the lifespan and discuss sleep disturbance in midlife women in relation to age, menopausal transition, stress, and other factors. Currently, the evidence does not permit an unequivocal answer about the cause of sleep disturbance in midlife women. Sleep architecture differs by age and sex but sleep disturbance in women is not due to chronologic age per se. When the menopausal transition is studied, associations of menopause with sleep quality differ for objective and self-report data. Qualitative research may be useful in better understanding this difference between PSG recordings and perception of diminished sleep quality through the menopausal transition. Sleep disturbance is associated with hot flashes and specific reproductive hormone changes, but most importantly with comorbid illnesses and stressors that arise during midlife. Stress has a direct effect on sleep quality and an indirect effect as it is thought to narrow the thermoneutral zone while relaxation and other strategies can widen the zone. Women may also have undiagnosed sleep disorders and require a formal sleep clinic evaluation. Sleep disturbance in midlife women should not be attributed entirely to the menopausal symptom experience but should trigger a careful clinical assessment to identify other potential and more likely causes of poor sleep such as primary sleep disorders, medical or psychiatric disorders, life stressors, and lifestyle behaviors. Interventions targeted at improving sleep quality will also improve daytime functioning and quality of life for women at midlife and beyond.

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