

Sleep in the Elderly

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Older people have difficulty in falling asleep and staying asleep due to frequent arousals. It is important to know how sleep patterns change as we age and, at the same time, to recognize primary sleep disorders among the elderly people.



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Abstract

Aging is associated with several changes in sleep patterns. Older adults have increased prevalence of primary sleep disorders including insomnia, sleep disordered breathing, restless legs syndrome, REM sleep behavior disorder, and circadian rhythm disturbances. These can be further compromised by sleep disturbances secondary to medical or psychiatric disorders, and medication side effects. This review discusses age-related changes in sleep architecture, etiology, clinical presentation, and treatment options of various sleep disorders in the elderly.

Introduction

Sleep is an important aspect for health and wellness across the lifespan. The number of people in the United States who are 65 years or older is steadily increasing, and is expected to double over the next 25 years to about 72 million. By 2030, roughly one in five people in the US will be over the age of 65.¹ Sleep physiology changes with the age, and many sleep disorders increase in the elderly. As many as 50% of older adults, compared to 15.9 to 22.3% of the general population, complain about sleep problems.² In the elderly population, a large contributing factor to poor sleep is the high prevalence of medical and psychiatric comorbidities in addition to the issue of polypharmacy. Sleep complaints

when persistent, can lead to daytime sleepiness, which can lead to morbidity in elderly people, such as impaired cognition, disorientation, delirium, as well as increased risk of falls. Patients with sleep disorders are often more likely to develop cardiovascular and cerebrovascular disorders, and individuals with a history of these medical disorders are often at a high risk of developing sleep disorders. Sleep disturbance in the elderly should be considered a multifactorial geriatric health condition, requiring consideration of multiple risk factors and a comprehensive treatment approach.³ In this review, we will focus on common sleep disorders, along with the diagnostic and specific treatment options to help improve quality of life in the elderly population.

Sleep Changes with Aging

As part of the natural aging process, sleep becomes more fragmented and lighter with an increase in the number of EEG arousals and awakenings which result in reduced sleep efficiency and total sleep time.⁴ Several changes occur in both sleep architecture as well as sleep parameters throughout the lifespan.⁵ (Table 1.) The percentage of stage N1 and stage N2 along with time spent awake during the night increases with aging while there is a reduction in sleep efficiency and slow-wave sleep percentage. The elderly tend to

Table 1. Age-Related Changes to Sleep Architecture

Sleep Parameter	Increased	Decreased
	Sleep Latency	Sleep efficiency
	Time awake after sleep onset (WASO)	Total sleep time
	Number of arousals from sleep	Slow wave sleep

go to bed earlier and wake up earlier when compared to young adults. The shift in sleep times is due to the circadian rhythm generated by the pacemaker that is located in the suprachiasmatic nucleus (SCN) of the hypothalamus. Aging is associated with a decrease or malfunction in sensitivity of the SCN to environmental cues to adjust circadian rhythm to a natural 24-hour day/night cycle. Melatonin levels also diminish with age and reach levels similar to daytime concentrations which may contribute to the increased prevalence of sleep-related disorders with aging.⁶ The amplitude of circadian rhythms, including those of body temperature and hormones including cortisol, are reduced in the elderly.⁷ Sleep homeostasis also declines with aging. The age-related decrease in total sleep time and sleep efficiency may be partially due to the reduced homeostatic sleep pressure with aging.^{8,9} The age-related changes mentioned above are mostly relevant to older adults who are in excellent health. However, a significant percentage of older adults have multiple comorbidities, including osteoarthritis, cardiovascular disease, pulmonary disorder, psychiatric illnesses, diabetes mellitus, gastroesophageal reflux and cancer.¹⁰ The increased use of medications along with an increase in prevalence of primary sleep disorders may also have a detrimental effect on sleep. It is therefore reasonable to say the sleep problems reported in elderly people are usually multifactorial and are not necessarily explained by age alone.

Common Age-Related Sleep Disorders

Insomnia

There is a high prevalence of reported sleep disturbances in the elderly. Foley and colleagues reported up to 43% of older adults with complaints of initiating or maintaining sleep.¹¹ Multiple factors increase the risk of developing insomnia in older adults. (Table 2.) For example, sleep complaints may be caused by behavioral and environmental issues. Many individuals older than 65 years are retired and may not feel the need to follow a regular sleep-wake schedule. In addition, people who are institutionalized may be at a higher risk of sleep disturbance due to social isolation

and decreased daily activity. A number of primary sleep disorders including restless leg syndrome, periodic limb movement disorder, sleep apnea, and rapid eye movement sleep disorder can present as insomnia. Also, many medications (e.g., beta blockers, bronchodilators, anticholinergics, antihypertensives, antidepressants, and stimulants) cause or exacerbate insomnia.¹²

Due to the high prevalence and negative consequences of insomnia in older adults, screening for insomnia and other sleep disorders should be included in the routine clinical evaluation. It is important for clinicians to take a detailed history from patients and their bed partner, asking for insomnia symptoms, sleep-wake patterns, other sleep related questions, daytime functioning, and previous treatments.¹³ As in younger adults, use of the sleep diary and/or structured sleep questionnaires (e.g., Insomnia Severity Index, Pittsburg Sleep Quality index) is appropriate in older adults. Elderly people with significant vision or hearing impairment and problems with manual dexterity may have difficulty with completing these diagnostic methods. Objective assessments of sleep such as polysomnography and wrist actigraphy are usually not indicated in the routine evaluation of insomnia but may be utilized to rule out other sleep disorders including sleep disordered breathing, disruptive nocturnal movements, and circadian rhythm sleep-wake disorders.¹⁴ The treatment of insomnia in the elderly population must include maintaining a regular sleep-wake schedule, optimizing treatment of comorbid medical and psychiatric conditions, and eliminating medications contributing to insomnia. Several studies suggest behavioral/psychological treatment should be the first-line treatment for insomnia in older adults.¹⁵ Cognitive therapy of insomnia (CBTi) is a multicomponent process that involves cognitive and behavioral techniques like stimulus control therapy, sleep restriction therapy, cognitive restructuring, relaxation techniques, and sleep hygiene education.¹⁶ Pharmacotherapy should be exercised with caution in the elderly due to reduced metabolism, as well as, drug-to-drug interactions in patients that take multiple medications. Longer acting benzodiazepines should

Table 2. Causes of poor sleep in the Elderly Subjects

Physiologic	Age related changes in sleep efficiency
Medical Disorders	Cardiopulmonary disorders, Arthritis, Chronic pain syndrome, Neurodegenerative disorders Gastroesophageal reflux disorder
Psychiatric Disorders	Depression, Anxiety Disorder
Behavioral	Excessive napping, Use of caffeinated beverages, including alcohol
Medications	Diuretics, Beta-blockers, Anti-depressants
Primary sleep disorders	Insomnia, Restless Legs Syndrome, Sleep disordered breathing, REM sleep behavior disorder

be avoided due to risks of daytime sedation, falls, and confusion.¹⁷ Due to a shorter duration of action, most non-benzodiazepines (zolpidem, eszopiclone and zaleplon) are believed to carry a lower risk of side effects. However, these should be avoided in older adults with dementia and cognitive impairment.¹⁸ Other FDA approved agents include melatonin receptor agonist, such as ramelteon which has shown efficacy in older adults for sleep initiation insomnia.¹⁹ Diverse categories of antidepressants (including trazodone, tricyclic antidepressants, and mirtazapine) and first-generation anti-histamines (diphenhydramine) have been used for the treatment of insomnia. In the absence of an underlying depressive disorder, antidepressants should be avoided in the elderly because they can also increase the risk of falls and cause orthostatic hypotension. Melatonin is an endogenous hormone secreted by the pineal gland and has been used in people with insomnia in different doses and strengths. Melatonin decreases subjective sleep latency in some studies but may cause headaches and drowsiness.²⁰ Melatonin preparations are not regulated by the FDA.

Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is characterized by instability of the upper airway during sleep via recurrent pharyngeal collapse which results in reduced (hypopnea) or absent (apnea) airflow.²¹ OSA increases with advancing age, with prevalence estimates varying depending on the definition used. OSA prevalence in older adults may be as high as 70% in men and 56% in woman as compared to the prevalence estimates of 15% in men and 5% in women in the general adult population.²² The increase in prevalence has been

attributed to the structural changes to the upper airway, including lengthening of soft palate and upper airway fat pad deposition.²³ Elderly people are more likely to present with excessive daytime sleepiness and nocturia while witnessed apneas and snoring may not be reported as frequently.^{24, 25}

Although there has been controversy about whether sleep disordered breathing has health consequences in older adults, recent studies indicate a significant health risk of sleep disordered breathing in older adults.^{26, 27} In a six-year follow-up in a population-based cohort of 394 noninstitutionalized elderly subjects (ages 70-100 years, median 77 years, 57% men), Munoz et al. found that severe obstructive sleep apnea (Apnea Hypopnea Index (AHI) index of greater than 30) at baseline had an increased risk of ischemic stroke in the elderly.²⁸ Whether sleep disordered breathing increases the risk of hypertension in older adults remains uncertain given the conflicting findings in the literature. In a cross-sectional analysis, sleep disordered breathing was not associated with systemic hypertension in subjects age 60 years or older.²⁹ Conversely, a French study reported that an AHI of 30 or greater was independently associated with incident hypertension, after three years, in normotensive older adults.³⁰ A longitudinal study of incident congestive heart failure showed that each 10 unit increase in the AHI led to a 13% increase in heart failure in men, but not in woman.³¹ The diagnosis of sleep apnea requires overnight sleep study and previously necessitated an overnight stay at an in-lab sleep facility. The Centers for Medicare and Medicaid Services has also approved portable at home sleep apnea testing (HSAT) for subjects with suspicion

of sleep disordered breathing. Home sleep testing is generally recommended for patients with moderate to high clinical probability of sleep apnea. Ambulatory monitoring can be successfully completed in older adults, but factors such as adequate visual acuity, arthritis and other functional limitations may need to be addressed.

As with younger adults, continuous positive airway pressure (CPAP) therapy is the treatment of choice in older patients. Before instituting any specific treatment, certain general measures are recommended including weight loss, smoking cessation, avoidance of alcohol and sedatives before bedtime, avoidance of supine sleep position and maintaining nasal patency. The major limiting factor for CPAP use is patient adherence: approximately 40 to 50% are adherent.³² Older age by itself does not affect CPAP adherence.³³ Adherence to CPAP therapy in older adults may be impaired by factors such as medical and mood disorders, cognitive impairment, impaired manual dexterity, nocturia, and lack of a supportive partner. The benefits of CPAP therapy are noticeable in older population, with improvement in cognition, memory, executive function, sleep quality and cardiovascular function.³⁴ For Medicare to cover CPAP therapy long-term, the patient must use CPAP for a minimum of four hours a night on 70% of the nights for at least one month during the initial three-month trial. In addition, they require a face-to-face encounter with the ordering physician to document clinical response at sometime between months one and three. Individuals who have failed or refused CPAP therapy for obstructive sleep apnea may be considered for oral appliances. These devices are effective in treating snoring and mild to moderate obstructive sleep apnea but may not be appropriate in older adults who are edentulous. Common side effects include dry mouth, increase salivation, tooth soreness and temporomandibular joint discomfort. As with younger adults, upper airway surgery is not particularly effective for older patients and may be associated with especially high morbidity in the elderly.³⁵

Sleep-Related Movement Disorders

Restless legs syndrome, also known as Willis-Ekbom disease, is characterized by an urge to move the legs often accompanied by abnormal leg sensation, resulting in sleep initiation and/or sleep maintenance problems.³⁶ Restless legs syndrome (RLS) may be idiopathic or secondary to other medical conditions

including iron deficiency anemia, chronic renal disease and peripheral neuropathy. Medications including SSRIs, tricyclic antidepressants, lithium along with excess caffeine intake and tobacco smoking can worsen symptoms in RLS patients. Restless leg syndrome is common in older people, with an estimated prevalence of 10-35% among those over 65 years of age.³⁷ The majority of people with RLS also present with periodic limb movements (PLMs) in sleep that are characterized by repetitive, stereotyped movements of the big toe and ankle and occasionally of the knee and hip. However, PLMs occur in the absence of RLS approximately 70% of the time.³⁸ This syndrome is diagnosed with polysomnography by recording bursts of electromyographic activity that recur at regular periods in the affected muscles. Although PLMs may be asymptomatic and require no treatment, the findings of PLMs in patients with unexplained insomnia may warrant appropriate treatment. The pathogenesis of RLS is unclear, but appears to involve abnormalities in the dopaminergic neural transmission.³⁹ Iron replacement therapy should be considered for RLS treatment when serum ferritin levels are lower than 50 µg/L. If there is no response to iron supplementation or the initial ferritin is >50µg/L, RLS is usually treated with dopaminergic agents such as ropinirole or pramipexole. Patients should be warned about side effects including sleep attacks and compulsive behaviors. In some cases, augmentation can occur that leads to reemergence and worsening of RLS symptoms. Alpha-2-delta calcium channel ligands such as gabapentin, gabapentin enacarbil, and pregabalin are also effective therapies for RLS with data showing decreased augmentation with pregabalin.⁴⁰ Benzodiazepines and opioids may be used in refractory cases but caution is warranted while using these medications in the elderly population.

Rapid Eye Movement Sleep Disorder

Rapid eye movement sleep disorder (RBD) is a parasomnia that occurs during REM sleep and is characterized by dream enacting behavior. Affected people may display a variety of movements, which in extreme cases can be harmful to the patient or bed partner. These behaviors/movements can include talking, shouting, thrashing limbs, punching, while remaining in REM sleep. RBD is most prevalent among older adult males.⁴¹ Although the etiology of RBD is unclear, acute onset of RBD has been associated with the use of tricyclic antidepressants, fluoxetine, monoamine oxidase inhibitors, and withdrawal

from alcohol or sedatives.⁴² Chronic RBD has been associated with neurodegenerative disorders such as Parkinson's disease, Lewy body dementia, and multiple system atrophy. Interestingly, symptoms of REM sleep behavior disorder may precede a diagnosis of Parkinson's disease for years.⁴³ RBD is diagnosed with polysomnogram to detect loss of muscle atonia during REM sleep in the setting of proper clinical context. Patient education, including removing potentially hazardous objects from the bedroom and placing the mattress on the floor to prevent falling from the bed is important to prevent sleep-related injury. RBD is often treated with clonazepam, a long-acting benzodiazepine, which is shown to reduce or eliminate abnormal motor behavior in approximately 90% of RBD patients.⁴⁴ Melatonin is an alternative therapy and is usually better tolerated in the elderly population and therefore may be used as a first-line agent in this group.⁴⁵

Circadian Rhythm Sleep-Wake Disorders

Circadian rhythm sleep-wake disorders (CRSWD) occur when the timing of sleep is disrupted due to an altered circadian rhythm or mismatch between an individual's circadian rhythm and required sleep-wake schedule. The sleep-wake cycle is controlled by the suprachiasmatic nucleus (SCN) in the hypothalamus. This brain region controls the internal circadian pacemaker, which is synchronized to the hour of the day by both external cues and internal cues. Light is the most important external cue while the core body temperature and melatonin are the internal cues. Circadian rhythms become weaker and less responsive to the external stimuli with advancing age. Advance sleep-wake phase schedule (ASWPS) is the most common circadian rhythm sleep-wake disorder in older adults. Elderly people with ASWPS tend to become sleepy early in the evening (typically between 1900 and 2000 h) and wake up early in the morning (typically around 0300 to 0400 h). Many of these adults feel pressure from societal norms to stay up later in the evening, despite being sleepy and despite continuing to wake up early in the morning. This can lead to limited sleep resulting in daytime sleepiness. ASWPS can easily be misdiagnosed as insomnia and it's important to differentiate between the two diagnoses because the treatment approach differs. Circadian rhythm disorders are treated with bright light therapy where the patient is exposed to light at specific times which helps to realign the sleep-wake schedule.

Sleep and Dementia

Sleep disturbances are common (25-40%) in patients with Alzheimer's dementia.⁴⁶ Patients with neuro-degenerative disorders, including Lewy body dementia (LBD) or Parkinson's disease (PD) may have sleep disorders including REM sleep behavior disorder (RBD). Sleep disordered breathing is the most common sleep disorder in individuals with vascular dementia while patients with Alzheimer's dementia present more commonly with symptoms of insomnia and excessive daytime napping.⁴⁷ The polysomnographic findings in patients with Alzheimer's disease include a decrease in sleep efficiency, increase in N1 sleep, increase in awakening frequency, and a reduction in sleep spindles and K complexes.⁴⁸ Individuals with dementia are also at risk for irregular sleep-wake rhythm disorder (ISWRD) where the person sleeps in fragmented episodes during the day and night. Pharmacological agents for the treatment of dementia may also disrupt sleep. Individuals taking acetylcholinesterase inhibitors to slow down the cognitive decline in Alzheimer's dementia may lead to increased nighttime arousals and nightmares.⁴⁹ Behavioral interventions including a daily consistent routine for bed and wake times should be instituted. Naps may be planned but should be brief and consistently done at the same time every day. Bright light therapy has been shown to increase sleep efficiency and total sleep time in individuals with dementia.⁵⁰

Conclusion

In conclusion, there are changes to sleep architecture throughout the lifespan that are considered normal. Older people have difficulty in falling asleep and staying asleep due to frequent arousals. It is important to know how sleep patterns change as we age and, at the same time, to recognize primary sleep disorders among the elderly people. Careful assessment of sleep including a comprehensive sleep history, and relevant testing, should be conducted to evaluate the patient's complaints. Treatment should address both the primary sleep problem and any comorbidities thereby optimizing the chance for improvement in quality of life and functioning in older adults.

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Disclosure

None reported.

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