



Sleep and Aging **Mangala Narasimhan, DO**

Sleep patterns change with age.¹ Aging is characterized by changes in circadian rhythms, sleep architecture, sleep quality and the frequency of sleep disorders. These changes result in recurrent sleep complaints and the frequency of complaints have been found to predict the general physical and mental health-related quality of life status in elderly populations with co-morbid medical and mental illness.²

Age-related changes

Changes in circadian physiology include an advance of the circadian sleep phase, a shortening of the free-running sleep period, and a desynchronization of rhythms. Circadian rhythm changes have a relationship to age-related retinal changes, as well as changes in suprachiasmatic nucleus and pineal gland function. The suprachiasmatic nucleus is the site of the circadian pattern generator and is normally influenced by light exposure (through the retina) and melatonin (secreted by the pineal gland). Age-related behavioral changes, such as decreases in physical activity and photic stimulation, can also affect the circadian pattern generator.³ Circadian rhythm changes are frequently associated with a reduction in nighttime sleep quality, a decrease in daytime alertness, and attenuation in cognitive performance.

Sleep architecture, the distribution and pattern of sleep stages, changes as people age. A 2004 study looking at over 6000 patients showed that stage 1 and 2 sleep was significantly higher in individuals older than 61 years and stage 3-4 was

Sleep and Aging

Mangala Narasimhan, DO
Page 2 of 6

significantly lower in those older than 54 as compared to younger individuals. The percentage of time spent in rapid eye movement (REM) sleep was also lower in those 61 or older and sleep efficiency decreased significantly with increasing age. The number of awakenings also increases.⁴

The role of menopause is important in assessing the cause of sleep architecture change in elderly females. Studies have found that post-menopausal sleep is worse than in young controls.⁵ There is prolonged sleep latency, many awakenings, a shorter sleep time, and a significant difference in the subjective quality of sleep. There is also less REM sleep. Recovery sleep after sleep deprivation seems to be preserved in post-menopausal women. Hormone replacement therapy has not been shown to improve sleep and has been shown to worsen recovery sleep.

Primary sleep disorders, as well as sleep problems secondary to other medical problems, medications or social conditions, may disturb sleep and are more common in the elderly. The prevalence of obstructive sleep apnea (OSA), insomnia and restless legs syndrome increases with age. Several sleep disorders, such as REM sleep behavior disorder and advanced sleep phase circadian rhythm disorder typically don't appear until middle age or later. Many co-morbid illnesses that can disrupt sleep, such as arthritis, heart failure, stroke, bronchitis or emphysema, are more common in the elderly. In addition, many medications that older adults take routinely affect their ability to sleep.

Sleep complaints in the elderly

The chief sleep complaints of older adults include waking not feeling rested, waking too early, difficulty falling asleep, frequent daytime napping and nocturnal

Sleep and Aging

Mangala Narasimhan, DO
Page 3 of 6

waking. As a result of poor sleep, they also complain of difficulty sustaining attention, slowed response time and decrease in memory and performance.

There is a discrepancy between the number of complaints and the prevalence of sleep disorders. While aging results in significant changes in sleep pattern and the frequency of sleep disorders, there is not the expected increase in complaints of insomnia and sleep apnea as many individuals seem to adapt to their changing sleep patterns and what they consider acceptable sleep.⁶ As a result, this population tends to underreport symptoms of common sleep disorders.

Sleep disorders and aging

As in the general population, sleep disordered breathing is a significant cause of interrupted, poor quality sleep in elderly individuals. It often remains undiagnosed in the elderly. As opposed to younger patients, OSA in the elderly is less likely to be related to weight-related measures such as body mass index (BMI) and neck circumference, but may be related to upper-airway muscle changes, genioglossus muscle fiber type distribution and changes in respiratory drive.⁷ Aging has been shown to contribute significantly to an increase in the size of lateral pharyngeal fat pads, resulting in a reduction in the size of the upper airway, independent of BMI.⁸

Other sleep disorders that are seen in the elderly are REM sleep behavior disorder, advanced sleep phase disorder and periodic limb movements of sleep. REM sleep behavior disorder is seen in men more than women and usually above the age of 60. The muscle atonia that normally accompanies REM sleep is not seen and patients act out their dreams, which are usually vivid, violent dreams of being attacked. The symptoms are best described by the bed partner. Two thirds of men diagnosed with

Sleep and Aging

Mangala Narasimhan, DO
Page 4 of 6

REM sleep behavior disorder after the age of 50 go on to develop a parkinsonian disorder. Advanced sleep phase disorder is a circadian rhythm disorder that is extremely common in the elderly and is believed to be linked to inactivity, less exposure to sunlight, and changing environmental cues. The circadian sleep phase shifts earlier and earlier so that those with this problem go to sleep in the early evening and awake early in the morning. Periodic limb movements of sleep are very common in the elderly, presenting as repetitive movements that can fragment sleep. A surprising finding is that they have not been found to be associated with excessive daytime sleepiness in the elderly.

Multiple other factors interact to increase the risk of hypersomnolence in older adults. These factors include chronic pain, respiratory disorders and medications. There is a high prevalence of chronic pain in the elderly and this likely has a significant affect on the quality and quantity of sleep. Also, the medications taken both for pain and for many of their co-morbid conditions may cause sleepiness as a side effect, including antihistamines, antihypertensives, antidepressants, antipsychotics, anticonvulsants, and analgesics.⁹

Treatment of sleep disorders

In addition to disorder-specific therapies, general recommendations for treating sleep disorders in the elderly include changing medications or the timing of medications that interfere with sleep, maintaining regular exercise regimens, avoidance of fluid intake in the evening and avoidance of alcohol and caffeine. Another important feature is recognizing depression and treating it appropriately.

Sleep and Aging

Mangala Narasimhan, DO
Page 5 of 6

The first line therapy for OSA in the elderly is continuous positive airway pressure (CPAP). However, the elderly have many more problems with compliance to CPAP and other treatment measures.¹⁰ This may be related to inadequate symptom resolution, problems with dexterity, understanding and memory. Provisions for addressing these problems need to be part of OSA management programs for the elderly.

Treatment of insomnia includes identifying and correcting factors that contribute to sleep problems as well as directly addressing the sleep complaint. Magnesium and calcium deficiencies have been shown to cause an increase in sleep fragmentation and sleep maintenance insomnia.¹¹ Cognitive behavioral therapy is an effective option for treating insomnia in the elderly and can also be combined with medications. Hypnotic use has been shown to decrease insomnia and there is a suggestion that it may protect against falls and hip fractures.¹² There is no clear consensus on the safety of sleep medications in the elderly. Appropriate treatment should be guided by the severity of symptoms and concurrent medical problems and medications. Efficacious pharmacologic interventions are the non-benzodiazepine hypnotics zolpidem, zaleplon, eszopiclone and ramelteon. The benzodiazepine hypnotics may also be used safely in this population. In general, for the older population, hypnotics need to be given at the lowest possible dose for a short period of time, as other treatments are being pursued. These patients need to be followed closely.

One study looked to see if naps could be used to increase total 24 hour sleep time in the elderly.¹³ Napping in the early afternoon for 30-90 min did not have an effect on nighttime sleep quality or duration and resulted in a significant increase in total 24 hour sleep amounts. This increased sleep resulted in enhanced cognitive and

Sleep and Aging

Mangala Narasimhan, DO
Page 6 of 6

psychomotor performance throughout the next day. Other studies have linked napping in the elderly to an increase in depression and higher mortality.¹⁴

Given that sleep complaints are common in the elderly and seem to be directly related to quality of life scores, questions regarding sleep should be an integral component of most clinical evaluations. Identification of sleep disorders can lead to improvement in chronic illnesses and quality of life for older adults. Attention should be paid to the sleep history, the interaction with medical and psychiatric history, medications, level of activity and sleep-wake schedules. Although the sleep pattern changes over the course of a lifetime, not all sleep disturbances are a natural consequence of aging and are frequently due to treatable conditions.

¹ Carskadeon MA, Rechtschaffen A. Monitoring and staging human sleep. In: Kryger MH, Roth TT, Dement WC, eds. *Principals and practice of sleep medicine*. 4th ed. Philadelphia: Elsevier Saunders 2005.

² Reid KJ, et al. Sleep: a marker of physical and mental health in the elderly. *American Journal of Geriatric Psychiatry*. 2006;14(10):860.

³ Myers BL, Badia P. Changes in circadian rhythms and sleep quality with aging: Mechanisms and interventions. *Neuroscience and Biobehavioral Reviews*. 195;19(4):553-71.

⁴ *Arch Intern Med*, Vol 164(4). February 23, 2004.406-418.

⁵ Kalleinen N et al. Sleep deprivation and hormone therapy in post menopausal women. *Sleep Medicine*. 2006;7(5):436-47.

⁶ Vitello MV, Larden LH, Moe KE. Age-related sleep change: Gender and estrogen effects on the subjective-objective sleep quality relationships of healthy, non-complaining older men and women. *Journal of Psychomatic Research*. 2004;56(5):503-510.

⁷ Avidan A. Sleep disorder breathing in the geriatric patient population in 2005. *Advances in Cell Biology and Gerontology*.. Philadelphia;Elsevier; 79-112.

⁸ Malhotra A et al. *The American Journal of Medicine* 2006;119: 72e9-72e14.

⁹ Pack AI, Dinges DF, Gehrman PR, et al. Risk factors for excessive sleepiness in older adults. *Ann Neurol* 2006; 59:893-904.

¹⁰ Young T, Shahar E, Nieto FJ, et al. Predictors of sleep-disordered breathing in community-dwelling adults: the Sleep Heart Health Study. *Arch Int Med* 2002;162:893-900.

¹¹ Sleep/Sleep disorders/ Insomnia news March 20th 2007. <http://www.medicalnewstoday.com/medicalnews.php?newsid=65698>

¹² Avidan AY, et al. Insomnia and hypnotic use, recorded in the minimum data set, as predictors of falls and hip fractures in Michigan nursing homes. *Journal of the American Geriatrics Society*. 2005;53(6):955-62.

¹³ Campbell S, Murphy P, Stauble P, Thomas N. Effect of a nap on nighttime sleep and waking function in older subjects. *Journal of the American Geriatrics Society*. 53(1):48-53, 2005.

¹⁴ Hays JC, Blzaer DG, Foley Dj. Risk of napping: excessive daytime sleepiness and mortality in an older community population. *J Am Geriatr Soc* 1996; 44:693-698.