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Sleep in the Elderly – When to Reassure, When to Intervene

By JULIE CARRIER, PhD, MARJOLAINE LAFORTUNE, BSc,
and CAROLINE DRAPEAU, PhD

Sleep changes occur from the cradle to the grave with important modifications even in “optimal aging”. Gradual changes in sleep with aging lead to lighter sleep and more awakenings, especially in the second half of the night. Normal changes in the circadian rhythm produce earlier bedtimes and early morning waking (a phase advance), and lighter sleep. Indeed, complaints of poor sleep quality and insomnia are common in the elderly and are exacerbated in older adults with comorbid medical or psychiatric conditions. The prevalence of some sleep disorders, such as periodic leg movements and sleep apnea, increase with age; others, such as rapid eye movement (REM) sleep behaviour disorder, are associated primarily with increased age. In this issue of *Insomnia Rounds*, we describe some of these sleep disorders and factors that have an adverse effect on sleep in the elderly, review normal changes in sleep and the circadian rhythm with aging, and provide approaches to treatment of insomnia in late life.

The commonality of sleep problems among older adults, from around 40 years of age, is now well established. About half of the elderly complain about their sleep, reporting lower sleep duration, more awakenings, difficulty maintaining sleep, nonrestorative sleep, and daytime somnolence.¹ Many factors may interfere with optimal sleep and wakefulness in older adults, including acute and chronic illness, adverse events of medication, mental health conditions, primary sleep disorders, and abrupt and uncontrollable changes in both social and personal life.¹⁻³ The prevalence of nightly awakenings increases with age, reaching 35% in people aged 65 years or older; the most common reason cited for waking was going to the washroom.⁴

Epidemiology

As described in more detail in the first issue of *Insomnia Rounds*, insomnia is defined as a subjective complaint of insufficient or nonrestorative sleep whose prevalence increases with age.⁵ In a large sample of community-dwelling elderly (2673 men and 3213 women) aged 65 years and older from which patients diagnosed with dementia were excluded, 70% reported frequently or regularly having at least 1 insomnia symptom.⁶ Of the 3 insomnia symptoms assessed (difficulty initiating sleep, difficulty maintaining sleep, and early morning awakening), difficulty with maintaining sleep was the most prevalent symptom in both men and women. Difficulty initiating sleep was more frequent in women, who also more frequently experienced 2–3 symptoms. In men, difficulty maintaining sleep was associated with snoring, which suggests that sleep-related breathing disorders might be associated with their insomnia symptom.

Insomnia has significant consequences on the daily lives of elderly individuals. A recent meta-analysis has shown impaired problem solving, working memory, and episodic memory in individuals with insomnia, compared to those who do not report insomnia-related symptoms.⁷ Insomnia appears to have more detrimental effects on elderly compared to young adults; sleep disturbance is a risk factor for cognitive decline in older adults, and is also associated with increased risk of falls and a higher rate of mortality.⁸

Are primary sleep disorders more common with increasing age?

The prevalence of some primary sleep disorders such as sleep apnea, periodic leg movements, rapid eye movement (REM) sleep behaviour disorder, and advanced sleep phase starts to increase significantly in the middle years of life, from about age 40 years (Table 1).⁹⁻¹⁴

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Table 1. Primary sleep disorders in the elderly

Obstructive sleep apnea (OSA) ^{9,11}	Description	Recurrent apnea (breathing cessation) or hypopnea (reduced breathing) during sleep, despite breathing efforts; caused by upper airway collapse; induce arousals and hypoxemia
	Prevalence	2%-4% in the adult population; 24%-62% in the elderly; 75% are male
	Comorbidities	Excessive daytime sleepiness; cognitive impairments (ie, executive functions and attention); increased risk of motor vehicle accident; hypertension; GERD; depression in women
	Risk factors	Obesity; age; male sex
	Treatments	CPAP; oral appliances; surgery; weight loss
Periodic leg movement in sleep (PLMS) and periodic leg movement disorder (PLMD) ¹²	Description	PLMS: Repetitive limb movements, typically extension of the big toe with partial flexion of the ankle, knee and sometimes hip, during sleep which may induce partial or complete awakenings; often seen in restless leg syndrome (overwhelming urge to move the legs usually caused by uncomfortable or unpleasant sensations in the legs) PLMD: Insomnia or hypersomnia not explained by any factor except PLMS
	Prevalence	4%-11% in the adult population; >35% in the elderly
	Comorbidities	Other sleep disorders; hypertension; alcohol dependency
	Risk factors	Age; psychoactive substances
	Treatments	Levodopa; dopamine agonists
REM sleep behaviour disorder (RBD) ¹³	Description	REM sleep without atonia and prominent abnormal motor behaviour that may cause injury; associated with unpleasant and violent dreams; 3 subtypes: 1) Acute RBD: triggered by psychotropic medication (ie, antidepressant) 2) Symptomatic RBD: associated with neurological disorders 3) Idiopathic RBD: RBD without any associated condition
	Prevalence	0.5% in the general population; 7% in the elderly; 85% of RBD patients are male
	Comorbidities	Sleep disruption injuries; cognitive deficits (attention, executive functions, verbal and nonverbal learning); perceptual abnormalities (olfaction and colour perception); autonomic dysfunctions Idiopathic RBD is strongly associated with neurodegenerative diseases (Parkinson disease, dementia with Lewy bodies, progressive supranuclear palsy, and multiple-system atrophy), and often occurs before disease onset
	Risk factors	Age; male sex; alcohol withdrawal
	Treatments	Clonazepam; melatonin
Advanced sleep phase disorder ¹⁴	Description	Extreme morning-type; bedtimes and wake times several hours earlier than conventional or desired sleep schedule; induce complaints in social functioning and/or everyday responsibilities
	Prevalence	7.4% in the middle-aged population
	Risk factors	Age; genetics
	Treatments	Evening light exposure; prescribed sleep/wake scheduling

GERD = gastroesophageal reflux disease; CPAP = continuous positive airway pressure; REM = rapid eye movement

Physical and Mental Health Status is Closely Related to Sleep Problems

The interrelationships between health and sleep are of great importance for the elderly (Table 2).^{3,15} Older individuals with newly identified serious illnesses are more likely to have emergent complaints of chronic insomnia within the subsequent few years than those who do not develop such medical illnesses.² Cardiovascular diseases, pulmonary diseases, chronic pain conditions, and dementia are all associated with morning fatigue and/or daytime sleepiness while also being a cause of poor nocturnal sleep quality.³ Psychiatric

disorders also have acute symptoms that might contribute to sleep difficulties. For example, the association between major depression and insomnia is now well established.¹⁶

Elderly individuals frequently take medications that may affect their sleep-wake cycle. Drug interactions, dependence to medication, and age-related pharmacokinetic and pharmacodynamic changes increase older adults' susceptibility to the adverse effects of medication.¹⁷

Normal Age-related Sleep Changes

Sleep changes occur from cradle to grave. Important modifications of the sleep-wake cycle occur also in "optimal

Table 2. Factors that adversely influence sleep quality in older individuals^{3,15}

<p>Behavioural and environmental factors</p> <ul style="list-style-type: none"> • Sleep hygiene • Extreme temperature • Noise or light • Lack of exposure to sunlight • Physical inactivity <p>Psychosocial factors</p> <ul style="list-style-type: none"> • Stress • Hyperarousal • Social isolation • Bereavement • Change of residence • Hospitalization • Work status <p>Psychiatric disorders</p> <ul style="list-style-type: none"> • Depression • Anxiety • Psychosis • Delirium • Schizophrenia <p>Physical status</p> <ul style="list-style-type: none"> • Cardiovascular disorders • Pulmonary diseases • Gastrointestinal disorders • Genitourinary disorders • Neurodegenerative disorders • Stroke and seizure • Chronic pain • Thyroid disorder • Diabetes • Menopause <p>Medication and drugs</p> <ul style="list-style-type: none"> • Alcohol • Caffeine • Nicotine • CNS stimulants • Beta-blockers • Thyroid hormones • Calcium channel blockers • Decongestants • Bronchodilators • Corticosteroids • Anticholinergics • Antidepressants

CNS = central nervous system

aging;” ie, in individuals who are free of any medical or psychiatric condition, and who do not present with any specific sleep disorder. Compared to young subjects, elderly individuals demonstrate:

- 1) Changes in sleep schedule¹⁸
 - a) Earlier bedtimes and earlier wake-up times
 - b) More daytime sleep (naps)
 - c) Less nocturnal sleep

- 2) Changes in sleep architecture¹⁹
 - a) Less sleep efficiency: more awakenings during sleep episode, especially in the second half
 - b) Lighter sleep: less slow-wave sleep (stage N3) and more superficial sleep stages (stages N1 and N2)
- 3) Changes in specific waves during non-REM sleep
 - a) Fewer slow waves (<4 Hz and >75 uV) and spindles (11–15 Hz), along with a decrease in their amplitude;^{20,21} both types of waves are markers of neural synchrony and brain plasticity^{22,23}

The biological clock and aging

The biological clock (24-hour circadian rhythm) exerts a strong influence on the sleep-wake cycle. The modulation of sleep-wake pressure by the biological clock is experienced in situations – eg, jet lag and shift work – when attempting to sleep at times when the biological clock promotes wake (which leads to fragmented sleep) and trying to stay awake and productive when the circadian system promotes sleep (which leads to lower alertness and attention failure). Age-related changes in the regulation of the biological clock are associated with earlier sleep-wake schedules (early to bed and early to rise) and difficulty maintaining sleep, in particular in the second half of the sleep episode. Older individuals also appear to be more sensitive to challenges imposed upon their biological clock, such as having more difficulty adjusting to shift work or jet lag compared to younger individuals. Older individuals also have more difficulty sleeping when the biological clock promotes wakefulness (ie, during daytime).²⁴

When does sleep start to change?

The effects of aging on the sleep-wake cycle are gradual. Many sleep characteristics may change in individuals as young as their mid-thirties, including reduced slow-wave (deep) sleep, whereas other sleep characteristics will change only later during the life span.^{19,25} Importantly, members of the middle-aged population may be particularly at risk of suffering from perturbations of the sleep-wake cycle. Their multiple social, familial, and professional responsibilities not only limit the strategies they may adopt to alleviate their sleep and alertness problems (eg, fewer opportunities to nap, change sleep-wake schedules, etc.), but they also enhance the consequences of such problems (lower productivity level, higher risk for accidents, irritability, etc.).

Do age-related sleep changes always have negative consequences on quality of life of older individuals?

Importantly, for many healthy older individuals, age-related sleep modifications may go unnoticed and will not induce sleep or vigilance complaints. It is possible that, in some individuals, aging is associated with a reduced need for sleep. However, for others, age-related changes in the sleep-wake cycle may have negative effects on their daily lives. A better understanding of the effects of age-related changes in sleep is important in terms of treatment planning, implementation, and evaluation.

Is there an effect of napping on nocturnal sleep?

Napping does not have negative effects in older people who do not complain of insomnia. In fact, some studies have

shown that napping may increase evening alertness and total sleep time in healthy older subjects.²⁶ However, it is important to note that sleeping during the day decreases sleep propensity during the following night and is not recommended for older subjects suffering from insomnia.²⁷

Contributing Factors

Many variables have been proposed as potentially significant contributors to the increase in vulnerability of the aging sleep-wake system to disturbances, as outlined in Table 2. These factors include consumption of stimulants, menopause, and stress.

Caffeine

Caffeine is the most widely used central nervous system stimulant in North America, and older individuals consume it regularly. Caffeine mimics some of the effects of aging on sleep; it decreases slow-wave sleep and increases wakefulness across the night.²⁸ Thus, caffeine consumption in older individuals further decreases the already low amount of slow-wave sleep and increases the already enhanced amount of wakefulness across the night.²⁹

Menopause

The transition to menopause is associated with an increase in sleep complaints. However, not every woman will have sleep problems through menopause. Factors such as vasomotor symptoms (hot flashes and night sweats), mood symptoms, anxiety, and chronic stress explain poor sleep in menopausal woman rather than menopausal status *per se*. Few studies have evaluated the effect of menopausal status or vasomotor symptoms on polysomnographic sleep variables in laboratory, and those that have show inconsistent results.³⁰ Importantly, the male predominance of obstructive sleep apnea diminishes when compared with women at menopause.¹¹

Hormonal therapy appears to improve subjective sleep quality, particularly decreased vasomotor symptoms; however, decreased psychological symptoms and somatic symptoms (palpitations and muscular pain) also appear related to the beneficial effect of hormone therapy on sleep complaints. The effects of hormonal therapy in perimenopausal women on polysomnographic sleep measures are inconsistent.³⁰

Enhanced sensitivity to stress

Stress has been proposed to significantly increase the vulnerability of the sleep-wake cycle to the effects of aging. It has been shown, for example, that a similar stress experience may have a more negative impact on sleep of older subjects than in younger individuals. Experimentally induced stress hormones increase waking and decrease slow-wave sleep in middle-aged men, while it has no effect in young men.³¹ Many sources of stress, such as financial and caregiver strains, bereavement, loneliness, hospitalization, and moving into nursing homes, may contribute to sleep difficulties in older individuals.³²⁻³⁴

Significantly more research is required to appropriately evaluate the many factors in sleep dysfunctions that accompany aging, and the roles they play in disturbing sleep. A first step in the direction of better sleep is to know what interferes with it.

Evaluation⁸

- 1) Establish whether the sleep problem in the elderly patient is the normal aging process or if the person truly has insomnia.
- 2) Define the dominant sleep disturbance by asking about the patient's nighttime sleep pattern (habitual bedtime and wake time), the quality of his/her sleep, the time to fall asleep, the total sleep duration, and the number of awakenings. As described in the first and third issues of *Insomnia Rounds*, have the patient complete a sleep diary over 1–2 weeks.
- 3) Ask about napping habits and daytime sleepiness; consider using the Epworth Sleepiness Scale.³⁵
- 4) When possible, also question the bed partner; they may notice symptoms or behaviours of which the patient is unaware.
- 5) Identify any medical conditions (eg, Table 2) that may contribute to the patient's disturbed sleep. As previously stated, the presence of concomitant conditions is significantly increased in older individuals.
- 6) Review your patient's prescription/nonprescription medications. Check for potential adverse events on the sleep-wake cycle (Table 2).
- 7) Ask about daily caffeine and alcohol consumption.
- 8) Evaluate the patient's stress and anxiety level and history of psychiatric and mood disorders.
- 9) Consider referral to a sleep specialist should there be any suspicion of a primary sleep disorder as outlined in Table 1; eg, daytime sleepiness, complaints of snoring, restless sleep, dry mouth, or headaches on awakening.

Management

Pharmacotherapy

Sleep medication use is disproportionately high in older adults. Community use rates for hypnotics among adults over age 65 years are 3%–21% for men and 7%–29% for women compared with only 2%–4% for younger age groups.^{15,36} Elderly women report sleep medication use for longer periods than elderly men: median 8 years (interquartile range 2–16) versus 5 years (2–15), respectively.⁶ Benzodiazepines are the most frequently prescribed agents (61% of women and 52% of men), followed by “Z-drugs”; ie, the non-benzodiazepine sedative-hypnotics zolpidem and zopiclone (around 25% for both women and men).

The use of pharmacotherapy for insomnia is outlined in more detail in the second issue of *Insomnia Rounds*. However, the elderly are more vulnerable to the hazards and adverse events associated with hypnotics, in part because of slower drug absorption and elimination.¹⁷ Health Canada has recently approved a lower dose for zolpidem (5 mg), which is more appropriate for use in the elderly population

than the 10-mg dose for the acute management of insomnia. Furthermore, undiagnosed sleep apnea or periodic leg movement disorder is often encountered in older adults. The administration of hypnotics leads to risks of exacerbation of respiratory disturbance in elderly patients with undiagnosed sleep apnea.¹⁵

Melatonin and melatonergic drugs

Age-related reduction of melatonin secretion has been hypothesized to mediate the increase of sleep disturbances in older individuals. However, the association between melatonin decline and sleep quality in older individuals is still a matter of debate. Furthermore, it is still unclear if insomniacs have lower melatonin secretion compared to non-insomniacs. Nevertheless, it is possible that despite similar melatonin levels, the sensitivity to the sleep-promoting effect of endogenous melatonin would be lower in older subjects, particularly in populations suffering from insomnia.¹⁸

Results on the effect of melatonin on polysomnographic sleep measures in younger and older insomniacs are inconsistent.¹⁸ A novel melatonin agonist (ramelteon) appears to have greater efficacy than melatonin in treating insomnia. Clinical trials of ramelteon show a decrease in sleep latency and increase in sleep duration in older adults suffering from insomnia, with fewer adverse events compared to benzodiazepines or other hypnotics.³⁷ Ramelteon has not been approved by Health Canada.

Nonpharmacological approaches

Cognitive behavioural therapy

Nonpharmacological approaches including sleep hygiene and cognitive behavioural therapy (CBT) are recommended in the elderly. These are described in more detail in the third issue of *Insomnia Rounds*. Improvements in sleep are sustained over time with CBT for insomnia. Morin et al³⁸ conducted a randomized clinical trial of 78 adults (mean age 65 years) with chronic and primary insomnia, comparing CBT with temazepam and placebo. Combination CBT-temazepam was also assessed. Reduction in time awake after sleep onset was greater with CBT (55.0%) compared with temazepam (46.5%), and was greatest in the combination group (63.5%). Given the more chronic and comorbid nature of insomnia in late-life, behavioural techniques are the preferred treatment approach.

Phototherapy

To date, studies on the effect of phototherapy for treating insomnia in elderly have led to mixed results on subjective or polysomnographic sleep measures. However, the methodologies vary among studies and very few included a control group. A recent study by Friedman et al³⁹ showed no significant difference between 12 weeks of scheduled dim-light or bright-light conditions (morning or evening) in individuals suffering from insomnia in either polysomnographic sleep measures (total sleep time, wake after sleep onset,

sleep efficiency, and time in bed) or subjective patient self-reports. The contribution of other factors on the effectiveness of phototherapy, such as phototherapy protocol (light intensity, time of administration, frequency, and duration), insomnia subtype, depression and circadian phase advance still needs to be clarified. Indeed, bright-light therapy appears to improve mood in depression and is the treatment of choice in seasonal affective disorder,⁴⁰ and it benefits sleep disturbances in sleep phase advanced disorder.¹⁴ Further studies should also evaluate long-term efficacy and the possibility of tolerance.

12 Recommendations for Elderly Patients to Sleep More Soundly

- 1) Don't panic. Age-related sleep changes are normal unless you feel a negative impact on your life.
- 2) Discuss sleep difficulties with your doctor and let him/her know if you suspect that you have a primary sleep disorder (for example snoring) or if your medical/mental condition interferes with your sleep.
- 3) If your night sweats or hot flashes interfere with your sleep, discuss it with your doctor.
- 4) Discuss possible adverse events associated with your medications.
- 5) Adopt a regular sleep-wake cycle and sleep a sufficient number of hours every night. Older people may have more difficulty recovering following sleep deprivation.
- 6) Try to stay away from night-work.
- 7) Reduce drug and stimulant intake, especially caffeine, nicotine, and alcohol.
- 8) Create an optimal environment for sleep, including a quiet and dark room and a comfortable ambient temperature.
- 9) Diminish stressful experiences and worries at bedtime as much as possible.
- 10) Don't eat too much or exercise near bedtime.
- 11) A daytime walk with correctly timed daylight exposure is useful for insomnia.
- 12) Be active, eat well and exercise: good health is strongly associated with good sleep.⁴¹

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UPCOMING CONFERENCE

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