

# Sleep Disorders In the Elderly

Jean K. Matheson, MD

Older patients frequently complain of difficulty initiating sleep, sleep maintenance or excessive daytime sleepiness, while bed partners or caretakers are distraught by episodes of nocturnal confusion or belligerence.

Sleep disorders may represent a primary disorder of mechanisms regulating sleep or failure of a specific organ system manifesting in a unique way during sleep. Sleep complaints should not be ignored or treated empirically with pharmacologic agents without analysis of the etiology.

## POLYSOMNOGRAPHY

Polysomnography is the term applied to the simultaneous and continuous measurement of multiple physiologic parameters during sleep. In practice, the polysomnogram (PSG) has come to mean a specific type of polysomnographic study in which measurements allow for 1) the identification of sleep stage, 2) monitoring of cardio-pulmonary function and 3) monitoring of body movements during sleep.

## SLEEP STAGING AND ARCHITECTURE

Rapid eye movement (REM) sleep, sometimes called dreaming sleep, and non-REM (NREM) sleep are the two sleep states. NREM and REM sleep alternate in recurring cycles of approximately 90 minutes. NREM sleep had been divided into four stages (1-4), representing progressive deepening of sleep. A recent revision of staging nomenclature now identifies these stages as N1, N2 and N3.<sup>1</sup>

In what has been thought to be normal aging nocturnal awakenings and wake time increase. N3 sleep decreases and REM time usually remains relatively constant. Stage one sleep increases as a reflection of sleep disruption. Sleep efficiency, the ratio of time asleep to time in bed, decreases secondary to both increased time in bed and increased wake. However, many of these changes attributed to "normal" aging may also be exacerbated or induced by what we now know to be common and treatable sleep disruptors such

as sleep apnea and periodic leg movements as described below.

## SLEEP- RELATED BREATHING DISORDERS (SRBDs)

The most important cause of sleep disruption is sleep-disordered breathing. The term "sleep-disordered breathing" primarily refers to the sleep apnea syndromes, but also includes disorders that result in nocturnal hypoventilation and hypoxemia such as restrictive and parenchymal pulmonary diseases. While well known to cause excessive daytime sleepiness, the sleep apnea syndromes, both central and obstructive, are also important contributors to difficulty initiating and maintaining sleep because of frequent nocturnal arousals. Current definitions that have the most widespread clinical use are based on guidelines provided by the Center for Medicare and Medicaid Services (CMS)<sup>2</sup>

*Apnea:* An apnea is defined as the absence of airflow for at least 10 seconds.

There are three types:

*Obstructive apnea:* Absence of airflow for at least 10 seconds with evidence of persistent respiratory effort.

*Central apnea:* Absence of airflow for 10 seconds without evidence of any of respiratory effort.

*Mixed Apnea:* Absence of airflow for 10 seconds with initial absence of effort followed by a return of respiratory effort before resumption of airflow.

*Hypopnea:* The term hypopnea refers to a decrease in airflow. By CMS criteria: "Hypopnea in adult patients is defined as an abnormal respiratory event lasting at least 10 seconds with at least a 30% reduction in thoracoabdominal movement or airflow as compared to baseline, and with at least a 4% oxygen desaturation."<sup>2</sup>

*Apnea Hypopnea Index (AHI):* The total number of apneas and hypopneas are summed and divided by the number of hours of sleep. When used with the definitions above, the index is useful as a standardized measure that reflects sever-

ity of sleep disordered breathing  
*Respiratory Effort Related Arousal:* When airway resistance increases, oxygen saturation and airflow may stay the same as respiratory effort increases to overcome obstruction. This increased respiratory effort may induce an arousal that disturbs sleep termed, RERA, respiratory effort-related arousal. This event is NOT recognized by CMS and is sometimes called a "hypopnea without desaturation".<sup>1</sup>

The presence of 5 apneas/hour of sleep was previously deemed necessary to establish the presence of either "obstructive sleep apnea" or "central sleep apnea". It is now clear, however, that either incomplete obstructions or central hypoventilatory episodes without apnea induce physiologic changes of the same magnitude as apneas. CMS currently accepts a minimum AHI of 5 as evidence of sleep apnea that justifies treatment. However, RERAs, often occult contributors to sleep disruption, are not included in the CMS definition of sleep apnea, but are accepted by the American Academy of Sleep Medicine as determinants of obstructive sleep apnea syndrome.<sup>4</sup>

Well-documented risk factors for obstructive sleep apnea include obesity, large neck, upper airway structural abnormalities, nasal congestion, endocrine abnormalities, muscular weakness and sedating drugs.

In aging and degenerative neurological disease there are additional risk factors including laryngeal dysfunction and centrally-induced dysynergy of upper airway muscle activation in relationship to chest wall and diaphragmatic activation.

Central sleep apnea episodes usually represent Cheyne-Stokes breathing, a crescendo-decrescendo breathing pattern, common in the elderly, especially those with congestive heart failure. Periods of central apnea or hypopnea predispose to obstruction as well, because low airflow contributes to airway collapse. This type of breathing abnormality, once considered benign, may markedly disrupt sleep.<sup>4</sup>

## TREATMENT OF SLEEP-DISORDERED BREATHING:

Continuous positive airway pressure (CPAP) is the mainstay of treatment for obstructive sleep apnea and for some patients with predominantly central apnea. Airway pressure acts as a pneumatic splint to maintain upper airway patency during sleep. Bi-level positive pressure (BIPAP) is often better tolerated in the elderly because it provides an expiratory pressure always lower than inspiratory pressure, making expiration more natural and less effortful. The inspiratory–expiratory pressure difference also acts to augment ventilation in disorders associated with hypoventilation. New devices termed servo-ventilators are based on bi-level positive pressure technology, and can be used at home to treat patients with central components of their sleep-disordered breathing, especially Cheyne-Stokes respirations. These devices are an important addition to the treatment of sleep-disordered breathing in heart failure. Many new mask styles and variations on these devices including “smart” auto titrating machines can improve patient tolerance dramatically. Full face masks are now comfortable and useful in patients who may have rejected positive pressure previously because of nasal obstruction.<sup>3</sup>

Cheyne-Stokes respirations often respond to low-flow oxygen delivered through nasal prongs that generally are better tolerated than positive pressure. O<sub>2</sub> tends to decrease over-responsiveness to CO<sub>2</sub> that perpetuates the hyperventilation-apnea cycle. Obstructive episodes exacerbated by central apneas may also improve. Sedating medications, especially hypnotics and narcotics, can exacerbate sleep disordered breathing and are best avoided when sleep-disordered breathing is suspected.<sup>3</sup>

## SLEEP RELATED MOVEMENT DISORDERS

Sleep-related movement disorders include conditions in which simple stereotyped movements are present during sleep and induce sleep disruption. Difficulty initiating and/or maintaining sleep are the typical complaints.

### Periodic Limb Movement Disorder

The most prevalent of these disorders is **periodic limb movement disorder (PLMD)**, characterized by periods of repetitive stereotyped leg movements

that disturb sleep (PLMS). Many medications are implicated in the induction of periodic and aperiodic leg movements, most commonly SSRIs, SNRIs and tricyclic antidepressants.

### Restless Legs Syndrome

**Restless legs syndrome (RLS)** is characterized by 1) an urge to move accompanied by uncomfortable sensations, predominantly in the legs, that are 2) relieved by movement, 3) occur when sedentary and 4) are worse in the evening.<sup>5</sup> This syndrome is closely associated with PLMD. Restless legs syndrome, however, is a syndrome based on clinical, not polysomnographic criteria. The disorder is familial in approximately 50% of cases. Prevalence estimates vary between 5 and 20% of the general adult population in North America and the disorder appears to increase with age.<sup>5</sup> Abnormalities of both dopamine and iron metabolism are implicated in the underlying pathophysiology. Iron deficiency is known to exacerbate or precipitate restless legs and periodic leg movements in familial and non-familial cases. Secondary causes of RLS are subject to some debate due to limited data and include uremia, neuropathy, and medications, especially anti-dopaminergic drugs and SSRIs.

### Management of Restless Legs and Periodic Limb Movements

Periodic leg movements are often found incidentally on sleep studies and are not generally treated unless they are either accompanied by symptomatic restless legs, or clearly contribute to arousals. Recommendations for the management of restless legs have recently been published.<sup>6</sup> Serum ferritin should be checked in all patients; iron replacement is recommended in patients with ferritins below 45-50 ug/ml. Response to iron replacement may not occur in all patients and usually takes months to years; some clinicians advocate intravenous replacement in severe cases. Because antidepressant and antihistamine medications may exacerbate restless legs they should be avoided if possible. Some clinicians routinely screen for neuropathy with exam and metabolic studies. Ropinirole (Requip) and pramipexole (Mirapex), both dopaminergic agonists FDA approved for RLS, are markedly effective. Because of the possibility of inducing a syndrome termed “augmentation”, it is best to use as low a single evening dose as possible. Augmen-

tation refers to the development of symptoms earlier in the day with increasing severity, further exacerbated by dosage increases. This phenomenon occurs most dramatically with the use of levodopa and less frequently with the dopaminergic agonists ropinirole and pramipexole. Gabapentin and low dose opioids are useful second line drugs that can be used alone or in combination with dopaminergic agonists for dosage sparing. Benzodiazepines are third line drugs because of limited efficacy and the development of tolerance.

### REM Behavior Disorder

Low muscle tone observed on PSGs during REM correlates with the normal paralysis that occurs during dreaming. This temporary paralysis, termed REM sleep atonia, prevents the dreaming subject from enacting dreams. REM Behavior Disorder is characterized by incomplete REM atonia associated with motoric activation during dreams.<sup>7</sup> Typically the patient, bed partner, or caretaker complains of violent, often injurious, activity during sleep. The patient may complain of a change in dream content with violence and running as typical themes. Sometimes the patient is able to incorporate ongoing conversation and activity into the dream, giving rise to the misperception that he is confused or hallucinating until he suddenly awakens and appear to “clear” his mental status. Underlying dementia or acute illness may impair the patient’s ability to report the perception of dreaming, resulting in misdiagnosis. Hospital caretakers usually dismiss even detailed dreaming reports as confusion. The disorder is frequently mistaken for “sundowning” or, because of the violent quality of the dreams, post-traumatic stress disorder.

REM behavior disorder occurs most frequently in older men with a mean age of 60. Over time it has become clear that RBD precedes other clinical signs or symptoms of some degenerative diseases, especially Parkinson’s disease, dementia with Lewy bodies and multisystem atrophy, (the “synucleinopathies.”) by years. Conversely, the prevalence of RBD in Parkinson’s disease is in the range of 33-60%. The combination of degenerative dementia and RBD is highly correlated with the diagnosis of dementia with Lewy bodies, based on clinical and pathologic criteria. There are rare published reports of RBD with a

“tauopathy” (e.g. pure Alzheimer’s disease, frontotemporal dementia, progressive supranuclear palsy). Some medications, especially NSRIs and SSRIs are known to precipitate and exacerbate the disorder. Idiopathic RBD also exists.<sup>7</sup>

### **Circadian Rhythm Disorders: Advanced Phase Sleep Disorder**

The tendency for elderly patients to spend more time asleep during the day and less time asleep at night raises the possibility that neurological dysfunction of the biologic clock within the suprachiasmatic nucleus of the hypothalamus mediates these changes. Advanced phase sleep disorder is a well-recognized circadian disorder in which patients complain of difficulty staying awake in the evening and early morning awakening.<sup>5</sup> This disorder is common in the elderly and may be mistaken for early morning insomnia.

Phase advance is exacerbated by visual impairment and low light exposure during the day; evening light exposure can therapeutically delay rhythms and improve sleep maintenance.<sup>8</sup>

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## **Driving Safety Among Older Adults**

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**The number of individuals in the United States** who are age 65 and older is expected to double by 2030.<sup>1</sup> As this population increases, so will the number of licensed older drivers. Increasing age is a significant risk factor for unsafe driving. The risk for crash involvement increases dramatically after the age of seventy; and drivers 85 and older have the highest driver fatality rate.<sup>2</sup> Drivers over the age of 70 have the highest annual fatality rate per miles driven compared to all age groups, except those aged 25 and younger.<sup>2</sup> In a study of mild dementia and non-demented drivers, baseline age significantly predicted performance on a road test independent of cognitive status.<sup>3</sup> These findings suggest that, as older people age, the risk of unsafe driving increases, and care providers will need to monitor their aging patients’ driving safety.

Research on driving safety in the elderly has mainly focused on drivers with dementia, who consistently perform more poorly on open road tests and simulated

driving tests compared to their non-demented counterparts.<sup>4</sup> For example, Duchek and colleagues found that 43% of participants with mild **Alzheimer’s disease (AD)** failed the road test, compared to 13% of patients with very mild AD and 3% of non-demented control participants.<sup>3</sup> Longitudinal data indicated that patients with mild AD experienced a more rapid decline in driving skills compared to the control group; however, patients with very mild AD did not differ significantly from either group.<sup>3</sup> Comparing crash rate records collected by the state registries, only one study has observed that patients with dementia are more frequently involved in accidents compared to a control group.<sup>4</sup>

There is also concern about the driving skills of patients with **Parkinson’s disease (PD)**, because of the motor and non-motor symptoms (visual changes and cognitive dysfunction). Interestingly, motor symptom severity and visual functioning do not consistently predict driving skills.<sup>5</sup>

While performance on neuropsychological measures does predict driving abilities, our research has found that PD drivers are infrequently observed to be unsafe drivers: only one of 25 participants assessed actually failed our road test. Rather, most participants received marginal or safe ratings.<sup>5</sup> Research in dementia and Parkinson’s disease emphasizes that mild degrees of motor slowing, cognitive dysfunction, and changes in vision may not adversely affect driving skills, and that these diagnoses alone are not absolute indicators of unsafe driving.

The American Medical Association’s Physician’s Guide to Assessing and Counseling Older drivers lists acute medical events such as myocardial infarction, stroke, syncope, seizure, surgery, and delirium as well as chronic conditions such as disease affecting vision, cardiovascular disease, neurological disorders, psychiatric illnesses, metabolic conditions, musculoskeletal impairments, and respiratory disease as risk factors for unsafe driving.<sup>6</sup> Detailing the