

# Behavioral Treatment for Chronic Insomnia

J. Todd Arnedt, PhD, Jennifer L. Martin, PhD, Donn A. Posner, PhD

Insomnia is a subjective complaint of insufficient or non-restorative nighttime sleep.<sup>1</sup> In a recent Gallup survey, 49% of US adults reported having occasional insomnia, while 12% reported having chronic insomnia.<sup>2</sup> In primary care settings, the overall prevalence of insomnia complaints may be as high as 69%.<sup>3</sup> Women are more likely than men to report problems sleeping,<sup>2</sup> and psychiatric and medical disorders are associated with an increased risk of insomnia complaints.

Insomnia is associated with adverse consequences, including daytime fatigue and sleepiness, decreased quality of life and deficits in daytime functioning.<sup>4</sup> Individuals with insomnia utilize more healthcare resources, miss more days of work, and report less rewarding interpersonal relationships.<sup>5</sup> Although sleep problems are common, many patients with insomnia do not discuss their complaints with their physicians.<sup>2</sup> People erroneously believe that sleep problems are normal as we get older, or are unaware that effective treatments for chronic insomnia exist that do not involve medication. It is the physician's responsibility to ask patients about sleep quality in the course of providing routine care.

## THE EVOLUTION OF CHRONIC INSOMNIA

Insomnia develops from the confluence of predisposing, precipitating, and perpetuating factors.<sup>4</sup> Predisposing factors can include age, gender, excessive worry, or depression. All can lower the threshold for developing insomnia. Precipitating factors are commonly defined as stressful life events (e.g., loss of employment, newly-diagnosed medical illness) that herald the onset of acute insomnia. In the face of such stressors, an individual may have transient difficulties with sleep initiation, frequent or extended nocturnal awakenings, or early morning awakenings with an inability to return to sleep. It is generally assumed that such indi-

viduals slept well before the onset of the stressor, and that the sleep problem is likely to remit once the stressor resolves. The patient is often best served by simple reassurance that the sleep problem will resolve with time. If the stressor is more severe and has a predictable course, the short-term use of hypnotic medication would be considered the treatment of choice.<sup>6</sup>

Perpetuating factors can be ongoing conditions or behaviors that are initiated to relieve the transient sleep problem, but instead exacerbate the difficulties. Chronic insomnia results when difficulties initiating and/or maintaining sleep occur three or more nights weekly for at least six months.<sup>1</sup> The primary focus of behavior therapy is to change these perpetuating factors.

*Individuals with insomnia tend to spend excessive time in bed to compensate for sleep loss.*



## Medications and Chronic Insomnia

In the case of chronic insomnia, hypnotic medication is not recommended for long-term management.<sup>7</sup> There is little information about the long-term efficacy of hypnotic medications for chronic insomnia or the maintenance of benefits once medications are discontinued.<sup>8</sup> Other problems include drug tolerance, daytime hangover, dependence, and rebound insomnia. Finally, insomnia is a symptom of a variety of conditions including psychological (e.g., anxiety, depression), neurological (e.g., Parkinson's disease), medical (e.g., thyroid disorder, chronic pain) or other sleep disorders (e.g., sleep apnea, restless leg syndrome). Under these circumstances sedative-hypnotic medications cannot be considered more than a short-term band-aid.

## Primary Insomnia

Chronic insomnia often results from inappropriate sleep-related behaviors (e.g. irregular sleep schedule, frequent napping), poor sleep habits (e.g. caffeine overuse, lack of exercise), and/or maladaptive thinking (e.g. excessive anxiety, worry, and rumination about sleep). Such a "Primary Insomnia" can exist as a co-morbid condition that persists after other causes have been treated. For example, the patient who becomes anxious about not sleeping after insomnia originally developed during an episode of depression may have improved mood with anti-depressant medications, yet continue to exhibit sleep problems. Rather than adding hypnotic medication, in these cases non-pharmacological, behavioral interventions are indicated.

The aim of the remainder of this paper is to highlight important assessment issues, and to outline some of the most effective behavioral techniques. These techniques are time-intensive and are likely best delivered by a behavioral sleep medicine specialist.

## ASSESSMENT OF INSOMNIA

A thorough evaluation of the predisposing, precipitating, and perpetuating factors of insomnia is critical. The assessment should clarify the nature and severity of the insomnia, and also reveal clues as to the insomnia's etiology. At a minimum this should consist of a clinical interview with the patient, and daily sleep diary monitoring. Patients often overestimate the frequency of insomnia. When patients prepare daily logs of their sleep, they often find that this is not the case. Typically, polysomnography is not included in the assessment of insomnia unless there is an indication that medical factors or a physiological sleep disorder (e.g., sleep apnea) are the primary etiological factors. If a patient with insomnia does undergo polysomnography, it is not unusual to

find that the patient overestimates how long it takes to fall asleep and underestimates how long s/he slept. Typically, sleep architecture will demonstrate an increase in light Stage 1 sleep and perhaps a deficiency in deep Stages 3-4 sleep.

**The clinical interview**

The clinical interview is a detailed analysis of the nature, severity, and historical course of the presenting sleep complaint. A good interview should rule out or identify medical, neurological, and psychological etiologies. A complete account of medications, as well as alcohol and other psychoactive substances (e.g., caffeine, nicotine) is essential for clarifying the interaction between medications and nighttime sleep patterns and daytime alertness or sedation. A thorough history of patients' sleep habits including exercise, naps, bed and wake times, meal times, and nighttime activities should be obtained. Finally, information should be collected regarding patients' thoughts

and worries when they cannot sleep with special emphasis on ruminations about sleeplessness and/or daytime consequences of sleep deprivation.

**Sleep Diaries**

The final step is a baseline assessment of typical sleep patterns by means of a nightly sleep diary maintained by patients. (Figure 1) We suggest a minimum of a two-week baseline period in order to provide a representative sample of usual sleep patterns. Once this information is compiled, a behavioral protocol can be implemented using one or more of the following techniques: Sleep Restriction, Stimulus Control, Sleep Hygiene education, Relaxation, and Cognitive techniques.

**COMPONENTS OF BEHAVIORAL THERAPY FOR INSOMNIA**

**Sleep Restriction**

Sleep restriction curtails the time spent in bed each night to the estimated average total sleep time.<sup>9</sup> Individuals with insomnia tend to spend

excessive time in bed to compensate for sleep loss. Contrary to expectation, this practice exacerbates and perpetuates the sleep problem by promoting fragmented, rather than consolidated, sleep. The initial goal of sleep restriction is to consolidate sleep over a prescribed "sleep window" no longer than the current average total sleep time based on data from the patient's sleep diary. The goal is to raise sleep efficiency (total sleep time/total time in bed) to greater than 85%. Once this goal is achieved, time in bed is progressively extended by moving the bedtime earlier until an "ideal sleep duration" is achieved. Morin<sup>4</sup> recommends increasing time in bed by 15 minutes every four days when sleep efficiency is greater than 85%, reducing it by 15 minutes when sleep efficiency is less than 80%, and keeping it constant when sleep efficiency falls between 80-85%. The determination of "ideal sleep duration" is based on a host of considerations, including sleep log data (e.g. the point just prior to a decline in

<b>SLEEP DIARY</b>										
<b>Rhode Island Hospital Insomnia Treatment Program</b>										
Name: _____		Week Ending: ___/___/___			Next Appointment: ___/___/___ @ ___ am/pm					
Fatigue	0	25	50	75	100					
Rating Scale	extremely fatigued	moderately fatigued	mildly fatigued	somewhat energetic	very energetic					
COMPLETE AT NIGHT in reference to today					COMPLETE IN MORNING in reference to previous night					
Date	Unusual daytime stressors	Fatigue rating	Naps: Time & sleep length	Time you went to bed	Time it took you to fall asleep initially	Number of awakenings	Amount of time awake in the middle of the night	Time you got up for good	Total sleep time	Medication(s) used to sleep

Figure 1: Example of a daily sleep diary.

**Table 1. Stimulus Control Instructions**  
**Bootzin & Nicassio<sup>10</sup>**

1. Lie down intending to go to sleep only when sleepy.
2. Do not use your bed for anything except sleep; that is, do not read, watch television, eat, or worry in bed. Sexual activity is the only exception to this rule. On such occasions, the instructions are to be followed afterward when you intend to go to sleep.
3. If you find yourself unable to fall asleep, get up and go into another room. Stay up as long as you wish and then return to the bedroom to sleep. Although we do not want you to watch the clock, we want you to get out of bed if you do not fall asleep immediately. Remember that the goal is to associate your bed with falling asleep quickly! If you are in bed more than about 10 min without falling asleep and have not gotten up, you are not following this instruction.
4. If you still cannot fall asleep, repeat rule 3. Do this as often as is necessary throughout the night.
5. Set your alarm and get up at the same time every morning regardless of how much sleep you got during the night. This will help your body acquire a consistent sleep rhythm.
6. Do not nap during the day.

sleep efficiency), and patient report (e.g. significant improvement in daytime functioning).

While straightforward in theory, sleep restriction is often difficult to implement. Fearing “sleep loss,” patients may initially be skeptical of the rationale and resist going to bed later than usual. They may need to be reassured frequently and reminded about the rationale. Sleep restriction can be integrated with other techniques such as stimulus control and sleep hygiene education.

**Stimulus Control**

Insomnia may also develop as a result of classical conditioning factors, where environmental sleep cues (bed/bedroom) become associated with wakefulness and sleep-incompatible behaviors (e.g. worrying, watching television). The primary goal of stimulus control therapy is to re-establish the connection between stimuli associated with sleep (e.g. the bed) and sleep itself.<sup>10</sup> This is typically achieved by discouraging sleep-incompatible behaviors in the bedroom, by reinforcing a regular sleep-wake schedule, and instructing patients to be in bed only when sleeping. (Table 1)

Encouraging adherence to stimulus control instructions can be a difficult task for the clinician. Patients may resist getting out of bed when awake during the night, or rising on time in the morning. The clinician should reiterate the rationale for the approach and help patients overcome barriers to successful treatment.

**Sleep Hygiene Education**

Sleep hygiene education focuses on general health behaviors and environmental factors

that interfere with or facilitate sleep.<sup>4</sup> Although rarely the primary cause of chronic insomnia, poor sleep hygiene can limit the degree to which sleep du-

ration can be increased during the extension phase of sleep restriction, and may increase the likelihood of insomnia relapse. Changing only one habit (e.g. stopping caffeine intake), particularly while maintaining several other poor habits, will rarely improve sleep. Thus, patients should adhere to as many good habits at once as possible. Likewise, changing habits for only a few days may not insure results. Good sleep hygiene should be considered a lifestyle change and should be imple-

mented for 3-4 weeks before results can be expected. (Table 2)

**Relaxation Therapy**

Relaxation techniques can help in the treatment of insomnia as well. Clearly not all insomnia patients have anxiety disorders, but many are anxious specifically about their inability to sleep. Patients may also simply be physically tense. Studies of biofeedback training suggest that, when insomnia patients learn the techniques, their sleep quality improves.<sup>11</sup> Controlled studies examining progressive muscle relaxation have also shown that treatment improved subjective sleep quality.<sup>12</sup> Although relaxation therapies are more effective than placebos, they are generally less effective than other behavioral therapies.<sup>13</sup> Relaxation therapies are often part of multi-component treatments, and can be beneficial in combination with other strategies.

**Cognitive-Behavioral Therapy**

**Cognitive-behavioral therapy (CBT)** for insomnia refers to a group of treatments that target inappropriate

**Table 2. Rules For Better Sleep Hygiene**

1. Sleep only as much as you need to feel refreshed and awake during the day.
2. Wake up and go to bed at approximately the same time every day of the week.
3. Do not lie in bed if you cannot sleep.
4. Do not nap during the day.
5. Spend time outside in the light each day.
6. Exercise regularly but not within 3 hours of bedtime.
7. Make sure that your bedroom is comfortable, dark, and quiet.
8. Eat regular meals and eat a light snack before bed. Carbohydrates (e.g. crackers, bread, cereal) are best for a good nights sleep.
9. Do not consume caffeinated products (e.g. coffee, tea, many sodas, chocolate) in the evening.
10. Do not use alcohol to help you sleep and do not consume alcohol too close to bedtime.
11. Smoking disrupts your sleep.
12. Make the last hour before bed a “wind-down” time.

sleep-related behaviors and maladaptive sleep-related cognitions.<sup>4</sup> The behavioral component of CBT is typically some combination of the treatments outlined above. The cognitive component targets inaccurate beliefs and attitudes about sleep. Insomnia patients sometimes believe that "If I try hard enough, I'll fall asleep." Patients also "catastrophize" their sleep difficulties believing, for example, "If I don't catch up on sleep, I'll die." These beliefs perpetuate anxiety and insomnia, leading to more catastrophic thinking. Cognitive strategies challenge these thoughts directly, or through "evidence" collected by Socratic interviewing of the patient. For example, patients can be asked to count the number of catastrophic events that have occurred to them since the insomnia began. Although disruptive, insomnia rarely has catastrophic consequences in the short run. Such questioning forces the patient to re-evaluate his/her fears.

#### EFFICACY OF BEHAVIORAL INTERVENTIONS FOR CHRONIC INSOMNIA

Both single- and multiple-component treatment outcome studies have included samples ranging from general insomnia patients to specific sub-groups with insomnia such as older adults, and patients with psychiatric or medical disorders.<sup>12</sup> Two meta-analyses of more than 50 treatment studies found that behavioral intervention were effective in 70-80% of patients with primary insomnia with improvements in sleep latency and time awake after sleep onset to near-normal values.<sup>13,14</sup> Clinical studies commonly use multi component treatment that include sleep restriction, stimulus control, and sleep hygiene education.<sup>15</sup> These demonstrate efficacy

for patients who complete treatment, and some data suggest that improvements are maintained or improved for at least several months after treatment ends. Patients also seem to prefer behavioral rather than pharmacological techniques to manage their insomnia.<sup>16</sup>

#### BEHAVIORAL AND PHARMACOLOGICAL INTERVENTIONS

##### Combined treatments

One drawback to behavioral treatment for insomnia is that it typically takes 4-6 weeks before the patient notes marked improvement. In some instances, the patient will fail to comply with the treatment protocol, or discontinue treatment. In contrast, sedative-hypnotic medications ameliorate insomnia almost immediately. This would seem to suggest that a combination of the two approaches may enhance the efficacy of either alone. Unfortunately, the few studies to examine combined treatments have yielded equivocal results.

Recently, in a placebo-controlled trial using CBT and medication (temazepam), Morin et al.<sup>17</sup> found that individuals who received CBT + temazepam showed the greatest improvement at the conclusion of treatment, but improvement was more consistently maintained in the individuals who received CBT alone


These findings suggest that behavioral treatments alone are most effective for the long-term treatment of insomnia, and that the initial benefits of combination treatments may not be sustained over time. It is also possible that medication withdrawal after the study led to an overall decrease in sleep quality or, perhaps, patients attributed their initial gains primarily to the medication rather than to behavior changes. Continuation of the behavioral intervention after discontinuation of the medication may have improved the maintenance of treatment gains. Thus, the question remains open whether a combination of behavioral and pharmacological approaches may be better than either treatment alone for chronic insomnia.

##### Medication reduction and medication withdrawal


Behavioral treatment of insomnia may be beneficial for reducing or discontinuing the use of medications for sleep. Studies have shown that patients who participate in behavioral treatment of insomnia often reduce their use of sleep medications whether or not medication withdrawal is a specific goal of treatment.<sup>18</sup> Often individuals treated with hypnotic medications for extended periods experience psychological and physiological withdrawal as well as rebound insomnia when they

C O M M U N I C A T I O N S + D E S I G N M G T I N C


Identity and visual communications specifically tailored to present and represent your practice/health services. The following is a sampling of identities we've created:




BROWN  
MEDICAL  
ALUMNI  
ASSOCIATION



Atmed




Community Health Systems Inc



Sports  
MEDICINE  
RHODE ISLAND

UNIVERSITY



CARDIOLOGY FOUNDATION

175 MATHEWSON STREET PROVIDENCE RHODE ISLAND 02903

TEL 401 331 3530 FAX 401 331 3594 E-MAIL [cdmgt@ids.net](mailto:cdmgt@ids.net)

stop the medication. Some research suggests that targeting the maladaptive thinking and providing insomnia patients with behavioral tools to assist in coping with the short-term nature of medication withdrawal insomnia can be clinically beneficial.<sup>19</sup>

#### SUMMARY AND CONCLUSIONS

Insomnia is a common medical symptom with multiple causes and consequences. Identification of the predisposing, precipitating and perpetuating factors contributing to chronic insomnia is important to a complete assessment, which can help to determine etiology and points of intervention. Sedative-hypnotic medications can be useful in the treatment of short-term insomnia. For more chronic insomnias, it is best to identify primary medical, psychological, neurological or environmental etiologies and aggressively treat these. For patients who develop perpetuating behavioral strategies or anxiety-provoking cognitive ruminations that contribute to the chronic condition, behavioral interventions may be superior to pharmacotherapy.

Although many of the described techniques are effective, however, they are difficult for patients to carry out and require careful explanation, continued support throughout the process, and follow-up care. This can be time-consuming in the context of a primary care practice. As such, there are times when a referral to a sleep specialist to carry out the treatment may be warranted.

#### REFERENCES

1. American Sleep Disorders Association. *The International Classification of Sleep Disorders, revised. 2 ed.* Rochester, MN: American Sleep Disorders Association, 1997.
2. The Gallup Organization. *Sleep in America: 1995.* Princeton, NJ: 1995.
3. Shochat T, Umphress J, Israel AG, Ancoli-Israel S. Insomnia in Primary Care Patients. *Sleep* 1999; 22(Suppl 2):S359-S65.
4. Morin CM. *Insomnia: Psychological Assessment and Management.* New York: Guilford Press, 1993.
5. Roth T, Ancoli-Israel S. Daytime consequences and correlates of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. II. *Sleep* 1999; 22(Suppl 2):S354-S8.
6. Kupfer D, Reynolds CF. Management of Insomnia. *NEJM* 1997; 336:341-5.
7. National Institute of Mental Health. Consensus Development Conference: Drugs and insomnia: The use of medications to promote sleep. *JAMA* 1984; 251:2410-4.
8. Walsh JK, Engelhardt CL. The direct economic costs of insomnia in the United States for 1995. *Sleep* 1999; 22(supplement 2):S386-S93.
9. Spielman AJ, Caruso LS, Glovinsky PB. A behavioral perspective on insomnia treatment. *Psychiatr Clin North Am* 1987;10:541-3.
10. Bootzin RR, Nicassio PM. Behavioral treatments for insomnia. In: Hersen M, Eisler RM, Miller PM, editors. *Progress in Behavior Modification*, Vol. 6. New York: Academic Press, Inc., 1978: 1-45.
11. Hauri PJ, Percy L, Hellekson C, et al. The treatment of psychophysiological insomnia with biofeedback: A replication study. *Biofeedback Self Regul* 1982;7:223-35.
12. Lichstein KL. Relaxation. In: Lichstein KL, Morin CM, editors. *Treatment of Late-life Insomnia.* Thousand Oaks, California: Sage Publications, Inc., 2000: 185-206.
13. Morin CM, Culbert JP, Schwartz SM. Nonpharmacological interventions for insomnia: A meta-analysis of treatment efficacy. *Am J Psychiatry* 1994;151:1172-80.
14. Murtagh DR, Greenwood KM. Identifying effective psychological treatments for insomnia: a meta-analysis. *J Consulting Clin Psychol* 1995; 63:79-89.
15. Perlis ML, Aloia M, Millikan A, et al. Behavioral treatment of insomnia: a clinical case series study. *J Behav Med* 2000; 23:149-61.
16. Morin CM, Gaulier B, Barry TN, Kowatch RA. Patients' acceptance of psychological and pharmacological therapies for insomnia. *Sleep* 1992;15:302-5.
17. Morin CM, Colecchi C, Stone J, Sood R, Brink D. Behavioral and pharmacological therapies for late life insomnia. *JAMA* 1999; 281:991-9.
18. Verbeek I, Schreuder K, Declerck G. Evaluation of short-term nonpharmacological treatment of insomnia in a clinical setting. *J Psychosom Res* 1999;47:369-83.
19. Pat-Horenczyk R, Hachohen D, Steinbuk M, et al. Changes in attitudes toward insomnia following cognitive intervention as part of a withdrawal treatment from hypnotics. *Sleep Res* 1994;23:184.

*J. Todd Arnedt, PhD, is an Instructor in the Department of Psychiatry and Human Behavior, Brown Medical School.*

*Jennifer L. Martin, PhD, is a Clinical Psychology Intern in the Brown University Clinical Psychology Training Consortium.*

*Donn A. Posner, PhD, is a Clinical Assistant Professor, in the Department of Psychiatry, Brown Medical School.*

#### CORRESPONDENCE:

J. Todd Arnedt, PhD  
 Department of Psychiatry and  
 Human Behavior  
 Box G-BH, Brown University  
 Providence, RI 02912  
 phone: (401) 444-1943  
 fax: (401) 444-1948  
 e-mail: J\_Todd\_Arnedt@Brown.edu

*Dr. Curran/Salk Realty ad*

# A Review of the Adult Primary Sleep Parasomnias

Brian Kimble, MD, Alice E. Bonitati, MD, Richard P. Millman, MD

The parasomnias are a group of disorders characterized by motor, verbal, experiential, or physiologic phenomena occurring during sleep. The phenomena are unintended and may cause distress either to the individual or significant others. The primary parasomnias describe disorders involving the process of sleep itself; the secondary parasomnias are disorders of various organ systems which manifest themselves during sleep. Examples of the latter include nocturnal seizures, cardiac arrhythmias, nocturnal angina pectoris, nocturnal asthma, and gastroesophageal reflux. This review will focus on the primary parasomnias, offering brief descriptions with treatment options. A final section will address some of the medico-legal issues surrounding the parasomnias, specifically the forensic implications of crimes committed while asleep. Multiple comprehensive reviews of this topic published elsewhere proved invaluable in the preparation of this manuscript.<sup>1-4</sup>

While it was once thought that the awake state was an active process compared to the passive state of sleeping (defined as the absence of wakefulness), we now know that this is not the case. Sleep is actually an active process and is composed of two entirely different states: **non-rapid eye movement (NREM)** sleep and **rapid eye movement (REM)** sleep. Each of the three states that characterize the human mind (wake, NREM, REM) is unique and involves different degrees of excitation and inhibition of various regions of the central and peripheral nervous systems. The wake state is characterized by low-voltage, fast (beta and alpha) waves on the EEG (representing cortical activation), an awareness by the individual of his surroundings, resting muscle tone, and voluntary control of motor function. NREM sleep is characterized by high-voltage, slower (theta and delta) waves on the EEG (representing cortical deactivation), lack of awareness by the individual of his sur-

roundings, decreased muscle tone compared to the wake state, and loss of voluntary control of motor function. REM sleep is characterized by an EEG similar to that seen in the wake state (cortical activation), lack of awareness by the individual of his surroundings, absence of muscle tone (while there is activation of the motor cortex during REM, there is inhibition of the spinal motoneurons with resultant atonia<sup>5</sup>), and loss of voluntary control of motor function. NREM sleep usually predominates in the first 1/3 of the night while REM sleep is usually concentrated in the final 1/3 of the night.

The mechanisms governing the maintenance of these three states as well as the change from one state to another are complex. The parasomnias manifest when these mechanisms fail to function properly. This results in a rapid fluctuation between states, a fusion of features of different states, or the absence of a feature usually associated with a state. Because the manifestations are state-dependent, the primary parasomnias are commonly grouped according to the state in which they occur, namely NREM or REM.

## NORMAL NREM PHENOMENA

Before discussing the abnormal NREM parasomnias, brief mention should be made of two common phenomena that may present to a physician's attention. The first, hypnagogic imagery, is the experience of dream-like sequences occurring at sleep onset. While conventional wisdom holds that dreaming is associated solely with REM sleep, this is in fact not the case. Dreaming can occur in NREM sleep as well as during relaxed wakefulness.<sup>1</sup> This is important to note since the presence of dream imagery at sleep onset should not necessarily be seen to imply sleep-onset REM periods, a feature common to narcolepsy (reviewed elsewhere in this issue).

The second normal phenomenon is the sleep start or hypnic jerk. Most

commonly these involve sudden brief episodes of motor activity occurring at sleep onset. They can also involve sensory phenomena of a visual, auditory, or somesthetic nature. While normal, the pathophysiology is not understood.

## NREM PARASOMNIAS (DISORDERS OF AROUSAL)

Perhaps the most common parasomnias, the disorders of arousal encompass behaviors that have features of both wake and NREM sleep. The three major classifications are: (1) confusional arousals, (2) sleep terrors, and (3) sleepwalking. Common to all three is a genetic predisposition and childhood presentation (though persistence into adulthood can occur and rarely they can manifest for the first time in adults). They occur predominantly early in the night and are associated with stage 3/4 sleep (slow-wave or delta sleep). During an episode patients are only vaguely aware of their environment. While still capable of performing complex actions (such as driving a car) they almost always appear confused to observers. These behaviors are often associated with vague dream imagery at the time of the event. Additionally, patients are almost universally amnesic concerning the event when questioned afterwards.

Confusional arousals (also termed sleep drunkenness) are defined as relatively brief (0.5-10 min) confusional states that occur when a patient transitions from stage 3/4 sleep directly to wakefulness. The patient stays in bed and may mumble or perform some stereotyped action such as pick up an object as if to answer a phone call. The episodes are usually not associated with fear and are usually not aggressive unless attempts to complete the stereotyped action are blocked.

Sleep terrors are characterized by a sudden partial arousal from slow-wave sleep accompanied by a loud piercing cry and autonomic/behavioral features suggesting intense fear. Peak

prevalence occurs between 5 and 7 years of age, with the prevalence in adults being < 1%. Duration of the episodes is generally less than 10 minutes and during this time the patient is completely inconsolable. While usually staying in bed, patients may exhibit a flight response causing them to jump out of bed and run around the room potentially injuring themselves or others. Like the other disorders of arousal, patients when awakened have only vague dream recall ("bugs in the bed" or "someone in the room").

In sleepwalking (somnambulism), patients engage in complex behavioral automatisms following a partial arousal from stage 3/4 slow-wave sleep. As in the other NREM parasomnias, patients are only incompletely aware of their surroundings and usually do not respond appropriately to environmental cues. These automatic behaviors take varied forms, from simply walking around the room or house to dressing to preparing meals to driving a car. In general the behaviors are not aggressive although published cases exist of crimes committed while sleepwalking (see section on Medico-Legal Issues below). In common with the other NREM parasomnias (and in distinction to the REM parasomnias) there is usually only vague dream imagery accompanying the episodes and the patients are usually amnesic for the events when awakened.

Mahowald et al. described a patient with a dramatic disorder of arousal.<sup>6</sup> This 67-year-old man presented with a 40-year history of symptoms consistent with a combination of night terrors and sleepwalking. He would jump out of bed screaming in terror and run into objects and walls. On four occasions he had jumped out of his second-story bedroom window, once landing on his head and sustaining a C3 fracture. In the year prior to presentation he had tied himself to the bed with a restraint jacket to prevent injury.

Two other disorders which may be related to the NREM parasomnias deserve mention. The first, nocturnal eating, while sharing many of the features of the disorders of arousal is currently

classified as an extrinsic sleep disorder. Nocturnal eating is characterized by unintentional eating at night in a patient who does not have a daytime eating disorder.<sup>7-9</sup> Patients are usually mildly confused and have varying degrees of awareness of their environment. Unlike the NREM parasomnias, patients often remember the episodes the following day. These nocturnal binges can account for substantial caloric intake, averaging 1200 kcal per night in one study. Significant obesity can result with all of the attendant morbidities associated with that condition. One of us (RM) reported on an obese male with **obstructive sleep apnea (OSA)** and nocturnal eating disorder who lost a significant amount of weight when incarcerated due to the lack of available food at night.<sup>10</sup> As a result his OSA resolved as documented by **polysomnography (PSG)**. On release his nocturnal eating disorder became active again, resulting in weight gain and reappearance of PSG-documented OSA.

Another reported entity which may be a form of sleepwalking has been termed sleepsex.<sup>11</sup> In a case report a woman related that her partner would awaken her in the first portion of the

night to engage in sexual activity. She reported that he was a completely different person during these nocturnal sessions than during the daytime, being much more aggressive, biting, and "talking dirty" to her. The following morning he would deny any recollection of the previous night's events. The woman became suspicious one night when her partner began loudly snoring while performing the sexual act, prompting them both to seek medical attention.

Treatment for the NREM parasomnias is twofold. First, the patients should avoid if possible the environmental factors which can contribute to excessive amounts of slow-wave sleep or fragment sleep; e.g., drugs (sedatives, hypnotics, stimulants), alcohol, sleep deprivation (rebound phenomenon), stress, environmental stimuli, pain, pregnancy, and migraine headaches. Pharmacologic therapy can include trials of benzodiazepines such as triazolam, clonazepam, or diazepam which may decrease the number of episodes, possibly by decreasing the amount of slow-wave sleep. Tricyclic drugs such as imipramine, desipramine, and clomipramine may also prove effective.

Table 1. Comparison of Common Features of Various Parasomnias

	Confusional Arousals	Sleep Terrors	Sleepwalking	Nightmares	RBD	Complex PS
Time of night	Early	Early	Early to mid	Late	Late	Any
Sleep stage at start	SWS	SWS	SWS	REM	Dissociated REM	Any
EEG discharges	No	No	No	No	No	Usual
Screams	No	Yes	No	Rare	Rare	Rare
CNS activation	Minimal	Extreme	Minimal	Mild	Mild	Mild
Myoclonus	No	No	No	Rare	Common	Rare
Walking	No	No	Yes	No	Rare	Common
Returns to bed	Stays	Stays	Usual	Stays	Unusual	Unusual
Awakens	Uncommon	Uncommon	Uncommon	Common	Common	Common
Duration	0.5-10 min	1-10 min	2-30 min	3-20 min	1-10 min	5-15 min
Confusion (after)	Usual	Usual	Usual	Very rare	Rare	Usual
Reduced in lab	Yes	Yes	Yes	No	No	No
Episodes in wake	No	No	No	No	No	Usual
Usual Age	Child	Child	Child	Any	Adult	Adult
Genetic transmission	Yes	Yes	Yes	No	No	Rare
Organic CNS lesions	No	No	No	No	Common	Common
Potential for violence	Yes	Yes	Yes	No	Yes	Yes

Modified from ref. [2]. CNS, central nervous system; dissociated REM, sleep consisting of REM sleep without atonia; PS, partial epileptic seizures; RBD, REM sleep behavior disorder; SWS, slow-wave sleep (i.e. stages 3 and 4).

## REM PARASOMNIAS

Dream anxiety attacks, commonly referred to as nightmares, can occur in both children and adults. While they may be frightening and associated with autonomic symptoms, they can be differentiated from night terrors (see above) by the fact that there are usually no behavioral manifestations, there is usually excellent recall of associated vivid dream imagery, and if an arousal occurs the patient is usually immediately aware of his environment. Several drugs have been reported to increase the incidence of nightmares including thiothixene, beta-blockers, fluoxetine, triazolam, verapamil, among others. Treatment involves psychotherapy or various cognitive-behavioral interventions.

REM sleep behavior disorder (RBD) is the major REM parasomnia. The disorder is characterized by a loss of atonia during REM sleep resulting in the acting out of dream content (termed oneiric behaviors). Oneiric behaviors were first described by Jouvet in 1965 in a feline model.<sup>12</sup> In these studies, REM sleep without atonia was noted following bilateral lesions of the locus ceruleus. Not until 1986 was RBD first described in humans.<sup>13</sup> Like the NREM parasomnias, patients with RBD have impaired perception of their surroundings. However, unlike the patients with delta sleep parasomnias, patients with RBD report vivid dream imagery, are generally alert at the termination of an episode, and do not experience amnesia for the event on the following morning.

Acute forms of RBD result from drug withdrawal (alcohol, meprobamate, pentazosine, nitrazepam) or intoxication (biperiden, tricyclic antidepressants, MAO inhibitors, caffeine). While the chronic form may also occur secondary to medications (tricyclic antidepressants, fluoxetine, venlafaxine, selegiline treatment of Parkinson's disease, anticholinergic treatment of Alzheimer's disease), it is most commonly either idiopathic or associated with neurologic disorders. Affected individuals note that at the time of onset of the disorder their

dream content changes to include more episodes of violence than usual. This violence or aggression is translated into behaviors manifested during REM sleep, frequently resulting in injury to the patient or their spouse/bedpartner. In the original description of RBD, Schenck et al. reported some tape-recorded dream recollections from one of their patients.<sup>13</sup>:

*Patients initially diagnosed with idiopathic RBD are at risk of manifesting a neurodegenerative disorder such as Parkinson's disease, progressive supranuclear palsy, or multisystem atrophy at some point in their future.*



"I was on a motorcycle going down the highway when another motorcyclist comes up alongside me and tries to ram me with his motorcycle. Well, I decided I'm going to kick his motorcycle away and at that point my wife woke me up and said, 'What in heavens are you doing to me?' because I was kicking the hell out of her."

In general this is a disorder of older (> 50 year old) men (80-90%). Patients initially diagnosed with idiopathic RBD are at risk of manifesting a neurodegenerative disorder such as Parkinson's disease, progressive supranuclear palsy, or multisystem atrophy at some point in their future. In one series, 38% of patients initially thought to have idiopathic RBD subsequently developed Parkinsonism a mean 3.7 years after the diagnosis of RBD, and a mean of 12.7 years after the initial onset of RBD symptoms.<sup>14</sup> For this reason it is crucial that patients with idiopathic RBD receive careful neurologic follow up.

Effective therapy exists for RBD, underscoring the importance of establishing the diagnosis in affected individuals. Clonazepam is initiated at 0.5 mg at bedtime (usual effective range 0.25 to 4 mg) and is usually immediately effective. Chronic clonazepam has been shown to be safe and effective without the emergence of tolerance over time. It should be noted that relapse is common whenever doses are missed. In patients intolerant of clonazepam there are anecdotal reports of success with melatonin, gabapentin, or pramipexole.

Table 1 shows a comparison of some of the common features of various parasomnias, although diagnosis is not always as clear-cut as the table may suggest. Patients may in fact have features of more than one disorder. Schenck et al. reported on 33 patients exhibiting what they termed an overlap disorder with features of sleepwalking, sleep terrors, and RBD.<sup>15</sup>

## DISORDERS WHICH RESEMBLE PARASOMNIAS

Multiple entities may produce behaviors similar to those observed with the primary parasomnias. These are usually divided into organic disorders and psychogenic disorders. The organic disorders include transient global amnesia (a vascular disorder), mass lesions (either producing increased intracranial pressure or residing in deep structures), toxic/metabolic syndromes, limbic encephalitis, and seizures. Psychogenic causes include the dissociative states (fugues, multiple personality disorder, psychogenic amnesia) and post-traumatic stress disorder. While the history may be highly suggestive of the underlying pathological process, it is difficult to distinguish these entities on clinical grounds alone. For this reason, obtaining an overnight PSG with video recording and full EEG montage can be an important step when evaluating patients manifesting behaviors suggestive of a parasomnia.

## MEDICO-LEGAL ISSUES

Many of the primary parasomnias can manifest as behavior that is injurious to the patient or those around him

or her. In extreme cases the behaviors can be violent to a degree resulting in criminal proceedings.

Perhaps the best known example is the case of Kenneth Parks, a 23-year-old who beat and stabbed-to-death his mother-in-law and non-fatally strangled his father-in-law, all while apparently asleep.<sup>16</sup> Mr. Parks had been experiencing a great deal of stress in his life related to a gambling addiction and the subsequent strain it placed on his marriage. At the time of the incident he was also sleep-deprived secondary to insomnia. Alcohol or drugs were not believed to be involved. On repeated inquiry Mr. Parks denied recall of the events in question, including the 23 km drive to his in-laws' house. The legal defense was one of homicide during noninsane automatism as part of a presumed episode of somnambulism. In support of this argument was the lack of any motive, the known affection which he held for his in-laws, the evident sincerity of his grief, the lack of other medical causes for his behavior, the known personal and family history of sleepwalking, and the presence of factors known to precipitate sleepwalking (e.g. sleep deprivation and stress). Mr. Parks was acquitted.

An automatism can be defined from a medical point of view as the presence of complex behavior in the absence of conscious awareness or volitional intent.<sup>14</sup> From a legal point of view these behaviors are divided into "sane" and "insane." Sane automatisms result from external factors and are thus not likely to recur. If successful, defendants are released without follow up. Insane automatisms result from internal or endogenous factors and are felt to be more likely to recur. For this reason, hospitalization in a mental health facility is mandatory following a successful insane automatism plea. Schenck and Mahowald have argued that in the case of parasomnias a third category should exist that requires medical follow up but not mandatory hospitalization.<sup>17</sup>

## CONCLUSION

The primary parasomnias result in a blurring of the normally sharp lines separating the states of wakefulness,

NREM sleep, and REM sleep. In their milder forms they may cause anxiety or annoyance in family members or friends. More severe manifestations may place the patient or those around him in danger of suffering physical violence. Full PSG with video recording can be an important adjunct to the history in establishing a diagnosis. Treatment consists of avoiding factors that may precipitate the parasomnia and may include medications to keep the condition under control. The latter is especially important in RBD which has a very high success rate when treated with clonazepam. With regard to the medico-legal issues involved in this group of disorders, at the time of this writing persons are not legally accountable for actions committed while manifesting a parasomnia.

## REFERENCES

1. Mahowald MW, Schenck CH. Parasomnias including the restless legs syndrome. *Clin Chest Med* 1998;19:183-202.
2. Broughton R. NREM Arousal Parasomnias, in *Principles and Practice of Sleep Medicine*, Kryger M, Roth T, Dement W, Editor. 2000, W. B. Saunders Company: Philadelphia:693-706.
3. Mahowald MW, Schenck CH. REM Sleep Parasomnias, in *Principles and Practice of Sleep Medicine*, Kryger M, Roth T, Dement W, Editor. 2000, W. B. Saunders Company: Philadelphia:724-41.
4. Mahowald MW, Schenck CH. REM Sleep Parasomnias, in *Principles and Practice of Sleep Medicine*, Kryger, Roth, Dement, Editor. 2000, W. B. Saunders Company: Philadelphia:796-95.
5. Siegel JM. Brainstem Mechanisms Generating REM Sleep, in *Principles and Practice of Sleep Medicine*. Kryger, Roth, Dement, Editor. 2000, W. B. Saunders Company: Philadelphia:112-33.
6. Mahowald MW, et al. Sleep violence—forensic science implications: polygraphic and video documentation. *J Forensic Sci* 1990;35:413-32.
7. Schenck CH, et al. Sleep-related eating disorders: polysomnographic correlates of a heterogeneous syndrome distinct from daytime eating disorders. *Sleep* 1991;14:419-31.
8. Schenck CH, et al. Additional categories of sleep-related eating disorders and the current status of treatment. *Sleep* 1993; 16:457-66.
9. Spaggiari MC, et al. Nocturnal eating syndrome in adults. *Sleep* 1994;17:339-44.
10. Eveloff SE, Millman RP. Sleep-related eating disorder as a cause of obstructive sleep apnea. *Chest* 1993;104:629-30.
11. Rosenfeld DS, Elhajjar AJ. Sleepsex: A variant of sleepwalking. *Arch Sex Behav* 1998;27:269-78.
12. Jouvet M, Delorme F. Locus coeruleus et sommeil paradoxal. *C R Soc Biol* 1965;159:895-9.
13. Schenck, C.H., et al., Chronic behavioral disorders of human REM sleep: a new category of parasomnia. *Sleep* 1986;9:293-308.
14. Schenck CH, Bundlie SR, Mahowald MW. Delayed emergence of a parkinsonian disorder in 38% of 29 older men initially diagnosed with idiopathic rapid eye movement sleep behaviour disorder. *Neurol* 1996;46:388-93.
15. Schenck CH, Boyd JL, Mahowald MW. A parasomnia overlap disorder involving sleepwalking, sleep terrors, and REM sleep behavior disorder in 33 polysomnographically confirmed cases. *Sleep* 1997;20:972-81.
16. Broughton R, et al., Homicidal somnambulism: a case report. *Sleep* 1994;17:253-64.
17. Schenck, C.H. and M.W. Mahowald, An analysis of a recent criminal trial involving sexual misconduct with a child, alcohol abuse and a successful sleepwalking defence: arguments supporting two proposed new forensic categories. *Med Sci Law* 1998;38:147-52.

*Brian Kimble, MD, is a Sleep Medicine Fellow, Division of Pulmonary, Sleep, and Critical Care Medicine, Rhode Island Hospital, and Clinical Instructor in Medicine, Brown Medical School.*

*Alice E. Bonitati, MD, is a Diplomate, American Sleep Disorders Association, and Clinical Assistant Professor of Medicine, Brown Medical School.*

*Richard P. Millman, MD, is a Diplomate, American Sleep Disorders Association, and Professor of Medicine, Brown Medical School.*

## CORRESPONDENCE:

Richard P. Millman, MD  
Division of Pulmonary, Sleep, and  
Critical Care Medicine  
Rhode Island Hospital  
593 Eddy Street (APC-4)  
Providence, RI 02903  
phone: (401) 444-2670  
fax: (401) 444-3353  
e-mail: rmillman@lifespan.org



# Advances in Pharmacology

## Therapy of Insomnia

Richard P. Millman, MD

Fearing that patients may become "addicted," many physicians hesitate to use medications to treat insomnia.<sup>1</sup> As a result, patients with acute insomnia may not receive aggressive enough therapy to prevent the development of chronic insomnia. Studies have shown it only takes three to four weeks of nightly insomnia to become a chronic insomniac. More aggressive use of hypnotic-sedative agents during an acute insomnia episode is appropriate to break the cycle to prevent the development of chronic insomnia. If one agent does not work, the primary care physician needs to either increase the dose or choose an alternative therapy.

Patients with coexistent conditions such as chronic pain, chronic headaches, fibromyalgia, or depression often need to use a sedative-hypnotic chronically as well along with other medications dictated at the underlying condition. Fibromyalgia and chronic pain are exacerbated by lack of sleep. In addition, the pain and stiffness that the patient experiences may exacerbate the sleep problem causing a vicious cycle.

Restless leg syndrome is being increasingly recognized as a cause of sleep disruption and insomnia. Symptoms include dysesthesias and discomfort in the legs, and occasionally the arms. Some patients describe it as aching, and others describe it as "creeping-crawling" sensation. Patients with insomnia and restless legs typically need medications to calm the legs down. Sedative-hypnotic agents are generally not effective. Many patients respond to Parkinson-type drugs that increase dopamine levels in the brain; a current popular agent is pramipexole. Other patients respond to increasing opiate

levels using drugs such as hydrocodone.

The remaining part of this paper will deal with various pharmacological agents that have been used for sleep in an attempt to give appropriate guidelines for their use to physicians.

### ANTIHISTAMINES

Various over-the-counter medications have been used to treat insomnia. Diphenhydramine or doxylamine are the most common agents used. The biggest problem with these agents is that they have significant side effects. Sedation may last long into the daytime, and they also have significant anticholinergic properties. Growing evidence demonstrates an association with falling in elderly nursing home patients and these medications. In some patients, the drugs can actually be stimulating and disrupt sleep more. These agents should not be recommended as first-line therapy for insomnia.

### SEDATING ANTI-DEPRESSANT AGENTS

Certain anti-depressant agents tend to have significant sedative side effects. Since these agents do not have the stigma associated with a pure sedative-hypnotic drug, they have become extremely popular among primary care physicians. A classical example of this is trazadone given at a dose of 50 to 150 mg. This is a very long-acting agent and daytime side ef-

fects can be minimized by giving the drug an hour and a half to two hours before bedtime. Typically one starts at a low dose of 50 mg and slowly increases the dose by 25 mg at weekly intervals. The main side effect in men is priapism; clinicians need to be on the lookout for this rare side effect.

Older tricyclic anti-depressants such as amitriptyline and nortriptyline may also be used for insomnia. One starts at 10 mg and increases the dose at 10 mg intervals. Again, these agents tend to be very sedating the next day and may be given an hour and a half to two hours before bedtime. These agents are typically used in patients with chronic pain, chronic headaches or fibromyalgia-type symptoms. These agents may cause significant anti-cholinergic side effects.

Psychiatrists frequently will use mizapine at a dose of 15 to 30 mg to promote sleep. This drug seems to have a significant sedative component at low doses. This drug has side effects and is best used if other drugs fail.

### BENZODIAZEPINE AGENTS

Over the last few decades, benzodiazepines have replaced barbiturates

*Dr. Vohr/home  
nursing ad*

as the drug of choice for sedation because of a relatively low toxicity and clinical efficacy. They induce sleep by facilitating GABA<sub>A</sub> receptor transmission in the presence of GABA leading to the opening of chloride channels.<sup>2</sup>

Not all benzodiazepines are equivalent. Flurazepam, diazepam, and quazepam often last for several days because their metabolites are active sedative agents. This prolonged sedation may become a problem in many patients and has been shown to lead to an increased incidence of hip fractures in elderly patients.<sup>3</sup>

Intermediate-acting benzodiazepines such as temazepam and triazolam are associated with less daytime sedation and performance impairment. The shortest acting agent, triazolam actually can cause rebound insomnia when its effect wears off in the middle of the night and has been associated with a significant degree of tolerance and anterograde amnesia.

Tolerance may be related to changes in receptor binding at the GABA receptor. Nightly use of benzodiazepines is generally not recommended for longer than four weeks because more chronic administration may lead to physiological and possible psychological dependence.<sup>2</sup> Patients also may be associated with temporary impairment of information acquisition and subsequent recall.

#### SELECTIVE BENZODIAZEPINE-RECEPTOR AGONISTS

Two new agents, an imiazopyridine (zolpidem) and a pyrazolopyrimidine (zaleplon) were recently introduced into this country. They act at the BZ1 receptor subtype rather than the BZ2 or BZ3 receptor subtypes at the GABA receptor. Since they selectively bind to the BZ1 receptor, they tend to cause sedation without the other effects typically seen with benzodiazepines including anxiolytic properties, muscle relaxation or anti-seizure effects. Zolpidem is typically given at a 10 mg dose. It has been recommended that the dose be decreased to 5 mg in the elderly or in the presence of hepatic failure. The agent is an excellent agent for patients who have trouble initiating and maintaining sleep. It is also a reasonable agent for third-shift work-

ers who try to go to sleep at 8:00 in the morning and would otherwise be unable to sleep during the daytime.

Zaleplon seems to be somewhat shorter-acting and seems to be best in patients either who have a pure initiation problem or pure maintenance problem. Typically, the dose of zaleplon is 10 mg in the elderly.<sup>4</sup> Young and middle-aged adults may potentially tolerate 15 or 20 mg. It is recommended that the dose be decreased in hepatic failure to 5 mg as with zolpidem. There appears to be no impact on cognitive function with this drug even if given in the middle of the night.<sup>5,6</sup> It is therefore ideal for somebody who intermittently wakes up in the middle of the night and cannot fall back to sleep. Zolpidem given in the middle of the night does cause problems with daytime cognitive function.<sup>6</sup>

These newer agents have no impact on sleep architecture, specifically deep slow wave sleep as opposed to benzodiazepines, antihistamines, and sedating anti-depressants.<sup>2</sup> There appears to be no tolerance with these agents even after being used for long periods of time.<sup>2</sup>

#### MELATONIN

Recently, melatonin has received a lot of attention in the lay press as a treatment for insomnia. Studies on the hypnotic effects of melatonin have been conflicting and controversial; it is generally recommended in the sleep field that melatonin not be used for insomnia.<sup>7</sup>

#### CONCLUSION

A wide range of sedating agents may be used for sleep. In an acute setting, aggressive use of sedative-hypnotics may prevent the development of chronic insomnia. Long-term use of agents is appropriate in situations where there is a co-existent condition such as chronic pain, fibromyalgia, chronic headaches, depression, or restless leg syndrome. It is not inappropriate to give shift workers sedative-hypnotics during the work week so that they can sleep during the daytime. There are agents such as zolpidem and zaleplon that have less chance of tolerance. Zaleplon seems to have the least effect on daytime cognitive function, and

is the only agent available for use in the middle of the night. In patients with chronic insomnia who do not want to be on medications or in whom medications have failed in the past, a strict course of behavior modification using a combination of sleep restriction, stimulant control, and relaxation therapy would be more appropriate.

#### REFERENCES

1. Millman RP. Coping with insomnia: Effective drug and nondrug therapies. *Women's Health Primary Care* 1998;1:737-45.
2. Mitler MM. Nonselective and selective benzodiazepine receptor agonists - where are we today? *Sleep* 2000;23(suppl 1):S39-S47.
3. Ray WA, Griffin MR, Downey W. Benzodiazepines of long and short elimination half-life and the risk of hip fracture. *JAMA* 1989; 262:3303-7.
4. Ancoli-Israel S, Walsh JK, Mangano RM, et al. Zaleplon, a novel nonbenzodiazepine hypnotic, effectively treats insomnia in elderly patients without causing rebound effects. *Primary Care Companion J Clin Psychiatry* 1999;1:114-20.
5. Vermeeren A, Danjou PE, O'Hanlon JF. Residual effects of evening and middle-of-the-night administration of zaleplon 10 mg and 20 mg on memory and actual driving performance. *Hum Psychopharmacol Clin Exp* 1998;13:S98-S107.
6. Danjou P, Paty I, Fruncillo R, et al. A comparison of the residual effects of zaleplon and zolpidem following administration 5 to 2 h before awakening. *Br J Clin Pharmacol* 1999; 48:367-74.
7. Langer S, Mendelson W, Richardson G. Symptomatic treatment of insomnia. *Sleep* 1999; 22(suppl 13):S437-49.

*Richard P. Millman, MD, is Director, Sleep Disorders Center of Lifespan Hospitals, and Professor of Medicine, Brown Medical School.*

#### CORRESPONDENCE:

Richard P. Millman, MD  
Division of Pulmonary, Sleep and Critical Care Medicine  
Rhode Island Hospital  
593 Eddy Street  
Providence, Rhode Island 02903  
phone: (401) 444-2670  
fax: (401) 444-3353  
e-mail: Rmillman@Lifespan.org