

# The Physical and Fiscal Impact of Sleep Disorders

Gary S. Richardson, MD

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## Summary

Sleep disorders are common, result in significant health care costs, and have an important impact on patient functioning. The major sleep disorders are chronic insufficient sleep syndrome, obstructive sleep apnea, and insomnia. There are effective treatments for each. Managed care can easily implement interventions in several areas for both clinical and fiscal improvement in the treatment of sleep disorders.

## Key Points

- Sleep disruption has significant effects on daytime functioning, cognition and memory, pain perception, and metabolic parameters.
- Chronic insufficient sleep syndrome, obstructive sleep apnea, and insomnia are the most common sleep disorders.
- Treatment of chronic insufficient sleep syndrome is patient education on the benefits of sufficient sleep and awakeness promoting medication if related to shift work.
- Obstructive sleep apnea (OSA) is effectively treated with at least four hours per day of continuous positive airway pressure (CPAP).
- Noncompliance with CPAP is the most common problem in treating OSA.
- Chronic insomnia should be treated chronically with hypnotics that are FDA approved specifically for long-term use.
- Chloral hydrate, diphenhydramine, and sedating antidepressants should not be used to treat insomnia.
- Treating insomnia can improve concomitant diseases such as depression.

TO UNDERSTAND SLEEP DISORDERS, ONE must first understand normal sleep. Normal sleep is divided into rapid eye movement (REM) and non-REM sleep. Non-REM sleep is divided into three stages. All stages of sleep are valuable but the third stage of non-REM, slow wave sleep, is the deep restorative sleep that we all seek.

Adults need an average of eight hours of sleep nightly. The typical adult gets about six hours and is chronically sleep deprived. A person would know they are getting enough sleep if they awake spontaneously. Early morning awakening is the sign of a healthy well-rested person. Needing an alarm clock to awaken is a sign of sleep deprivation.

The need for sleep changes with age. Young children need substantially more sleep than adults, but the elderly do not need less sleep, as is commonly thought. They need eight hours but are less efficient sleepers and thus commonly have sleep complaints.

Electrophysiologic methods can be used to define sleep, awakeness, and normal sleep. The electro-

physiologic methods include electroencephalogram (EEG) to measure brain waves, electrooculogram (EOG) to measure eye movements, and the electromyogram (EMG) to measure muscle tone. The use of all three is a diagnostic polysomnogram.

The evolutionary origins of sleep probably rest in diurnal rhythms of rest and activity. Multiple physiologic systems within the body exploit a quiet period for optimization. For example, the areas of the body for energy generation are restored during sleep. The brain requires down time to process what it has learned and make room for new memories.

Vulnerable systems show the first effects of sleep deprivation. The demonstrated effects of chronic sleep deprivation in animals include a hypermetabolic state, altered gene transcription, and impaired learning and memory. The hypermetabolic state includes sympathetic nervous system activation, thyroid derangement, and thermoregulatory dysfunction, which can result in death. There are no controlled studies of sleep deprivation to the point

**Exhibit 1<sup>1</sup>: Epworth Sleepiness Scale (ESS)**

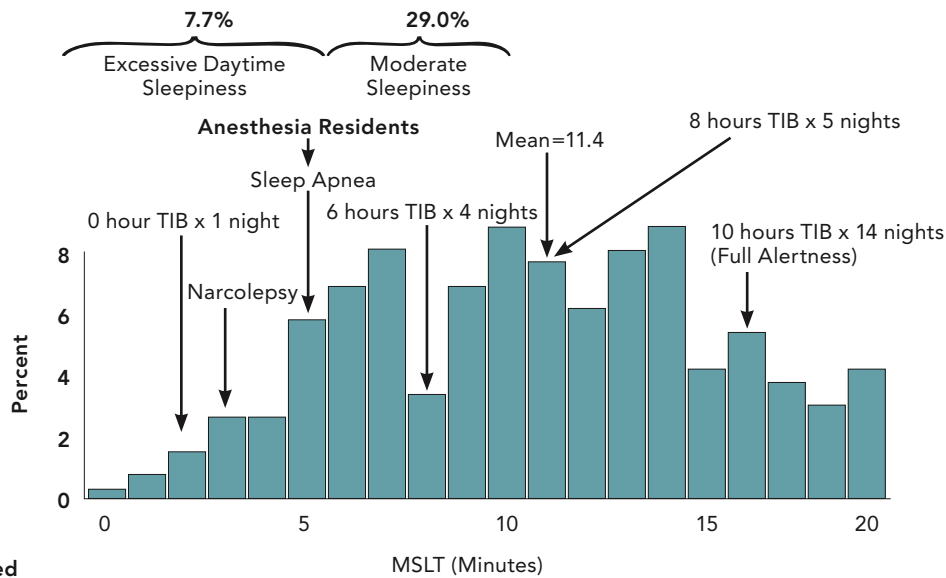
Situation	Chance of Dozing (0-3)			
	0	1	2	3
Sitting and reading	0	1	2	3
Watching television	0	1	2	3
Sitting inactive in a public place – for example, a theater or meeting	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after lunch (when you’ve had no alcohol)	0	1	2	3
In a car, while stopped in traffic	0	1	2	3
<b>Total Score</b>				

0 = would never doze  
1 = slight chance of dozing

2 = moderate chance of dozing  
3 = high chance of dozing

ESS total score >10 indicates excessive daytime sleepiness or sleep disorder

**Exhibit 2<sup>2</sup>: Sleepiness in the General Population**



of illness or death in humans. In uncontrolled case studies, cognitive function is definitely impaired after several days without sleep.

Sleepiness is measured with a multiple sleep latency test (MSLT), maintenance of wakefulness test (MWT), and the Epworth sleepiness scale (ESS). The ESS is the most commonly used (Exhibit 1).<sup>1</sup> It is used in screening for sleep apnea and some other disorders, but is not useful in children. A score greater than or equal to 10 indicates excessive day-

time sleepiness and possibly a sleep disorder.

The MSLT is a more objective test than the ESS. This test measures how long it takes a person to fall asleep in a quiet, dark room. Using the MSLT, almost eight percent of a normal population had excessive daytime sleepiness and 29 percent have moderate sleepiness (Exhibit 2).<sup>2</sup> Thus, sleepiness is a common daily occurrence.

Sleep disorders have an impressive effect on some clinical measures. Sleep shortening of a single night

Exhibit 3<sup>5</sup>: Pathophysiology of OSA

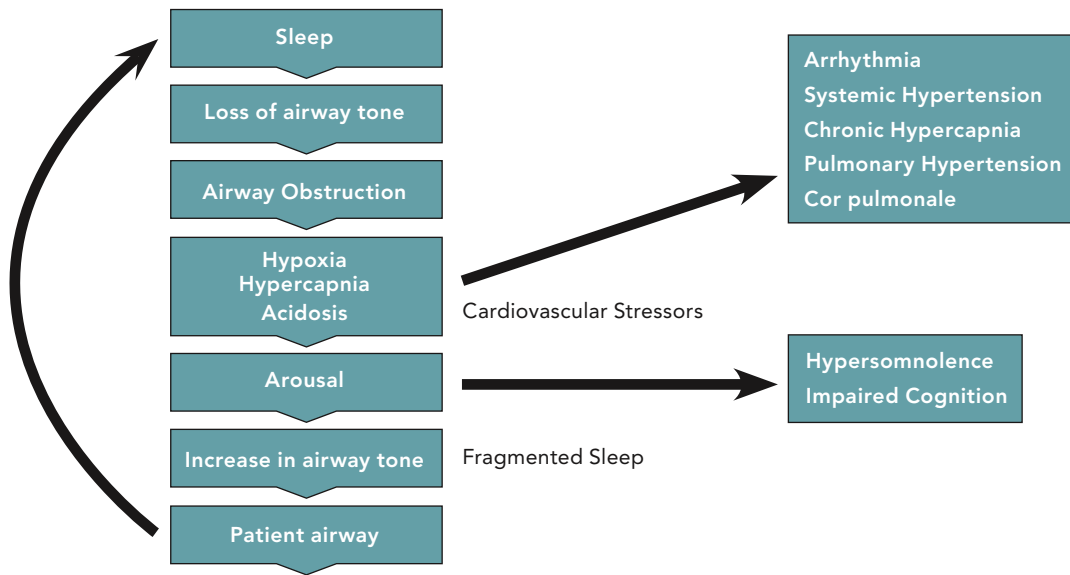


Exhibit 4<sup>7</sup>: Changes in Definition and Treatment of Insomnia

	NIH – 1983	NIH – 2005
Definition	Insomnia is a symptom, not a primary disorder	Insomnia is a disorder, typically comorbid with other disorders
Treatment	Treat the primary disorder (insomnia symptoms are sometimes addressed, sometimes ignored)	Chronic insomnia exists and merits treatment
	Hypnotics should generally be used only for short-term treatment	Treat insomnia as well as other disorder(s): improvements in insomnia may result in improvements in other disorder(s)
Other	Chronic insomnia occurs in the context of medical/psychiatric disorders	Insomnia is independently associated with significant impairment in function and quality of life

decreases pain threshold by 50 percent<sup>3</sup>. Patients with chronic pain issues can have improved pain by having their sleep improved.

Shortened sleep is associated with adverse metabolic complications from lowered leptin (appetite suppressant) levels and increased ghrelin (appetite stimulant) levels.<sup>4</sup> Shortened sleep increases the risk of type 2 diabetes, metabolic syndrome, and obesity. It increases the desire for sweets, salt, and starches.

Sleep complaints are among the most common complaints in medical practices. Almost fifty percent of adults will have some kind of sleep complaint.

Some example sleep disorders are chronic insufficient sleep syndrome, obstructive sleep apnea (OSA), insomnia, restless legs syndrome, and narcolepsy.

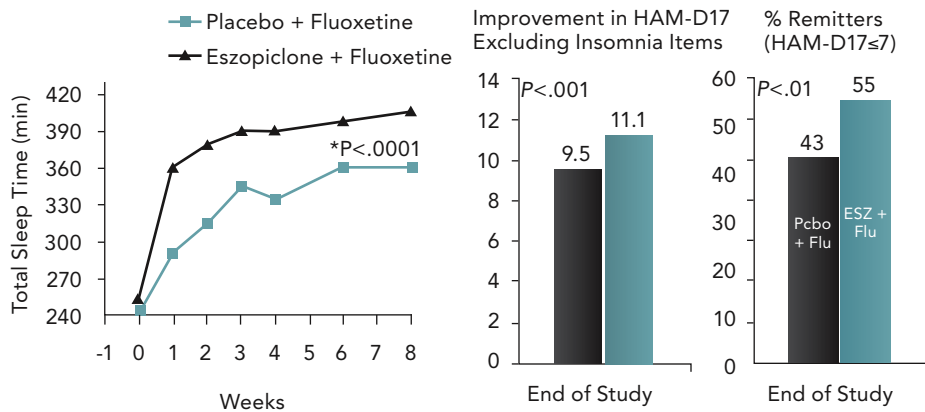
Chronic insufficient sleep syndrome is not a diagnosis that will likely appear on a medical claim, but it is an important diagnosis. It is the most common cause of pathologic sleepiness in the United States and it is excessive sleepiness due to behaviorally foreshortened sleep. The complicity of a patient with chronic insufficient sleep syndrome varies. A college student after an “all-nighter” is impaired but would not be treated with a wake promoting

Exhibit 5: Approved Hypnotics

Agent	Dose (mg)	Half-life (h)	Class	Approved
<b>Benzodiazepine receptor agonists (BzRAs)</b>				
Flurazepam HCL	15 or 30	47-100	BZDP	1970
Quazepam	7.5 or 15	39-73	BZDP	1979
Estazolam	0.5, 1 or 2	10-24	BZDP	1991
Temazepam	7.5, 15 or 30	3.5-18.4	BZDP	1982
Eszopiclone	1, 2, or 3	6.0	NON-BZDP	2004
Triazolam	0.125 or 0.25	1.5-5.5	BZDP	1979
Zolpidem	5 or 10	1.4-4.5	NON-BZDP	1993
Zaleplon	5 or 10	1.0	NON-BZDP	2005
<b>Melatonin receptor agonists</b>				
Ramelteon	8	1 – 2.6	--	2005

Exhibit 6<sup>13</sup>: Insomnia Treatment Improves Outcome

Significant Effect on Depression Response



medication. At present, insufficient sleep secondary to shift-work is the only indication for wakefulness medication. Unfortunately, many adult Americans subscribe to the notion, “I’ll sleep when I’m dead.”

Obstructive sleep apnea (OSA) is another common sleep disorder. The typical patients are older, overweight males. With OSA, the upper airway is compromised and collapses during sleep resulting in apnea (Exhibit 3).<sup>5</sup> Patients with OSA who stop breathing more than 20 times per hour are more likely to die than those with fewer instances. The cardiovascular effects of frequent apnea and hypersomnolence can result in death. Hypersomnolence leads to automobile and other accidents.

The first line treatment of OSA is continuous positive airway pressure (CPAP). CPAP improves

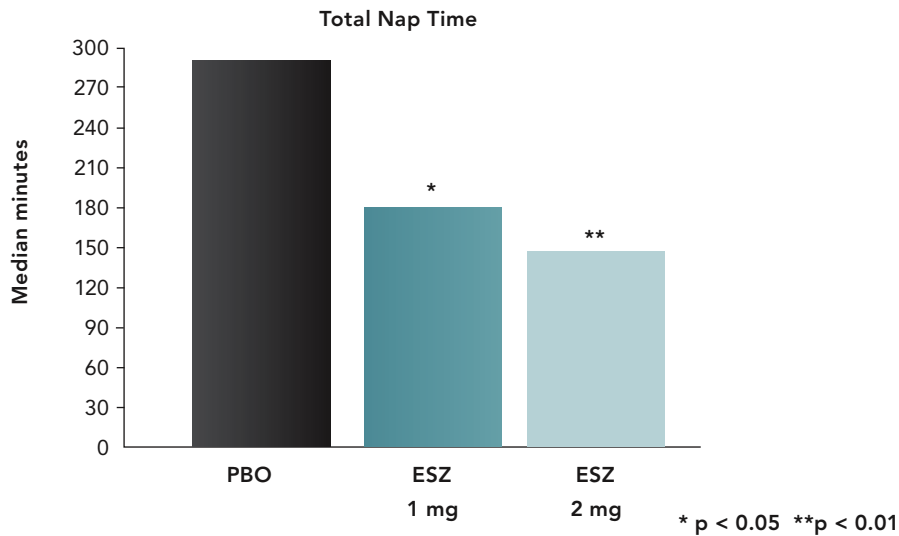
sleepiness, cardiovascular outcomes, and all cause mortality. Compliance with the treatment is the major stumbling block. It has to be used at least four hours per night to affect all cause mortality.

Weight loss is another effective treatment for OSA. Even modest weight loss can result in significant benefits. Although no medications are currently used to treat OSA, there are some under development. Surgery also is used to correct upper airway obstructions.

Patients with OSA may not realize they have a sleep disorder, but it is an expensive diagnosis to miss. In one study of overweight women with OSA, they had significantly increased pre-diagnosis health care costs compared with an overweight control group.<sup>6</sup>

If chronic insufficient sleep syndrome is excluded, insomnia is the most common sleep disorder. In-

Exhibit 7: Percent Wound Area Reduction Predicts Healing



somnia is the complaint of inadequate or insufficient sleep despite adequate opportunity. About 10 to 15 percent of adults have insomnia every year. Fifteen to 35 percent consider their problem serious.

In 2005, the NIH convened a State of Science conference on insomnia in adults.<sup>7</sup> Exhibit 4 shows how the definition and treatment of insomnia has changed since 1983.<sup>7</sup> Insomnia is now treated as a disorder, which may require chronic treatment. Chronic insomnia is a relapsing and remitting disorder but it never completely goes away. If a patient has insomnia for two years, then he or she is likely to have it for their lifetime.<sup>8</sup>

Insomnia is co-morbid with many chronic diseases and conditions including chronic arthritis pain, GERD, COPD, asthma, dementia, depression, and menopause. Concomitant diseases affect insomnia and vice versa. Treating insomnia can improve the other underlying diseases such as improved pain scores with arthritis. Forty percent of all insomnia cases are associated with common psychiatric conditions. Ninety percent of patients with depression have sleep disturbances. If a patient has chronic insomnia, there should be an evaluation for underlying depression, substance abuse, or other psychiatric disorders.

Chronic insomnia is a major public health problem affecting millions of individuals, along with their families and communities. The NIH statement on chronic insomnia in adults recommends behavioral therapy and approved pharmacological therapy (hypnotics).<sup>7</sup> Agents not specifically approved for insomnia are not recommended.

Agents inappropriately used off label for chronic insomnia include sedating antidepressants, chloral

hydrate, and diphenhydramine. Most of these agents have incomplete safety or efficacy data to allow assessment compared with prescription agents specifically studied for insomnia. Sedating antidepressants and chloral hydrate cause more adverse effects than the newer sleeping aids. Diphenhydramine should not be used because of evidence of inadequate efficacy. In physician surveys, insurers are the most commonly cited reason for inappropriate prescriptions for chloral hydrate because of its low cost.

A major problem with the use of hypnotics is the use of the wrong efficacy measure. Symptom control (i.e., does the patient quit calling because of the problem) is not the only goal. Improvement in daytime functioning and other signs of insomnia is important in determining hypnotic efficacy.

There are very few reasons to use agents other than those listed in Exhibit 5. There are data of long-term efficacy using appropriate efficacy measures and safety for these agents. The same data are not available for the off label hypnotics.

Chronic insomnia causes adverse effects including impaired psychomotor and memory function, decreased job performance, increased absenteeism, increased risk of automobile accidents, increased risk of major depression, and increased risk of falls.<sup>9-12</sup> Although hypnotics are commonly thought to increase falls in the elderly, the studies determining this finding are flawed. A well done recent study found that untreated insomnia increased the risk of falls in elderly nursing home residents.<sup>12</sup>

Recent data shows that managing insomnia when depression also is present has a benefit in the depression response (Exhibit 6).<sup>13</sup> Patients started on both an

antidepressant and a hypnotic at diagnosis had better scores on the Hamilton Depression (HAM-D) scale. Additionally, depression medication compliance was better and the percent of patients whose depression remitted increased with insomnia treatment.

Another benefit of effective hypnotics is an improvement in daytime functioning as measured by an increase in daytime alertness (Exhibit 7).<sup>14</sup> The newer long acting agents have been shown to produce this effect.

Insomnia results in significant health care costs. In one study, patients with moderate to severe insomnia had 12.87 outpatient physician visits/year compared with 5.25 visits/year in patients without insomnia.<sup>15</sup> There are data that treatment mitigates these added costs.

There are several interventions related to sleep that managed care should consider implementing. Preventative health programs should include education about the importance of sleep and the symptoms of sleep disorders. Sleep apnea outreach (i.e., finding individuals before they present) should be considered because of the high health care costs of undiagnosed OSA. Sleep apnea outreach has been shown to be cost effective. Because the benefits of CPAP therapy only come with regular use, CPAP therapy programs should include compliance education and measures.

## Conclusion

Sleep disorders cause a wide range of adverse effects that impact daytime functioning, cognition, and long-term risk of various diseases. OSA patients should be sought out for treatment but do require compliance programs for effective use of CPAP. Chronic insomnia needs chronic therapy and not all insomnia is psychiatric. Before patients go on chronic therapy for insomnia they should be screened for common psychiatric disorders. The newer hypnotic agents have real advantages in improving daytime functioning and underlying diseases. Generic hypnotics approved for long-term use are reasonable first line agents. **JMCM**

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**Gary S. Richardson, MD**, is a senior research scientist with the Sleep Research Lab and senior attending with Henry Ford Hospital in Detroit, Mich.

## References

1. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep*. 1991;14(6):540-5.
2. Drake CL. Sleepiness in the general population. *Sleep*. 2002;25(suppl):A91.
3. Roehrs T, Hyde M, Blaisdell B, et al. Sleep loss and REM sleep loss are hyperalgesic. *Sleep*. 2006;29:145-151.

4. Spiegel K, Leproult R, L'hermite-Balériaux M, et al. Leptin levels are dependent on sleep duration: relationships with sympathovagal balance, carbohydrate regulation, cortisol, and thyrotropin. *J Clin Endocrinol Metab*. 2004;89(11):5762-71.
5. Rapoport DM. Treatment of sleep apnea syndromes. *Mt Sinai J Med*. 1994;61(2):123-30.
6. Banno K, Ramsey C, Walld R, Kryger MH. Expenditure on health care in obese women with and without sleep apnea. *Sleep*. 2009;32(2):247-52.
7. National Institutes of Health State-of-the-Science Conference Statement. NIH State-of-the-Science Conference Statement on Manifestations and Management of Chronic Insomnia in Adults. June 13-15, 2005. Available [www.consensus.nih.gov/2005/2005InsomniaSOS026html.htm](http://www.consensus.nih.gov/2005/2005InsomniaSOS026html.htm). Accessed May 13, 2009.
8. Katz DA, McHorney CA. Clinical correlates of insomnia in patients with chronic illness. *Arch Intern Med*. 1998;158(10):1099-107.
9. Kuppermann M, Lubeck DP, Mazonson PD, et al. Sleep problems and their correlates in a working population. *J Gen Intern Med*. 1995;10(1):25-32.
10. Hauri PJ. Can we mix behavioral therapy with hypnotics when treating insomniacs? *Sleep*. 1997;20(12):1111-8.
11. Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *JAMA*. 1989;262(11):1479-84.
12. Avidan AY, Fries BE, James ML, et al. Insomnia and hypnotic use, recorded in the minimum data set, as predictors of falls and hip fractures in Michigan nursing homes. *J Am Geriatr Soc*. 2005;53(6):955-62.
13. Fava M, McCall WV, Krystal A, et al. Eszopiclone co-administered with fluoxetine in patients with insomnia coexisting with major depressive disorder. *Biol Psychiatry*. 2006;59(11):1052-60.
14. Scharf et al. Symposia. *International Psychogeriatrics*. 2003;15(s2):200-201.
15. Weyerer S, Dilling H. Prevalence and treatment of insomnia in the community: results from the Upper Bavarian Field Study. *Sleep*. 1991;14(5):392-398.