

The Economic Impact of Insomnia in Managed Care: A Clearer Picture Emerges

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Abstract

An important question for managed care organizations is whether insomnia is associated with increased consumption of healthcare resources. Even though a large number of adults complain of insomnia, few actually receive a diagnostic code for the condition. Consequently, it has been challenging to consistently measure both direct medical costs and indirect costs attributable to insomnia. Recent data have provided a clearer picture showing that insomnia is a costly medical condition. This paper summarizes current understanding of the prevalence of insomnia and explores its impact on health-related quality of life, workplace productivity, and healthcare resource utilization.

(*Am J Manag Care.* 2006;12:S246-S252)

Insomnia: A National Problem in America

Managed care organizations (MCOs) have generally viewed insomnia as a limited clinical problem, one that does not have a significant effect on medical costs. Fortunately, major strides have been made in understanding and measuring the economic impact of insomnia, although unanswered questions certainly remain. The National Institutes of Health (NIH) 2005 State-of-the-Science Conference statement on the treatment of insomnia concludes¹:

Insomnia is the most common sleep complaint across all stages of adulthood, and for millions, the problem is chronic. Insomnia can be a symptom of other disorders, like depression, or it can be a primary disorder in itself...[C]hronic insomnia is often associated with a wide range of adverse conditions, including mood disturbances, difficulties with concentration, and memory.

The National Academy of Sciences Institute of Medicine, in its 2006 publication, *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*, has noted²:

It is estimated that 50 to 70 million Americans chronically suffer from a disorder of sleep and wakefulness, hindering functioning and adversely affecting health and longevity. The cumulative long-term effects of sleep loss and sleep disorders have been associated with a wide range of deleterious health consequences, including increased risk of hypertension, diabetes, obesity, depression, heart attack, and stroke.

The institute's Committee on Sleep Medicine and Research concluded that awareness among the general public and healthcare professionals is low given the magnitude of the burden.²

Although a surprisingly large number of adults complain of insomnia, few are actually given a diagnostic code for the condition. As a result, it has been challenging to consistently measure direct medical costs attributable to insomnia (eg, physician visits) and indirect costs (eg, changes in workplace productivity). Recently, however, a clearer picture is emerging that shows insomnia to be a costly medical condition.

This paper summarizes current understanding of the prevalence of insomnia and explores its impact on health-related quality of life (HRQOL), workplace productivity, and healthcare resource utilization.

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Editorial assistance in the preparation of this manuscript was provided by Stephen Collins.

Prevalence of Insomnia and Its Impact on HRQOL and Resource Utilization

Several studies have measured the proportion of the adult population affected by insomnia. The typical reported range is 25% to 30%, but the definitions of insomnia used in the assessment can affect the results. Community- or population-based prevalence estimates found in the literature have generally relied on responses to telephone interviews or self-administered questionnaires.

Despite the variance in methodology and sample populations, these estimates have reported broadly similar results. The National Sleep Foundation conducted telephone interviews with 1000 randomly selected US residents and found that about 25% experienced occasional insomnia, whereas for an additional 9%, insomnia was a chronic, nightly occurrence.³ A survey of 588 employees at a telecommunications firm found that 30% reported a sleep problem, providing a snapshot of insomnia in a healthy working population.⁴ In a survey of 3447 members of 5 MCOs, Hatoum et al stratified insomnia into 2 severity levels based on daytime effects. Level II insomnia, characterized by daytime dysfunction in addition to insomnia, was more prevalent than level I insomnia (difficulty in falling or staying asleep)—32.5% versus 13.5%.⁵

As mentioned above, operational definitions of insomnia can affect prevalence estimates. In a study of over 12 000 French adults, 3 different criteria were applied and produced markedly divergent results. When insomnia was defined as “a nocturnal sleep problem,” prevalence was 73%, whereas the prevalence of subjects with “at least one sleep problem three times per week for a month” was 29%.⁶ When the French study used criteria similar to those for insomnia cited in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)*,⁷ which call for daytime consequences in addition to at least 1 sleep problem 3 times per week, prevalence estimates fell still further, to 19%.⁶ The 2005 NIH State-of-the-Science Conference statement concluded: “Population-based studies suggest that about 30 percent of the general population has com-

plaints of sleep disruption....The importance of sleep disruption often rests with its impact on the individual's daytime function.”⁷¹ Based on a literature review, Walsh has suggested that more severe forms of insomnia may be more persistent than milder forms.⁸

Prevalence surveys have illuminated aspects of the association of insomnia with demographic patterns and comorbidities, as well as the influence of insomnia on patients' behaviors and HRQOL. In the survey of telecommunications workers, insomnia was reported by a significantly higher proportion of women than men (34% vs 26%), and by a higher proportion of separated, widowed, or divorced respondents than single or married respondents. Statistically significant associations with insomnia were also demonstrated among respondents receiving medical treatment for gastrointestinal problems, frequent headaches, muscle pain, or neck or back pain; and among those with a possible mental health condition (based on responses to a 5-item version of the Mental Health Index).⁴ Among managed care enrollees, severe insomnia (ie, insomnia accompanied by daytime dysfunction) was more prevalent among women and nonwhite individuals, and was reported more frequently by patients with multiple comorbidities (assessed by proxy, using prescription records).⁵

Some studies have documented a reduction in HRQOL among patients with insomnia. Zammit et al⁹ compared 261 individuals with insomnia with 101 people without any sleep complaint using the 36-item short-form health survey of the Medical Outcomes Study (SF-36).¹⁰ These researchers found that the insomnia group had lower mean scores on all subscales of the SF-36 than the control group ($P < .0001$ or lower for each comparison), indicating impairments across multiple quality of life (QOL) domains. The patients with insomnia also had significantly higher mean item scores on the Zung depression scale and the Zung anxiety scale.⁹ In a French study, Leger et al compared good sleepers to patients with either severe insomnia (2 sleep complaints ≥ 3 times per week, with impaired daytime functioning) or mild insomnia (occasional sleep difficulties) also using the SF-36. Across all

8 SF-36 domains, patients with severe insomnia had significantly lower scores than both those with mild insomnia and good sleepers, whereas patients with mild insomnia had significantly lower scores than good sleepers.¹¹

As noted earlier in this paper, insomnia is a prevalent disorder that may be unrecognized or overshadowed by costly comorbid conditions, such as depression, cancer, irritable bowel syndrome, cardiovascular disease, and other conditions.¹² The most consistent clinical correlate with severe or chronic insomnia is depression.⁸ However, although severe insomnia is generally a symptom of depression, the reverse can also be true. In addition, insomnia can be an independent complaint to some extent in patients with depression.⁸ One study showed that 44% of patients with depression who were considered to be complete responders to fluoxetine, based on Hamilton Depression (HAM-D)¹³ scale scores, still experienced substantial sleep disturbances.¹⁴ Other comorbidities that have demonstrated significant associations with insomnia include various forms of cardiovascular disease, chronic obstructive pulmonary disease, peptic ulcer disease, osteoarthritis, and rheumatoid arthritis.¹⁵

The association of comorbidities with increased insomnia risk has been supported by studies demonstrating higher rates of insomnia among selected populations compared with the community at large. A survey of patients in primary care clinics found that 69% reported insomnia (50% occasional, 19% chronic).¹⁶ In a study of patients being treated for alcoholism, 61% were scored as having symptomatic insomnia based on responses to the Sleep Disorders Questionnaire. Patients with insomnia were twice as likely to relapse to alcohol use during a posttreatment follow-up period (mean follow-up, 5 months; relapse rates: patients with insomnia, 60%; patients without insomnia, 30%); this difference remained statistically significant after adjustment for other variables. In contrast, relapse was not predicted by a history of self-medication for insomnia using alcohol.¹⁷

A consistent finding in population- and community-based assessments of insomnia is a high rate of self-medication among those reporting sleep problems. In the National

Sleep Foundation survey, 4 of 10 subjects with insomnia reported self-medication using over-the-counter (OTC) sleep aids or alcohol.³ Significantly greater use of prescription and OTC sleep medications, as well as daytime use of caffeine for wakefulness, was found among telecommunications workers reporting sleep problems than among those without sleep problems.⁴ Both the MCO survey and the employee survey discussed earlier in this paper found that twice as many subjects with insomnia reported using OTC sleep aids than prescription sleep medications.^{4,5}

In summary, the prevalence of insomnia in the community is high, with several major studies suggesting that a substantial part of the population experience some form of insomnia. These studies also document that insomnia exerts a profound negative effect on HRQOL, productivity, and everyday functioning. Further research is needed to delineate the relationship between insomnia and comorbidities. As noted by Martin et al, it is not always clear whether insomnia is a cause, effect, or correlate of the identified association.¹⁸

Assessing the Costs of Insomnia

A particularly important question for MCOs is whether insomnia is associated with increased consumption of healthcare resources. Various studies have shown that the impact is substantial. As early as 1997, Simon and VonKorff concluded: "Insomnia among primary care patients is associated with greater functional impairment, lost productivity, and excess health care utilization."¹⁹ The 2005 NIH State-of-the-Science Conference statement noted that estimates place the direct and indirect annual costs of chronic insomnia at tens of billions of dollars, but cautioned that such estimates are based on many assumptions and vary extensively. In estimating the economic consequences of insomnia, it is difficult to separate the effects of insomnia from the effects of comorbid conditions....²¹ Recent data have begun to clarify the true economic costs attributable to insomnia.

Direct Costs. Overall Cost Burden: Medical and Pharmacy Claims Analyses. The

cost burden of insomnia is well illustrated by 2 retrospective claims database studies reported by Ozminkowski et al.^{20,21} The first study used 2 large matched-patient cohorts with insomnia (n = 86 472) and without insomnia (n = 86 475) from a medical and pharmacy claims database to evaluate the incremental costs of insomnia against the costs incurred during the 6-month period immediately before the start of insomnia treatment. Direct and indirect per-patient costs were \$2000 and \$1000 higher, respectively, for those with insomnia.²⁰

The second study by Ozminkowski et al illustrates the cost burden of insomnia in the elderly. This study evaluated claims data of patients with an average age of 75 years (41 502 with insomnia and 41 511 without insomnia). The investigators found that incremental direct per-patient costs were \$2789 higher in those with insomnia. Hospital admissions for reasons not related to mental health, which averaged a cost of \$1856 per patient, were the primary source of the higher incremental costs.²¹

Use of Healthcare Resources. A study by Simon and VonKorff of nearly 2000 adults enrolled in the Group Health Cooperative of Puget Sound found significantly more disability, significantly more days of limited activity, twice the number of days in bed, and 60% higher mean total health services costs in patients with insomnia than in those without insomnia.¹⁹ When the analysis was adjusted for depression, the costs were still 25% to 50% higher for those with insomnia. The study, which included patients older than 65 years of age, also found that 10% of those with insomnia had severe insomnia by strict definition.

A survey by Hatoum et al of 7500 patients at 5 American Medical Group Association clinics found that one third of more than 3400 patients who responded to an extensive written questionnaire that assessed QOL, sleep, demographic variables, and depression reported experiencing insomnia with daytime dysfunction.^{5,22} The survey found that patients with insomnia had lower HRQOL scores, more visits to the emergency department, more physician visits and calls to physicians for medical com-

plaints, more laboratory tests, and increased use of prescription and OTC medications compared with those who did not have insomnia.²²

This same survey also compared responses by severity of insomnia. Not surprisingly, patients with more severe (level II) insomnia used more healthcare resources than those with less severe (level I) insomnia.²²

Findings from a French survey of more than 11 000 adults were similar. After excluding respondents with psychiatric disorders, the investigators identified a group with severe insomnia (8.1%) and compared them with a matched group of good sleepers.^{11,23} These investigators found that adults with severe insomnia had significantly higher rates of physician office visits and medication use and were hospitalized twice as often. They also found that those with severe insomnia missed work twice as often as good sleepers, had a higher rate of work-related accidents, and had a higher incidence (15% vs 6%) of serious work errors.²³

Two other analyses of direct costs attributable to insomnia in the United States during the 1990s came to dramatically different conclusions, with one estimating direct costs at \$13.9 billion and the other estimating these costs at \$1.79 billion.^{24,25} Although the higher estimate reflects greater costs attributed to all of the categories noted above, most of the disparity stems from widely differing attribution of nursing home costs (\$10.9 billion vs \$7.0 million, respectively). The lower estimate is based on the direct treatment costs for insomnia in nursing homes, whereas the higher estimate is based on evidence that the primary factor in many nursing home admissions is disrupted caregiver sleep arising from the patient's insomnia. The authors of the latter study estimated that sleep problems underlie 20.4% of all nursing home admissions.¹⁸

The 2 estimates of direct costs paint a similar picture of medication costs. In both analyses, prescription medication costs were comparable to costs attributed to alcohol or substances used to self-medicate (\$455 million and \$574 million, respectively, in one study²⁴ and \$809 million and \$780 million, respectively, in the other^{18,25}). Estimates of OTC medication costs for insomnia differ

substantially between the 2 analyses (\$84 million²⁴ vs \$376 million, including \$50 million for melatonin alone^{18,25}), but evaluating these estimates is rendered more difficult because of “crossover” between drug classes and uses (eg, the use of OTC nighttime cold medications as sleep aids). Broad similarity between the 2 analyses suggests that the “true” direct costs of insomnia in the United States are in the range of \$1.8 billion to \$3 billion annually.^{24,25}

Indirect Costs. It is generally accepted that indirect costs of insomnia, resulting primarily from its daytime effects, are higher than direct costs.^{18,25} However, quantifying the contribution of insomnia to motor vehicle and workplace accidents, reduced productivity, and absenteeism is a significant challenge.

Stoller estimated annual US indirect insomnia costs of \$77 billion to \$92 billion.²⁶ This analysis included costs attributable to medical comorbidities, increased hospitalization (primarily for depression), insomnia-related alcohol abuse, reduced workplace productivity, and motor vehicle and other accidents. The author also estimated annual costs for increased primary care visits attributable to insomnia (\$13.8 billion) and for absenteeism (\$4800 per employee with insomnia), but because of concerns about the ability to discern causation and correlation, these costs were not included in the overall estimate.^{18,26}

Workplace Productivity

The association of insomnia with daytime dysfunction makes it a particular concern for employers, who must contend with reduced productivity, absenteeism, “presenteeism” (being on the job but at reduced productivity or efficiency), and increased risk of accidents. In addition, specific jobs may contribute to insomnia via stress and other aspects of the work environment; second- or third-shift work or rotation between shift schedules also may disrupt healthy sleep patterns.²⁷

The survey of 588 telecommunications workers by Kuppermann et al provides the most comprehensive analysis to date of associations between sleep problems (including

insomnia, narcolepsy, and related conditions) and functional parameters related to workplace performance, as well as subjective measures of job satisfaction. Compared with employees without sleep problems, those reporting sleep problems had significantly lower self-rated scores for energy, cognitive functioning, and overall health. The proportion of employees who rated their health as “excellent” over the 4 weeks preceding the survey was 12.1% for those with sleep problems, compared with 33.3% for those without such problems ($P < .001$). Of importance, the statistical significance of this difference was maintained in a multivariate analysis that corrected for the impact of demographic variables, comorbidities, and possible mental health problems.⁴

With regard to work-specific measures, individuals with sleep problems were significantly less satisfied with work, were significantly more likely to have missed work during the preceding 4 weeks, and had significantly lower self-rated job performance scores than did those without sleep problems. The strength of most of these associations was reduced, however, in a multivariate analysis compared with a bivariate analysis; the only difference that maintained statistical significance in the multivariate analysis was self-rated job performance.⁴ It is possible that these self-report measures may have attenuated between-group differences. It would be interesting to conduct similar studies using more objective measures of job performance.

Traffic and Workplace Accidents. Traffic accidents represent a sizeable proportion of indirect costs associated with insomnia. An Italian study examined the effects of sleep deprivation on vehicular accidents after excluding accidents resulting from alcohol use, neuropsychiatric drug use, speeding, or reckless driving. The study found that 3.2% of all accidents occurring on an Italian highway network between 1993 and 1997 were sleep related, with a higher rate of death of the driver (11.4%) than in accidents not related to sleep (5.6%).²⁸

The study of US MCO enrollees by Hatoum et al included a 3-question depression screen, a sleep questionnaire, and ques-

tions about drug use and medical system encounters, in addition to the SF-36. Patients with level II insomnia reported significantly more emergency department visits, calls to physicians, and OTC drug use than did those without insomnia; these associations remained significant even after adjustment for demographic variables and comorbid conditions.²² Another study showed that primary care patients with untreated insomnia report higher rates of serious accidents, which are likely to be associated with greater healthcare utilization and cost, compared with patients with treated insomnia or healthy controls.²⁹ These results suggest that effective treatment of insomnia may help to reduce per-patient resource requirements.

Cost-effectiveness of Insomnia Treatment

Martin et al recently published a detailed analysis of economic and health outcomes studies focused on insomnia, including papers published from 1966 to 2002. For this time period, the authors found that no comprehensive cost-effectiveness or cost-utility analyses had been published for insomnia diagnosis and/or treatment.¹⁸ As noted in the present paper, challenges related to diagnostic coding, differences in how insomnia has been defined, the relationship of insomnia with a range of comorbidities, and varying approaches for assessing direct or indirect costs have made cost-effectiveness analysis difficult.

Conclusions

This paper describes the complexities and data gaps that constrain the development of cost models of insomnia and its treatments that are robust enough to support knowledgeable planning and resource allocation in MCOs. Nonetheless, even the limited information available to date strongly suggests that (1) insomnia is a problem affecting a substantial fraction of the adult population; (2) insomnia exerts profound effects on patient HRQOL; and (3) direct and indirect costs attributable to insomnia exceed \$100 billion annually in the United States alone.

It is clear, however, that further progress in developing cost models for insomnia and insomnia treatment will depend on well-

designed studies that clarify the relationship between insomnia and various comorbidities, provide better estimates of the risk of insomnia-related outcomes (such as falls and accidents) attributable to insomnia alone, and quantify the impact of insomnia and its treatment on HRQOL and functional measures.

To a great extent, the usefulness of such studies also depends on the establishment of standardized definitions and severity ratings for insomnia, as well as standardized measurements of treatment outcomes. To that end, it is worth noting that the American Academy of Sleep Medicine has commissioned a work group to identify different insomnia phenotypes and to develop standardized research diagnostic criteria, permitting their use in clinical studies. This work group has recently reported on its progress.³⁰ In addition, a new 16-item HRQOL measurement instrument, the Hotel Dieu 16, has been developed specifically for use in studies of insomnia.³¹

These encouraging developments provide reason for optimism that more high-quality information on insomnia and its clinical, economic, social, and functional correlates will soon become available. Notwithstanding the obvious complexities involved in the analysis of insomnia, such data should form the basis for the development of rational, patient-centered, and economically sound guidelines for insomnia treatment in the managed care setting.

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