

Contributions of Cognitive-Behavioral Approaches to the Clinical Management of Insomnia

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Insomnia is a prevalent and costly health problem. Because psychological and behavioral factors often exacerbate sleep difficulties, these factors should be addressed when treating insomnia. This article reviews the benefits and limitations of cognitive-behavioral approaches for treating insomnia and summarizes recently developed evidence-based practice guidelines. The findings from controlled clinical trials indicate that 70% to 80% of patients with primary insomnia benefit from cognitive-behavioral interventions such as stimulus-control, sleep-restriction, relaxation, and cognitive therapies. These treatments mainly improve sleep continuity, enhance sleep satisfaction, and reduce emotional distress—changes that are well sustained over time. Despite these positive results, treatment response is not always optimal; only a few patients become good sleepers, and some patients do not respond at all. Because no single treatment method is effective for all patients and all insomnia subtypes, behavioral and pharmacologic approaches often need to be integrated. Recent findings from such studies are discussed, with emphasis on issues such as speed, magnitude, and durability of treatment effects. Finally, several clinical guidelines for implementing optimal treatment strategies are suggested.

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Insomnia, a common complaint in primary care medicine both as a symptom and a syndrome, is associated with significant psychosocial and health care costs.^{1,4} Paradoxically, insomnia complaints are often ignored or trivialized in clinical practice. Consequently, this condition often remains untreated.^{5,6} It is estimated that less than 15% of those with chronic insomnia receive any treatment for this condition.⁷ Not surprisingly, individuals with insomnia often rely on self-help measures such as alcohol and over-the-counter products as first-line treatment. When additional treatment is initiated, pharmacotherapy is the most frequent and often the only treatment recommended to insomnia patients. There are clinical circumstances, however, when drug treatment is either contraindicated, insufficient to alleviate insomnia, or an unacceptable treatment option for the patient. This article describes cognitive-behavioral treatments and their rationale and summarizes the evidence regarding their efficacy, durability, and applicability in the

management of insomnia. Ultimately, the outcome of treatments for insomnia may be optimized through integration of behavioral and pharmacologic therapies.

CONCEPTUAL MODEL OF INSOMNIA

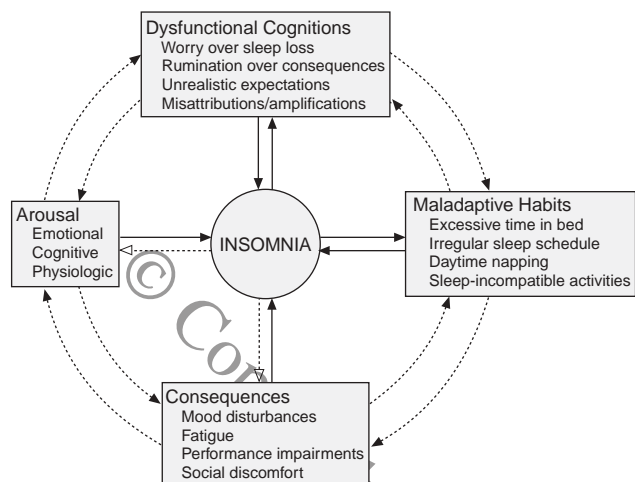
The 3 types of factors that contribute to insomnia (predisposing, precipitating, and perpetuating) take on different roles at different times during the course or natural history of insomnia.⁸ Predisposing factors are essentially hypothetical risk factors that make an individual more vulnerable to insomnia. These include age, female gender, hyperarousability, family/personal history of insomnia, and medical and psychiatric illnesses. Precipitating factors are those events that trigger or coincide with the onset of insomnia. The most common precipitating factors involve major stressors such as a separation, hospitalization, or death of a loved one or less severe but more chronic daily hassles that include occupational stress and family conflicts, as well as other important life events such as the birth of a child or menopause. Although most individuals will resume a normal sleep pattern after the initial triggering event has passed or after they have adjusted to its presence, some people—perhaps those who are initially more vulnerable to insomnia—will continue to experience sleep difficulties. Several perpetuating factors become particularly instrumental in sustaining sleep difficulties over time. As such, regardless of what precipitated the insomnia (e.g., illness, stressful life events), behavioral and psychological factors are almost always involved in maintaining it.⁹

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Figure 1. An Integrative Model of Chronic Insomnia^a



^aAdapted from Morin,⁹ with permission.

When sleep difficulties persist, a vicious cycle develops: poor sleep habits, irregular sleep scheduling, and the fear of not sleeping exacerbate the insomnia problem (Figure 1).⁹ A person may spend too much time in bed or nap during the day, all in a misguided effort to compensate for poor nocturnal sleep. Apprehension about not sleeping and excessive worry about the possible consequences of insomnia will further interfere with sleep. To short-circuit this pattern, treatment must focus on poor sleep habits and faulty beliefs and attitudes about sleep. Hypnotic medication is useful for breaking the cycle of insomnia, but behavioral therapies are essential to alter the conditions that perpetuate it.

COGNITIVE-BEHAVIORAL THERAPIES

More than a dozen nonpharmacologic interventions have been described for treating insomnia, but only those with adequate empirical validation from controlled clinical trials will be reviewed here: relaxation-based treatments, stimulus-control therapy, sleep restriction, cognitive therapy, and sleep hygiene education. A summary of these treatments is provided below and in Table 1; more extensive descriptions are available in other sources.⁹⁻¹²

Rationale and Objectives of Cognitive-Behavioral Therapy for Insomnia

The primary roles of cognitive-behavioral therapy (CBT) are to modify maladaptive sleep habits and scheduling factors, correct misconceptions about sleep, reduce autonomic and cognitive arousal, educate patients about healthy sleep practices, and teach coping skills to prevent relapse. Behavioral interventions are structured and sleep focused; they do not seek to alter the underlying predis-

Table 1. Cognitive-Behavioral Treatments for Insomnia

Therapy	Description
Relaxation training	Methods aimed at reducing somatic tension (eg, progressive muscle relaxation, autogenic training, biofeedback) or intrusive thoughts (eg, imagery training, hypnosis, thought stopping) interfering with sleep
Stimulus-control therapy	Patients go to bed only when sleepy, get out of bed when unable to sleep, use the bed/bedroom for sleep only (no reading, watching television, etc), arise at the same time every morning, no napping
Sleep restriction	Patients curtail time in bed to actual sleep time, thereby creating mild sleep deprivation, which produces more consolidated and more efficient sleep
Cognitive therapy	Psychotherapeutic method aimed at changing dysfunctional beliefs and attitudes about sleep and insomnia (eg, unrealistic sleep expectations, fear of the consequences of insomnia)
Sleep hygiene education	Patients avoid stimulants (eg, caffeine and nicotine) and alcohol around bedtime, do not eat heavy or spicy meals too close to bedtime, exercise regularly but not too late in the evening, maintain a dark, quiet, and comfortable sleep environment

posing factors such as the personality traits of patients. Rather, their primary focus is on teaching patients appropriate skills to improve sleep and to cope with residual sleep difficulties.

Relaxation-Based Interventions

There are several subtypes of relaxation-based interventions; some methods, such as progressive muscle relaxation, autogenic training, and biofeedback, focus primarily on reducing somatic arousal (e.g., muscle tension), whereas attention-focusing procedures, including imagery training, meditation, and thought stopping, target mental arousal in the form of worry or intrusive thoughts. Biofeedback is designed to train a patient to control some physiologic parameters (e.g., frontalis electromyographic tension) through visual or auditory feedback. However, patients should be realistic in their expectations. Relaxation can be very beneficial for some patients, but the results are rarely immediate. All methods require training and daily practice for at least 2 to 4 weeks. Relaxation may sometimes induce performance anxiety and exacerbate the underlying sleep difficulties. Professional guidance and audiotapes are often necessary at first. Clinical benefits are fairly similar across methods.^{13,14} Consistency is the most important element; the selected technique must be practiced regularly, initially during the day, when there is no expectation or pressure to get to sleep. Once the method is mastered, practice can be moved to bedtime or upon nocturnal awakening.

Stimulus-Control Therapy

People with chronic insomnia often become apprehensive around bedtime and associate the bed/bedroom with frustration and arousal. This conditioning process, which may take several weeks or even months, occurs unknown to the patient. Stimulus-control therapy consists of a set of instructions designed to reassociate temporal (bedtime) and environmental (bed and bedroom) stimuli with rapid sleep onset. This association is accomplished by postponing bedtime until sleep is imminent, getting out of bed when unable to sleep, and curtailing both overt and covert sleep-incompatible activities (e.g., reading, watching television, worrying). The second objective of stimulus control, to establish a regular circadian sleep-wake rhythm, is achieved by enforcing a regular waking time and avoiding daytime naps.¹⁵ Although these behavioral recommendations are fairly straightforward, follow-up visits are almost essential with all patients to ensure strict compliance with instructions.

Sleep Restriction

In a misguided effort to provide more opportunity for sleep, poor sleepers often increase their time in bed, a strategy that is more likely to cause fragmented and poor-quality sleep. Sleep-restriction therapy consists of curtailing the time spent in bed to the actual amount of time asleep.¹⁶ Time in bed is subsequently adjusted based on sleep efficiency (ratio of total sleep/time in bed \times 100%) for a given period (usually a week). For example, if a person reports sleeping an average of 6 hours per night out of 8 hours spent in bed, the initial prescribed sleep window (i.e., from initial bedtime to final arising time) would be 6 hours. The subsequent allowable time in bed is increased by about 20 minutes for a given week when sleep efficiency exceeds 85%, decreased by the same amount of time when sleep efficiency is lower than 80%, and kept stable when sleep efficiency falls between 80% and 85%. Adjustments are made weekly until an optimal sleep duration is achieved, as determined subjectively by a feeling of refreshment on awakening and level of alertness during the day. Sleep restriction produces a mild state of sleep deprivation and may also alleviate sleep anticipatory anxiety. To prevent excessive daytime sleepiness, time in bed should not be restricted to less than 5 hours per night. When implemented properly, this procedure produces the most rapid change in sleep patterns. For this reason, it may be preferable to introduce this treatment initially and then add stimulus-control instructions as the sleep window is increased.

Cognitive Therapy

Cognitive therapy seeks to alter faulty beliefs, expectations, and attributions about sleep and insomnia. The basic premise of this approach is that appraisal of a given situation (in this case, sleeplessness) can trigger negative

emotions such as fear and anxiety that are incompatible with sleep. For example, when a person is unable to sleep at night and begins thinking about the possible consequences of sleep loss on the next day's performance, a negative reaction can begin that prolongs the cycle of insomnia, intensifies the emotional distress, and leads to more sleep disturbance. To short-circuit this cycle, cognitive therapy is designed to identify and correct misconceptions about sleep. Specific treatment targets include unrealistic expectations ("I must get 8 hours of sleep every night"), faulty causal attributions ("My insomnia is entirely due to a biochemical imbalance"), amplification of the consequences of insomnia ("Insomnia may have a serious effect on my health"), and misconceptions about healthy sleep practices. Because these factors play an important mediating role in insomnia, they need to be addressed in treatment. The following messages must be conveyed to the patient: (1) keep your expectations realistic, (2) do not blame insomnia for all your daytime impairments, (3) do not place too much importance on sleep, (4) do not view a poor night's sleep as a catastrophe, and (5) develop some tolerance to the effects of sleep loss.⁹ Cognitive therapy is more time consuming than pure behavioral prescriptions, and clinical training is often required for proper implementation. However, this therapeutic component plays a very important role in teaching patients appropriate coping skills to prevent relapse or minimize recurrence of insomnia after the initial treatment.

Sleep Hygiene Education

Sleep hygiene education addresses health practices, such as poor diet, lack of exercise, and substance use, and environmental factors including excessive light, noise, and temperature that may interfere with sleep.¹² Although these factors are rarely severe enough to be the primary cause of insomnia, they may potentiate sleep difficulties caused by other factors. Sleep hygiene education is typically incorporated into other interventions to minimize interference from poor sleep hygiene practices. Basic recommendations involve avoiding stimulants such as caffeine and nicotine as well as alcohol, exercising regularly, minimizing noise and light, and keeping room temperatures comfortable.

OTHER THERAPIES

Several additional therapies—paradoxical intention, acupuncture, ocular relaxation, and electro-sleep therapy—have been described for treating insomnia. Although potentially useful in practice, these methods have not been evaluated as extensively in controlled studies as the interventions just described. Psychotherapy may also be a useful adjunct for addressing predisposing factors to insomnia, but there has been no controlled evaluation of its efficacy specifically for insomnia.

SUMMARY OF THE OUTCOME EVIDENCE— EFFICACY, DURABILITY, AND APPLICABILITY

The effects of cognitive-behavioral approaches for treating insomnia have been evaluated in more than 50 treatment studies involving more than 2000 patients. These results have been summarized in 2 meta-analyses^{13,17} and in an evidence-based review article¹⁴ prepared by a task force of the American Academy of Sleep Medicine, as well as in several other sources.^{18,19} These general findings indicate that CBT reliably improves several sleep parameters. Approximately 70% to 80% of patients with primary insomnia benefit from such interventions. The main benefits are improved sleep continuity and sleep efficiency and a 30- to 45-minute increase in total sleep time. These changes are associated with increased satisfaction with sleep, a perception of enhanced control over sleep, and a corresponding reduction in emotional distress.

Although stimulus-control therapy and sleep restriction are the most effective single-treatment modalities, the best outcome is often obtained from multifaceted interventions that incorporate behavioral, educational, and cognitive therapeutic components. The most important strength of CBT is that sleep improvements achieved during treatment are well sustained over time. Maintenance of sleep improvements for up to 2 years after completion of CBT has been well documented.^{14,17,20} Although much of the outcome evidence has been gathered from patients presenting with primary insomnia, initial findings from clinical case series and group studies suggest that CBT also benefits patients whose insomnia is associated with comorbid medical and psychiatric conditions.²¹⁻²⁴

Despite these positive results, CBT is not without limitations. This treatment modality has been evaluated predominantly for chronic insomnia, and little information is available regarding its efficacy and usefulness for situational/acute insomnia, which is often associated with jet lag, shift work, or acute stress. Also, despite some encouraging preliminary results, there is still limited evidence on the efficacy of CBT with patients presenting with significant medical or psychiatric comorbidity. Regarding the practical limitations, CBT is more time consuming than pharmacotherapy, and its success depends largely on the patient's willingness and motivation to implement the recommended changes. Another limitation is that CBT is not widely available, and not many therapists are trained in using this approach specifically for insomnia. Although the purely behavioral procedures (stimulus-control and sleep-restriction therapy) can be implemented successfully by primary care physicians,²⁵ more specialized treatments such as cognitive therapy or even relaxation might best be implemented by clinicians trained in these treatment modalities.

COMBINATION OF BEHAVIORAL AND PHARMACOLOGIC APPROACHES

Behavioral and pharmacologic therapies are not mutually exclusive and can often play complementary roles in the management of insomnia. The rationale for combining treatment modalities is based on several observations. First, no single treatment modality is effective with all forms of insomnia or acceptable to all patients. Even among those who achieve adequate treatment response, only a few become completely asymptomatic. Furthermore, there is a high rate of recurrence over time. Thus, combined treatments may optimize outcome in terms of speed, magnitude, and durability of sleep improvements or in terms of the proportion of patients responding to treatment. Also, not everyone is willing to take a sleep medication or to invest time and effort in implementing behavioral changes; as such, combined treatment may enhance treatment acceptability and compliance. For instance, a patient might be more willing to use a hypnotic medication knowing that treatment will also include behavioral strategies.

Theoretically, an integrated biobehavioral intervention should optimize treatment outcome by capitalizing on the more immediate and potent effects of drug therapy and the proven sustained effects of psychological intervention. Only 4 studies have directly compared the effects of behavioral and pharmacologic treatments for insomnia.^{20,26-28} Three of those studies compared triazolam with relaxation^{27,28} or sleep hygiene education,²⁶ and the other²⁰ compared CBT with temazepam. The findings indicate that both behavioral and pharmacologic forms of therapy are effective in the short term. Drug therapy produces quicker and slightly better results in the acute phase (first week) of treatment, whereas behavioral and drug therapies are equally effective in the short term (4 to 8 weeks). Combined interventions appear to have a slight advantage over single-treatment modalities during the initial course of treatment.

Long-term effects have been fairly consistent for the single-treatment modalities but equivocal for the combined approach. Sleep improvements are well sustained after behavioral treatment, while those obtained with hypnotic drugs are quickly lost after the medication is discontinued. In principle, behavioral changes are more permanent; however, no study has examined reversal of treatment effects if a patient returns to old habits. Clearly, this is an interesting question, for the experimental paradigm for behavioral treatment studies cannot be compared directly with medication studies. Some studies indicate that a combined intervention (i.e., medication plus behavioral modification) produces more sustained benefits than drug therapy alone,^{27,28} whereas other investigations report more variable long-term outcomes.^{20,26} Some patients appear to retain their initial sleep improvements, whereas others return to their baseline values. Since behavioral and attitudinal changes are often essential to sustain improve-

ments in sleep patterns, patients' attributions of the initial benefits may be critical in determining long-term outcomes, particularly when combining behavioral and drug therapies. Attribution of therapeutic benefits to the drug alone, without integration of self-management skills, may place a patient at significantly greater risk for relapse once the drug is discontinued. Thus, despite the intuitive appeal of combining behavioral and drug interventions, it is not entirely clear when, how, and for whom these treatment modalities should be combined. Additional research is needed to compare the effects of single and combined drug and nondrug treatments for insomnia and to examine optimal methods for integrating these therapies.

Until more evidence-based treatment guidelines become available, several strategies should be considered for selecting and combining behavioral and pharmacologic interventions in the clinical management of insomnia. The use of hypnotic medication initially may help break the cycle of insomnia and reinforce the belief that change is possible. This is particularly important since patients with chronic insomnia often approach treatment with rather skeptical expectations due to learned helplessness and poor success with self-treatment. Given that medication is likely to produce quicker benefits than behavioral interventions, it may be indicated particularly in the initial stage of therapy. On the other hand, CBT is essential to alter perpetuating factors and to teach coping skills and, as such, is a necessary treatment component to maximize durability of sleep improvements. Ideally, hypnotic medications should be discontinued under supervision after an initial treatment course of a few weeks. However, since insomnia may be a recurrent problem, even those who benefit from treatment initially may have to use hypnotic medications on an intermittent basis after the initial acute treatment phase. Sometimes, simply having a sleep medication available is sufficient to reduce sleep anticipatory anxiety and prevent a return to chronic insomnia.

Although significant advances have been made in the clinical management of insomnia in the past decade, there are still important limitations and barriers to achieving optimal outcome. Several ongoing research programs are evaluating key issues related to insomnia treatment. Some of the questions being evaluated are whether it is preferable to implement behavioral and pharmacologic treatments concurrently or sequentially, what the optimal treatment dosage is (in terms of both frequency of consultations and duration of treatment), and whether the addition of maintenance therapies enhances long-term outcome. Other studies are examining the efficacy of CBT to facilitate benzodiazepine discontinuation among long-term users. Research is also in progress to evaluate the cost-effectiveness of different modes of treatment delivery (brief consultation, group therapy, telephone consultation) relative to individual therapy.²⁹⁻³³

Insomnia is a prevalent and costly health condition that often goes untreated. Significant advances have been made in the management of insomnia with CBT, but these methods remain underutilized by health care practitioners. No single treatment is effective, indicated, or acceptable to all insomnia patients. To maximize both treatment compliance and outcome, nonpharmacologic therapies should be an integral part of the clinical management of insomnia.

Drug names: temazepam (Restoril and others), triazolam (Halcion).

REFERENCES

1. Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention? *JAMA* 1989;262:1479-1484
2. Simon GE, VonKorff M. Prevalence, burden, and treatment of insomnia in primary care. *Am J Psychiatry* 1997;154:1417-1423
3. Hohagen F, Rink K, Kappler C, et al. Prevalence and treatment of insomnia in general practice: a longitudinal study. *Eur Arch Psychiatry Clin Neurosci* 1993;242:329-336
4. Ohayon MM, Caulet M. Psychotropic medication and insomnia complaints in 2 epidemiological studies. *Can J Psychiatry* 1996;41:457-464
5. Katz DA, McHorney CA. Clinical correlates of insomnia in patients with chronic illness. *Arch Intern Med* 1998;158:1099-1107
6. NIH releases statement on behavioral and relaxation approaches for chronic pain and insomnia. *Am Fam Physician* 1996;53:1877-1878, 1880
7. Mellinger GD, Balter MB, Uhlenhuth EH. Insomnia and its treatment: prevalence and correlates. *Arch Gen Psychiatry* 1985;42:225-232
8. Spielman AJ, Glovinsky PB. The varied nature of insomnia. In: Hauri PJ, ed. *Case Studies in Insomnia*. New York, NY: Plenum Medical Book; 1991:1-15
9. Morin CM. *Insomnia: Psychological Assessment and Management*. New York, NY: Guilford Press; 1993
10. Espie CA. *The Psychological Treatment of Insomnia*. Chichester, England: John Wiley & Sons; 1991
11. Lichstein KL, Morin CM, eds. *Treatment of Late-Life Insomnia*. Thousand Oaks, Calif: Sage Publications; 2000
12. Hauri PJ. *Case Studies in Insomnia*. New York, NY: Plenum Medical Book; 1991
13. Morin CM, Culbert JP, Schwartz SM. Nonpharmacological interventions for insomnia: a meta-analysis of treatment efficacy. *Am J Psychiatry* 1994; 151:1172-1180
14. Morin CM, Hauri PJ, Espie CA, et al. Nonpharmacologic treatment of chronic insomnia: an American Academy of Sleep Medicine review. *Sleep* 1999;22:1134-1156
15. Bootzin RR, Epstein D, Wood JM. Stimulus control instructions. In: Hauri PJ, ed. *Case Studies in Insomnia*. New York, NY: Plenum Medical Book; 1991:19-28
16. Spielman AJ, Saskin P, Thorpy MJ. Treatment of chronic insomnia by restriction of time in bed. *Sleep* 1987;10:45-56
17. Murtagh DR, Greenwood KM. Identifying effective psychological treatments for insomnia: a meta-analysis. *J Consult Clin Psychol* 1995;63: 79-89
18. Edinger JD, Wohlgenuth WK. The significance and management of persistent primary insomnia: the past, present and future of behavioral insomnia therapies. *Sleep Med Rev* 1999;3:101-118
19. Lichstein KL, Riedel BW. Behavioral assessment and treatment of insomnia: a review with an emphasis on clinical application. *Behav Ther* 1994; 25:659-688
20. Morin CM, Coecchi C, Stone J, et al. Behavioral and pharmacological therapies for late-life insomnia: a randomized controlled trial. *JAMA* 1999; 281:991-999
21. Currie SR, Wilson KG, Pontefract AJ, et al. Cognitive-behavioral treatment of insomnia secondary to chronic pain. *J Consult Clin Psychol* 2000;68: 407-416
22. Dashevsky BA, Kramer M. Behavioral treatment of chronic insomnia in psychiatrically ill patients [CME]. *J Clin Psychiatry* 1998;59:693-699
23. Jacobs GD, Benson H, Friedman R. Perceived benefits in a behavioral-

- medicine insomnia program: a clinical report. *Am J Med* 1996;100:212-216
24. Morin CM, Stone J, McDonald K, et al. Psychological management of insomnia: a clinical replication series with 100 patients. *Behav Ther* 1994; 25:291-309
 25. Baillargeon L, Demers M, Ladouceur R. Stimulus-control: nonpharmacologic treatment for insomnia. *Can Fam Physician* 1998;44:73-79
 26. Hauri PJ. Can we mix behavioral therapy with hypnotics when treating insomniacs? *Sleep* 1997;20:1111-1118
 27. McClusky HY, Milby JB, Switzer PK, et al. Efficacy of behavioral versus triazolam treatment in persistent sleep-onset insomnia. *Am J Psychiatry* 1991;148:121-126
 28. Milby JB, Williams V, Hall JN, et al. Effectiveness of combined triazolam-behavioral therapy for primary insomnia. *Am J Psychiatry* 1993;150:1259-1260
 29. Bastien CH, Morin CM, Bouchard S, et al. Cognitive-behavioral treatment for insomnia: comparative efficacy of individual, group and phone consultations [abstract]. *Sleep Research Online* [serial online] 1999;2(suppl 1):280
 30. Edinger JD, Wohlgemuth WK, Radtke RA, et al. Dose response effects of behavioral insomnia therapy [abstract]. *Sleep* 2000;23(suppl 2):A310
 31. Espie C. Implementation and evaluation of multicomponent treatment for insomnia in community health care [abstract]. *Sleep Research Online* [serial online] 1999;2(suppl 1):668
 32. Morin CM. Late life insomnia and chronic use of benzodiazepines. CRISP [database online]. Bethesda, Md: National Institutes of Health; 1999. Accessed Nov 8, 2001
 33. Riemann D, Voderholzer U, Hohagen F, et al. Cognitive behavioral group therapy of primary insomnia: long-term effects [abstract]. *Sleep Research Online* [serial online] 1999;2(suppl 1):784

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