

Current Patterns and Future Directions in the Treatment of Insomnia

JOHN WINKELMAN, M.D., PH.D.

Brigham and Women's Hospital, Sleep Health Center, Newton, MA, USA

RONALD PIES, M.D.

Tufts University School of Medicine, Boston, MA, USA

Background. *Despite the high prevalence and the high burden associated with chronic insomnia, it remains largely unrecognized and often inadequately treated by physicians.*

Methods. *A review was undertaken of the literature on barriers to both acute and chronic treatment of insomnia, as well as recent trials of pharmacologic and nonpharmacologic agents for insomnia.*

Results. *Obstacles to appropriate treatment of the condition include outdated insomnia management guidelines, which have contributed to US Food and Drug Administration restrictions on longer-term prescription of hypnotic agents; lack of research demonstrating the benefit of treating insomnia; and fears of tolerance and withdrawal effects of long-term use of hypnotic agents, as well as an absence of longer-term, randomized, controlled, double-blind trials of existing agents used to treat insomnia.*

Conclusions. *There is evidence that improved sleep may improve outcome in some medical and psychiatric illnesses. Both behavioral and pharmacologic therapies have shown efficacy in chronic insomnia. In addition, a recent 6-month, randomized, controlled study has demonstrated that at least one agent may be safe and effective in longer-term use.*

Keywords Chronic insomnia, Sleep maintenance, Trazodone, Benzodiazepines, Non-benzodiazepines

INTRODUCTION

Prevalence rates for insomnia in general community surveys range from 9% to 36% (1–4). As insomnia is a symptom of numerous medical and psychiatric illnesses (5,6), prevalence rates reported in clinical settings are understandably higher, ranging from 10% to 50% (6–10). In addition, population surveys indicate that of the approximately 50% of the general population who report sleep difficulties, 20% to 36% report a duration of such difficulties of more than 1 year (11–14). Since many psychiatric patients have insomnia, and psychiatrists are frequently consulted regarding individuals with chronic insomnia, it is particularly important that psychiatrists understand and treat insomnia effectively.

Address correspondence to John Winkelman, MD, PhD, Associate Director, Sleep Disorders Program, Brigham and Women's Hospital, Sleep Health Center, 1400 Centre Street, Suite 109, Newton, MA 02459. E-mail: jwinkelman@sleephealth.com

While there are many ways of classifying insomnia, the first step in a psychiatrist's algorithm is the *duration* of the insomnia complaint (15). Unfortunately, commonly used classification systems for insomnia do not aid with determination and definition of chronicity. The International Classification of Sleep Disorders (ICSD) (16) distinguishes duration of insomnia by a number of different subtypes, making its use very cumbersome in the clinical setting. The *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision (DSM-IV-TR) (17) does not use duration as a determining criterion for its classification scheme; rather, it divides sleep disorders into "Primary Sleep Disorders," "Sleep Disorders Related to Another Mental Disorder," and "Other Sleep Disorders," including those caused by general medical conditions. However, DSM-IV-TR's criterion A for *primary* insomnia requires "...a complaint of difficulty initiating or maintaining sleep or of nonrestorative sleep that lasts for at least 1 month" (17) (see Table 1). Various definitions of acute and chronic insomnia have been put forward, with *acute insomnia* generally lasting no more than 2 weeks,

Table 1 Diagnostic Criteria for Primary Insomnia from the DSM-IV-TR

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- A. The predominant complaint is difficulty initiating or maintaining sleep, or nonrestorative sleep, for at least 1 month.
- B. The sleep disturbance (or associated daytime fatigue) causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
- C. The sleep disturbance does not occur exclusively during the course of Narcolepsy, Breathing-Related Sleep Disorder, Circadian Rhythm Sleep Disorder, or a Parasomnia.
- D. The disturbance does not occur exclusively during the course of another mental disorder (e.g., Major Depressive Disorder, Generalized Anxiety Disorder, a delirium).
- E. The disturbance is not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition.
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and *chronic insomnia* lasting 3 to 4 weeks or longer (18,19). The DSM-IV-TR construct of primary insomnia, therefore, appears to subsume most definitions of chronic insomnia.

Insomnia, by DSM-IV-TR criteria, involves difficulty *initiating* sleep (sleep onset problem); *maintaining* sleep; or obtaining *restorative* sleep. Sleep maintenance problems may take several forms—for example, prolonged wakefulness, frequent awakenings, and/or nonrestorative sleep. In addition, for a DSM-IV-TR diagnosis of insomnia, daytime dysfunction or distress is required, which usually takes the form of dysphoria, hyperarousal, or diminished function while awake (20). Of note, self-reports of patients' sleep may be inconsistent with polysomnographic recordings generated on the same night (21), demonstrating that sleep has both an objective and a subjective basis.

Insomnia symptoms often change over time in those with chronic insomnia (14). The presence of symptom variability in individual patients over time (i.e., changes from sleep onset to sleep maintenance insomnia, to insomnia with early morning wakening, or vice-versa) may have important implications for treatment of chronic insomnia. Although many physicians focus on treatments that address sleep onset difficulties, both psychiatrically and medically ill patients with chronic insomnia frequently experience *sleep maintenance* problems (8,22–28). Treatments that have demonstrated the ability to improve both sleep onset and sleep maintenance problems and improve next-day symptoms over the long term, without causing adverse next-day effects, remain an unmet need (29).

Burden of Chronic Insomnia

It is crucial that insomnia be viewed not only as a complaint of sleep disturbance or a measurable sleep impairment (in a laboratory setting), but also as an impaired capacity to function normally as a result of sleep difficulties. Studies have demonstrated that the life burden related to insomnia is substantial and that chronic insomnia reduces the ability to cope, accomplish

tasks, and deal with personal relationships and family and social life (30). Insomnia sufferers report becoming more readily annoyed, upset, or irritated, feeling tired, and having difficulty remembering (31). They also subjectively report difficulties with psychomotor functioning, including impaired memory, concentration, attention, reasoning, problem solving, and reaction time (32). Impairments in cognitive function (33,34), such as impairments in short-term and semantic memory, as well as confusion, have been objectively documented in association with sleep deficits. This impaired functioning has substantial implications. Individuals with insomnia use healthcare services more frequently (7,35), have more days with limited activity, and spend more days in bed due to illness than those without insomnia (7). Studies have also shown reduced productivity (36), higher rates of absenteeism (37), increased accident risk (31,38), and lower quality of life measures among chronic insomnia sufferers (39,40).

Aside from the direct consequences of insomnia, there is also evidence that individuals with insomnia are at higher risk for development of depression (35,41,42) and depressive relapse (43). Ford and Kamerow (35) found that the odds of developing depression were 20 times higher if insomnia was experienced during the preceding year than if insomnia was absent. Breslau et al. found that sleeping difficulty predicted depression, even in the absence of other depressive symptoms (odds ratio [OR], 2.1) (42). Insomnia associated with depression increases the risk of adverse events, such as suicide (44–46) and resistance to cognitive behavioral therapy (45), as well as relapse (43,47). Emerging evidence suggests that insomnia worsens outcome in medical illnesses; for example, one recent report demonstrated that chronic sleep difficulties predicted mortality related to coronary artery disease in males (48).

Insomnia Is Underrecognized and Undertreated

Insomnia is underdiagnosed. The World Health Organization's international collaborative study on healthcare attendees in 15 primary care sites found that physicians detected insomnia in less than 50% of patients with insomnia symptoms (49). It appears that both patients and physicians may not recognize the need to discuss sleep disturbances during office visits. Shochat and colleagues (8) found that only 30% of patients with sleep difficulties seen in primary care clinics had ever spoken with their physician about a sleep problem and reported that they were the first to raise the issue. Ford and Kamerow (35) found that of those among their subjects who reported "difficulty sleeping," only 9% had mentioned the problem to a physician. An Australian study (50) determined that, among hospitalized patients, reference to sleep was recorded in only 9% of patients' notes. There is also evidence that insomnia is undertreated. The 2002 Sleep in America Poll conducted by the National Sleep Foundation (51) demonstrated that of those who reported experiencing insomnia, only 15% reported using any medication to help them sleep (both physician-prescribed

[8%] and over-the-counter [10%]). In the survey by Shochat (8), 36% of patients in the chronic insomnia group (defined as those who frequently reported sleep difficulty) reported that the physician's recommendation for management was not effective.

Obstacles to Longer-term Treatment of Insomnia

When one considers the duration of insomnia experienced by many insomnia sufferers and the fact that insomnia is associated with a number of individual (31,33,34,36,37,51) and socioeconomic consequences (37,52), as well as the fact that treatment of chronic insomnia may improve daytime functioning (53), it would seem apparent that longer-term treatment may be necessary and/or indicated. On the other hand, there are many obstacles to longer-term treatment of these patients.

The 1983 National Institutes of Health (NIH) Consensus Conference established guidelines for the management of insomnia (54), which have largely been responsible for the establishment of restrictions on longer-term prescription of benzodiazepine and non-benzodiazepine hypnotics by the US Food and Drug Administration (FDA) (55). Current FDA-approved product labeling for hypnotic agents specifies short-term use (i.e., up to 1 month of use for benzodiazepine and non-benzodiazepine hypnotics) (55). Although these guidelines have been declared to be outdated by the NIH (http://consensus.nih.gov/cons/039/039_intro.htm), they have not been updated since 1983. FDA restrictions also have not been updated since NIH guidelines were instituted; are based largely on concerns regarding risks of abuse and dependence associated with benzodiazepines at the time (56); and persist despite developments in the field of insomnia over the last 20 years. More recent evidence suggests that patients with insomnia use hypnotic medications for therapeutic reasons and not due to drug-seeking behavior (57–60).

Lack of recognition of the longer-term consequences of insomnia and, similarly, the paucity of research demonstrating that there is in fact a benefit to treating insomnia, whether primary or secondary (44,61,62), have also contributed to inadequate treatment of this condition.

Reticence among physicians to recommend hypnotic medication for the longer term is also related, until recently, to the lack of randomized, controlled safety and efficacy trials lasting longer than 12 weeks. This also possibly contributes to the preference for use of antidepressants such as trazodone over hypnotics for insomnia management (63). Antidepressants are perceived as safer agents, despite the fact that they have also not been evaluated for longer-term use in insomnia. In addition, existing medications, while effective from a number of perspectives, also have various shortcomings, which may interfere with physicians' belief in their capacity to treat the patient with insomnia.

Pros and Cons of Available Treatments for Chronic Insomnia

Behavioral and Cognitive Behavioral Therapies

There is evidence that use of nonpharmacologic therapies improves insomnia in as many as 70% to 80% of cases; however, treatment response is highly variable (64). Therapies currently accepted as efficacious or probably efficacious by the American Psychological Association include stimulus control, progressive muscle relaxation, paradoxical intention, sleep restriction, biofeedback, and multifaceted cognitive-behavior therapy (64). In a recent meta-analysis (65), cognitive-behavioral therapy showed significant benefit for chronic insomnia, including positive effects on number of awakenings and wake time after sleep onset (WASO), although benefits for total sleep time are less robust. There is also evidence that behavioral and pharmacologic therapies and a combination of the two are equally effective over 4 to 8 weeks of treatment (66); however, longer-term studies (6–24 months) show that improvement associated with pharmacologic therapy is limited to its period of administration, whereas behavioral therapies have persistent beneficial effects (64,66). On the other hand, there is evidence that application of such interventions is difficult, especially in the primary care setting (67), though steps are being taken to increase their use in this environment (67).

Pharmacologic Therapies

Hypnotic agents are needed that improve sleep maintenance and quality of sleep, decrease sleep latency, and increase total sleep time (15), while improving next-day functioning. In addition, hypnotic agents that have a low potential for next-day cognitive side effects, tolerance, and abuse, even after long-term use, are needed. Finally, agents are needed that reduce insomnia in special populations, such as those with depression, anxiety disorders, and medical illness, which do not adversely affect next-day function or underlying medical problems, such as reduced respiratory drive. Although some newer non-benzodiazepine agents may fulfill some of these requirements, they are still far from ideal hypnotic agents (see Table 2).

Two studies offer the suggestion that treatment aimed primarily at reducing insomnia (and perhaps also anxiety) may have adjunctive benefits in the treatment of depression. A randomized, placebo-controlled study comparing the effects of fluoxetine plus clonazepam versus fluoxetine plus placebo in the treatment of adult outpatients with symptoms of anxiety, depression, and sleep disturbance was conducted to explore this (86). Cotherapy with clonazepam accelerated improvement of the core symptoms of depression (depressed mood, guilt, suicide, and loss of interest) provided by fluoxetine over 21 days of treatment. Moreover, adding clonazepam decreased anxiety and sleep disturbances. In another study, Levitan et al. (87) added the amino acid and hypnotic agent tryptophan to fluoxetine in the treatment of major depression. During the first week of

Table 2 Pros and Cons of Currently Available Agents Used for Insomnia (68–85)

Agent or chemical class	Potential advantages	Potential disadvantages
Trazodone (Refs. 71–74).	May improve TST and sleep latency in depressed patients and those with insomnia. Low risk of abuse.	No robust, controlled, or long-term (>2-week) studies demonstrating efficacy for sleep maintenance, especially in patients with primary insomnia, at doses used for insomnia. Potentially serious side effects (eg., priapism, cardiac arrhythmias) and drug-drug interactions.
Benzodiazepines (temazepam, flurazepam, quazepam, triazolam, estazolam) (Refs. 68–69).	Efficacy demonstrated for increasing TST. Anxiolytic effect may be useful for patients with comorbid anxiety disorder. Most BZDs are relatively non-toxic, with few severe drug-drug interactions (except with alcohol, CNS suppressants).	Small effect on time to sleep onset. No controlled studies showing BZD hypnotic efficacy >12 weeks. Benzodiazepines may be associated with next-day sedation, impaired memory, risk of falls, respiratory suppression, tolerance, abuse, and dependence. Short-acting agents may be associated with rebound insomnia and withdrawal syndromes. Drug interactions reported with triazolam.
Zolpidem (Refs. 75–78).	Effective for sleep latency. No accumulation of drug, due to short half-life. Fewer daytime residual effects than long half-life benzodiazepines. May result in less rebound insomnia than triazolam.	Data are weak for improving TST. No evidence of benefit for maintaining sleep in randomized, controlled clinical trials. Absence of longer-term (>5-week) studies of continuous use. After drug administration, dose-related effects on performance tasks and memory comparable to benzodiazepines; sensory/perceptual distortions reported. Abuse, dependence, withdrawal effects, rebound insomnia occasionally reported.
Zaleplon (Refs. 79–82).	Reduces sleep onset insomnia and subjective sleep latency. No accumulation of drug, due to short half-life; minimum of next-day side effects or residual sedation. Has relatively low rate of rebound insomnia and withdrawal on discontinuation.	No evidence from randomized, controlled studies that zaleplon reliably improves sleep maintenance or that hypnotic efficacy persists after 28 days. Drug interactions reported leading to increased zaleplon blood levels.
Over-the-counter antihistamines (diphenhydramine, doxylamine) (Refs. 83–85).	Placebo-controlled studies suggest modest, short-term (<2-week) benefits on sleep latency, number of awakenings, duration of sleep, improvement in depth and quality of sleep.	No recent controlled studies demonstrating long-term (>3-week) efficacy of diphenhydramine for objectively determined measures of sleep maintenance Evidence of tolerance after only 3 days; cognitive side effects Drug-drug interactions; potential toxicity with overdose with diphenhydramine and doxylamine.

treatment, there was a significantly greater decrease in Hamilton Depression Rating Scale (HAM-D) scores in the tryptophan/fluoxetine group than in the placebo/fluoxetine group. There was a significant decrease in slow-wave sleep at Week 4 in the placebo/fluoxetine group, but not in the tryptophan/fluoxetine group. The authors concluded that tryptophan both accelerated response to fluoxetine and had a “protective effect” on slow-wave sleep. While this suggests that improving sleep may have beneficial downstream effects on depression, it is also possible that tryptophan’s serotonergic properties acted synergistically with those of fluoxetine, thereby reducing depression and only secondarily improving slow-wave sleep.

There is also some evidence that sleep quality/quantity is correlated with improved outcome in bipolar disorder. Nowlin-Finch et al. (88), in a naturalistic study of 27 manic patients, found that rapid responders (those showing improvement within 2 days) had slept almost twice as long as the non-rapid responders. Whether the enhanced sleep was a cause or effect of the mood stabilization was unclear. Similarly, Malkoff-Schwartz et al. (89) demonstrated that episodes of mania were preceded by events that produced “social rhythm disruption,” which were defined as those that disturbed sleep. Based on this, and naturalistic

data, it appears that adequate sleep duration is important in predicting the course of bipolar disorder (90).

Treatment of insomnia also appears to improve overall quality of life and symptoms of the underlying medical condition, or both, in those with insomnia related to medical conditions. For example, a polysomnographic study of patients with rheumatoid arthritis (91) found that short-term hypnotic therapy with triazolam not only improved sleep, but also improved subjective reports of morning stiffness and daytime sleepiness.

Over-the-Counter Agents

Sedating antihistamines are commonly used as sleep aids, often in nursing home settings (92,93). Diphenhydramine, the most widely used over-the-counter antihistamine sleep aid, has proved superior to placebo in 2 double-blind, placebo-controlled studies (83,84). These studies were of very short duration (2 weeks) and involved patients with mild-to-moderate insomnia. However, there is no evidence that diphenhydramine is effective in long-term treatment, and another study demonstrated tolerance to its sleep-inducing effects within a few days (85). In addition, efficacy for sleep maintenance symptoms has not been demonstrated.

Hence, the available evidence fails to demonstrate that diphenhydramine and related over-the-counter antihistamines are viable treatments for providing long-term treatment in chronic insomnia. In addition, adverse effects associated with diphenhydramine, especially in the elderly, are significant and include next-day neurocognitive deficits, including impaired mental performance and automobile driving ability (94), risk of toxicity (83,84,95), drug-drug interactions (96), and anticholinergic effects.

For carefully selected insomniac patients, herbal remedies for insomnia (e.g., valerian) may be considered. However, the safety and efficacy of herbal agents remains uncertain (97), and several herbal agents have the potential for serious side effects and drug-drug interactions (98).

Benzodiazepine Hypnotics

Currently, FDA-approved benzodiazepine hypnotics include temazepam, triazolam, estazolam, quazepam, and flurazepam. Aside from triazolam, these agents have half-lives ranging from 10 to 100 hours, which likely improves their capacity to maintain sleep throughout the night (99–103). A recent meta-analysis (70) of benzodiazepine trials for insomnia, which included 45 randomized, controlled trials and a total of 2672 subjects, indicated that while benzodiazepines, compared with placebo, increased total sleep time on polysomnographic measures by 61.8 minutes (95% CI, 37.4 to 86.2), they decreased time to sleep onset by only 4.2 minutes on average (95% CI, -0.7 to -9.2). In this meta-analysis, benzodiazepines decreased subjective sleep latency by 11.7 minutes (95% CI, 7.6 to 15.8). Benzodiazepines may also be associated with impaired delayed and immediate recall (104–106), cognitive impairment (107–110), and risk for rebound insomnia and withdrawal symptoms, depending on the half-life of the medication and the duration of use (111). Triazolam's shorter half-life may also increase the risk of rebound insomnia (112,113). Long-acting, and possibly even shorter-acting, benzodiazepines also appear to be associated with increased risk of falls, particularly in the elderly (114,115).

Despite their frequent use for treating insomnia, no benzodiazepine has been evaluated in randomized, controlled trials exceeding 12 weeks (116); therefore, efficacy and safety in the longer term have not been evaluated.

Non-benzodiazepine Hypnotics

The advent of the non-benzodiazepine hypnotics zaleplon (81,82) and zolpidem (71,75) resulted in a reduced risk of next-day residual effects, based on their shorter half-lives (1 hour and 2.5 hours, respectively). Even middle-of-the-night dosing with zaleplon has not been associated with next-day residual effects (117), and it has been approved by the FDA for this indication. However, shorter half-lives have meant reduced efficacy in treating sleep maintenance problems, as measured by number of awakenings and WASO. This has been demonstrated in randomized, controlled, objective and patient-reported trials of zaleplon (81,82) and zolpidem (71,75,77,118). Compared to

benzodiazepines, these agents generally have a better safety profile (119,120), though there have been reports of negative, dose-related effects on performance tasks (121). Hallucinatory phenomena and other sensory distortions have also been reported in those awake after medication administration, even with therapeutic doses of zolpidem (76). Finally, there have been some reports of abuse, dependence, and withdrawal associated with zolpidem, particularly in individuals with a history of drug or alcohol abuse (122). There are no randomized, controlled trials of zolpidem or zaleplon of greater than 5 weeks (75,81,82); therefore, few conclusions can be drawn about their efficacy and safety in the longer term, although open-label studies have not demonstrated significant safety concerns with longer-term use (123,124).

Trazodone

There is evidence that use of antidepressants for insomnia is increasing due to physician perceptions of their better safety profiles over those of hypnotics, absence of longer-term safety and efficacy data for hypnotics, and FDA prescribing restrictions for benzodiazepines. Data compiled for 1987–1996 (63) concerning the use of medications for insomnia demonstrated a reduction in hypnotic mentions by 53.7%, whereas use of antidepressants (apparently sedating antidepressants) increased by 146% (63).

Trazodone is currently the second-most commonly prescribed agent for insomnia (125), despite the paucity of data evaluating its effectiveness in the treatment of insomnia independent of depression. Since 1980, fewer than 100 patients treated with trazodone have been assessed objectively in sleep laboratory studies. The largest subjective sleep studies (126–129) and many of the objective sleep studies (73,130,131) of trazodone have been conducted in depressed patients, not primary insomniacs, in many instances with doses 2 to 4 times higher than those used in insomnia. However, in the one placebo-controlled, double-blind study of primary insomniacs, trazodone 50 mg was effective in improving sleep latency and measures of sleep maintenance (71), though zolpidem was more effective than trazodone in the former, but not the latter measure. No trazodone trials have exceeded 6 weeks of active treatment, and many of those studies of 2 to 4 weeks' duration have demonstrated evidence of tolerance on some measures (71,130–132). Side effects (133) and drug-drug interactions (134) may be problematic with trazodone use. Dizziness and sedation, dry mouth, headache, and hypotension are known adverse effects of trazodone, though these are less common in the doses commonly used for sleep (50–100 mg) than those used for the treatment of depression (133). Priapism is also a rare side effect of trazodone. Data submitted to the FDA indicated that the majority of cases occurred with doses of between 50 and 150 mg/day (135). Finally, several case reports suggest that cardiac toxicity can occur with trazodone in patients with pre-existing heart disease (136).

Other Agents Used as Hypnotics

Sedating agents used for a variety of indications in psychiatry and neurology are also being used as second- or third-line

hypnotics when benzodiazepine or non-benzodiazepine hypnotics are contraindicated or have failed. These include gabatril (137), quietapine (138), olanzapine (139), and gabapentin (140). A number of these agents appear to increase the percentage of slow wave sleep observed on overnight polysomnography (141, 142). However, the functional significance of this change in sleep architecture remains to be determined. Similarly, these agents may produce next day sedation or metabolic abnormalities.

Progress in Insomnia Therapy

Chronic insomnia has a high prevalence and significant social and economic impact, yet remains undertreated. This undertreatment may be related to (a) the lack of understanding of the longer-term consequences of insomnia, (b) the dearth of existing evidence for efficacy and safety of hypnotic agents beyond a few weeks of treatment, and (c) their lack of efficacy in treating sleep maintenance symptoms without resultant next-day side effects.

Other agents are under development to treat insomnia. One of these agents, eszopiclone, was well tolerated in a study of efficacy and safety over 6 months of double-blind use. Eszopiclone is a non-benzodiazepine (cyclopyrrolone) agent (143), with a time to peak concentration of 1 hour and a half-life of 5.6 hours (144,145). Compared with placebo, eszopiclone 3.0 mg was found to significantly reduce the time to sleep onset, increase total sleep time, and reduce WASO and number of awakenings by self-report. Subjective reports of next-day benefit included improved alertness, daytime ability to function, and sense of physical well-being. Importantly, there was no evidence of reduction in benefit over 6 months of nightly use (146). Another non-benzodiazepine, indiplon, with a 1.5-hour half-life, in a modified release form that extends its duration of action, has also demonstrated superiority over placebo in elderly patients with primary insomnia in a 2-night unpublished study (147); however, longer-term studies are required to confirm its maintained efficacy and safety. Further trials of existing and emerging agents are needed to establish their efficacy and safety over the longer term. In addition, studies assessing the potential benefits of treatment with these agents on the course of diseases associated with insomnia (e.g., depression and chronic pain) may further reduce barriers to treatment. Such studies may also be useful in forging new policies regarding longer-term use of these agents in the treatment of chronic insomnia.

CONCLUSION

Insomnia is a common symptom in psychiatric patients. Existing data suggests that insomnia is associated with both acute psychological and professional dysfunction, as well as an increased incidence of psychiatric illness. Physicians should assess not only the risks of treatment, but of the lack of treatment of insomnia. Short-term use of benzodiazepine and

non-benzodiazepine hypnotics for insomnia in those with insomnia-related dysfunction is encouraged. Newer agents, with demonstrated efficacy for chronic treatment of insomnia, may soon be available, and allow for treatment of this often-chronic symptom.

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REFERENCES

1. Ancoli-Israel S, Roth T: Characteristics of insomnia in the United States: results of the 1991 National Sleep Foundation Survey. *I. Sleep* 1999; 22 Suppl 2:S347-S353.
2. Janson C, Lindberg E, Gislason T, Elmasry A, Boman G: Insomnia in men—a 10-year prospective population based study. *Sleep* 2001; 24:425-430.
3. Ohayon MM, Roth T: Place of chronic insomnia in the course of depressive and anxiety disorders. *J Psychiatr Res* 2003; 37:9-15.
4. Leger D, Guilleminault C, Dreyfus JP, Delahaye C, Paillard M: Prevalence of insomnia in a survey of 12,778 adults in France. *J Sleep Res* 2000; 9:35-42.
5. Buysse DJ, Reynolds CF, III, Kupfer DJ, Thorpy MJ, Bixler E, Manfredi R, Kales A, Vgontzas A, Stepanski E, Roth T: Clinical diagnoses in 216 insomnia patients using the International Classification of Sleep Disorders (ICSD), DSM-IV and ICD-10 categories: a report from the APA/NIMH DSM-IV Field Trial. *Sleep* 1994; 17:630-637.
6. Katz DA, McHorney CA: Clinical correlates of insomnia in patients with chronic illness. *Arch Intern Med* 1998; 158:1099-1107.
7. Simon GE, VonKorff M: Prevalence, burden, and treatment of insomnia in primary care. *Am J Psychiatry* 1997; 154:1417-1423.
8. Shochat T, Umphress J, Israel AG, Ancoli-Israel S: Insomnia in primary care patients. *Sleep* 1999; 22 Suppl 2:S359-S365.
9. Kushida CA, Nichols DA, Simon RD, Young T, Grauke JH, Britzmann JB, Hyde PR, Dement WC: Symptom-based prevalence of sleep disorders in an adult primary care population. *Sleep Breath* 2000; 4:9-14.
10. Hatoum HT, Kania CM, Kong SX, Wong JM, Mendelson WB: Prevalence of insomnia: a survey of the enrollees at five managed care organizations. *Am J Manag Care* 1998; 4:79-86.
11. Bixler EO, Kales A, Soldatos CR, Kales JD, Healey S: Prevalence of sleep disorders in the Los Angeles metropolitan area. *Am J Psychiatry* 1979; 136:1257-1262.
12. Zeitlhofer J, Rieder A, Kapfhammer G, Bolitschek J, Skrobal A, Holzinger B, Lechner H, Saletu B, Kunze M: Epidemiology of sleep disorders in Austria. *Wien Klin Wochenschr* 1994; 106:86-88.
13. Hyypa MT, Kronholm E, Alanen E: Quality of sleep during economic recession in Finland: a longitudinal cohort study. *Soc Sci Med* 1997; 45:731-738.
14. Hohagen F, Kappler C, Schramm E, Riemann D, Weyerer S, Berger M: Sleep onset insomnia, sleep maintaining insomnia and

- insomnia with early morning awakening—temporal stability of subtypes in a longitudinal study on general practice attenders. *Sleep* 1994; 17:551–554.
15. McCall WV: A psychiatric perspective on insomnia. *J Clin Psychiatry* 2001; 62 Suppl 10:27–32.
 16. Diagnostic Classification Steering Committee: *International Classification of Sleep Disorders (ICSD): Diagnostic and coding manual*. Rochester, MN: American Sleep Disorders Association; 1990.
 17. American Psychiatric Association: *Sleep disorders*. In: *Diagnostic and statistical manual of mental disorders-IV-TR*. Washington, DC: American Psychiatric Publishing, Inc; 2000: 597–661.
 18. Reite M, Ruddy J, Nagel K: Insomnia complaints. In: *Concise guide to evaluation and management of sleep disorders*. Washington, DC: American Psychiatric Press, Inc.; 1997: 47–112.
 19. McCall WV: Management of primary sleep disorders among elderly persons. *Psychiatr Serv* 1995; 46:49–55.
 20. Rosa RR, Bonnet MH: Reported chronic insomnia is independent of poor sleep as measured by electroencephalography. *Psychosom Med* 2000; 62:474–482.
 21. Riedel BW, Lichstein KL: Objective sleep measures and subjective sleep satisfaction: how do older adults with insomnia define a good night's sleep? *Psychol Aging* 1998; 13:159–163.
 22. Katz DA, McHorney CA: The relationship between insomnia and health-related quality of life in patients with chronic illness. *J Fam Pract* 2002; 51:229–235.
 23. Ohayon MM, Zulley J: Correlates of global sleep dissatisfaction in the German population. *Sleep* 2001; 24:780–787.
 24. Benca RM, Obermeyer WH, Thisted RA, Gillin JC: Sleep and psychiatric disorders. A meta-analysis. *Arch Gen Psychiatry* 1992; 49:651–668.
 25. Strang P: Emotional and social aspects of cancer pain. *Acta Oncol* 1992; 31:323–326.
 26. Dorrepaal KL, Aaronson NK, van Dam FS: Pain experience and pain management among hospitalized cancer patients. A clinical study. *Cancer* 1989; 63:593–598.
 27. Factor SA, McAlarney T, Sanchez-Ramos JR, Weiner WJ: Sleep disorders and sleep effect in Parkinson's disease. *Mov Disord* 1990; 5:280–285.
 28. Gislason T, Almqvist M: Somatic diseases and sleep complaints. An epidemiological study of 3,201 Swedish men. *Acta Med Scand* 1987; 221:475–481.
 29. Morin CM: Measuring outcomes in randomized clinical trials of insomnia treatments. *Sleep Med Rev* 2003; 7:263–279.
 30. National Sleep Foundation: *Sleep in America: 1995 Gallup Poll*. 1999.
 31. Balter MB, Uhlenhuth EH: The beneficial and adverse effects of hypnotics. *J Clin Psychiatry* 1991; 52 Suppl:16–23.
 32. 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–S358.
 33. Bonnet MH, Arand DL: 24-Hour metabolic rate in insomniacs and matched normal sleepers. *Sleep* 1995; 18:581–588.
 34. Mendelson WB, Garnett D, Gillin JC, Weingartner H: The experience of insomnia and daytime and nighttime functioning. *Psychiatry Res* 1984; 12:235–250.
 35. Ford DE, Kamerow DB: Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *JAMA* 1989; 262:1479–1484.
 36. Schweitzer PK, Muehlbach MJ, Walsh JK: Countermeasures for night work performance deficits: The effect of napping or caffeine on continuous performance at night. *Work and Stress* 1992; 6: 355–365.
 37. Kuppermann M, Lubeck DP, Mazonson PD, Patrick DL, Stewart AL, Buesching DP, Fifer SK: Sleep problems and their correlates in a working population. *J Gen Intern Med* 1995; 10:25–32.
 38. Ohayon MM, Caulet M, Philip P, Guilleminault C, Priest RG: How sleep and mental disorders are related to complaints of daytime sleepiness. *Arch Intern Med* 1997; 157:2645–2652.
 39. Schubert CR, Cruickshanks KJ, Dalton DS, Klein BE, Klein R, Nondahl DM: Prevalence of sleep problems and quality of life in an older population. *Sleep* 2002; 25:889–893.
 40. Zammit GK, Weiner J, Damato N, Sillup GP, McMillan CA: Quality of life in people with insomnia. *Sleep* 1999; 22 Suppl 2: S379–S385.
 41. Chang PP, Ford DE, Mead LA, Cooper-Patrick L, Klag MJ: Insomnia in young men and subsequent depression. The Johns Hopkins Precursors Study. *Am J Epidemiol* 1997; 146:105–114.
 42. Breslau N, Roth T, Rosenthal L, Andreski P: Sleep disturbance and psychiatric disorders: a longitudinal epidemiological study of young adults. *Biol Psychiatry* 1996; 39:411–418.
 43. Perlis ML, Giles DE, Buysse DJ, Tu X, Kupfer DJ: Self-reported sleep disturbance as a prodromal symptom in recurrent depression. *J Affect Disord* 1997; 42:209–212.
 44. Richardson GS, Roth T: Future directions in the management of insomnia. *J Clin Psychiatry* 2001; 62 Suppl 10:39–45.
 45. Thase ME, Simons AD, Reynolds CF, III: Abnormal electroencephalographic sleep profiles in major depression: association with response to cognitive behavior therapy. *Arch Gen Psychiatry* 1996; 53:99–108.
 46. Agargun MY, Kara H, Solmaz M: Sleep disturbances and suicidal behavior in patients with major depression. *J Clin Psychiatry* 1997; 58:249–251.
 47. Brunello N, Armitage R, Feinberg I, Holsboer-Trachslers E, Leger D, Linkowski P, Mendelson WB, Racagni G, Saletu B, Sharpley AL, Turek F, Van Cauter E, Mendlewicz J: Depression and sleep disorders: clinical relevance, economic burden and pharmacological treatment. *Neuropsychobiology* 2000; 42:107–119.
 48. Mallon L, Broman JE, Hetta J: Sleep complaints predict coronary artery disease mortality in males: a 12-year follow-up study of a middle-aged Swedish population. *J Intern Med* 2002; 251: 207–216.
 49. Hajak G: Insomnia in primary care. *Sleep* 2000; 23 Suppl 3: S54–S63.
 50. Namen AM, Landry SH, Case LD, McCall WV, Dunagan DP, Haponik EF: Sleep histories are seldom documented on a general medical service. *South Med J* 2001; 94:874–879.
 51. National Sleep Foundation: *2002 Sleep in America Poll*. 2002: 1–43.
 52. Walsh JK, Engelhardt CL: The direct economic costs of insomnia in the United States for 1995. *Sleep* 1999; 22 Suppl 2:S386–S393.
 53. Krystal AD, Walsh JK, Laska E, Caron J, Amato DA, Wessel TC, Roth T: Sustained efficacy of eszopiclone over six months of nightly treatment: results of a randomized, double-blind, placebo controlled study in adults with chronic insomnia. *Sleep* 2003; 26:793–799.
 54. National Institutes of Health: Consensus conference. Drugs and insomnia. The use of medications to promote sleep. *JAMA* 1984; 251:2410–2414.
 55. *Physicians' Desk Reference: 57th edition* ed. Montvale, NJ: Medical Economics, Inc; 2003.

56. Greenblatt DJ, Shader RI, Abernethy DR: Drug therapy. Current status of benzodiazepines. *N Engl J Med* 1983; 309: 354–358.
57. Roehrs T, Pedrosi B, Rosenthal L, Roth T: Hypnotic self administration and dose escalation. *Psychopharmacology* (Berl) 1996; 127:150–154.
58. Roehrs T, Bonahoom A, Pedrosi B, Rosenthal L, Roth T: Treatment regimen and hypnotic self-administration. *Psychopharmacology* (Berl) 2001; 155:11–17.
59. Roehrs T, Bonahoom A, Pedrosi B, Zorick F, Roth T: Nighttime versus daytime hypnotic self-administration. *Psychopharmacology* (Berl) 2002; 161:137–142.
60. Oswald LM, Roache JD, Rhoades HM: Predictors of individual differences in alprazolam self-medication. *Exp Clin Psychopharmacol* 1999; 7:379–390.
61. Benca RM: Consequences of insomnia and its therapies. *J Clin Psychiatry* 2001; 62 Suppl 10:33–38.
62. Lichstein KL, Durrence HH, Bayen UJ, Riedel BW: Primary versus secondary insomnia in older adults: subjective sleep and daytime functioning. *Psychol Aging* 2001; 16:264–271.
63. Walsh JK, Schweitzer PK: Ten-year trends in the pharmacological treatment of insomnia. *Sleep* 1999; 22:371–375.
64. Morin CM, Hauri PJ, Espie CA, Spielman AJ, Buysse DJ, Bootzin RR: Nonpharmacologic treatment of chronic insomnia. An American Academy of Sleep Medicine review. *Sleep* 1999; 22:1134–1156.
65. Smith MT, Perlis ML, Park A, Smith MS, Pennington J, Giles DE, Buysse DJ: Comparative meta-analysis of pharmacotherapy and behavior therapy for persistent insomnia. *Am J Psychiatry* 2002; 159:5–11.
66. Milby JB, Williams V, Hall JN, Khuder S, McGill T, Wooten V: Effectiveness of combined triazolam-behavioral therapy for primary insomnia. *Am J Psychiatry* 1993; 150:1259–1260.
67. Edinger JD, Sampson WS: A primary care “friendly” cognitive behavioral insomnia therapy. *Sleep* 2003; 26:177–182.
68. McGee M, Pies R: Benzodiazepines in primary practice: risks and benefits. *Resident & Staff Physician* 2002; 48:42–50.
69. Salzman C, Freeman SA: Benefits versus risks of benzodiazepines. *Psychiatric Annals* 1998; 28:139–141.
70. Holbrook AM, Crowther R, Lotter A, Cheng C, King D: Meta-analysis of benzodiazepine use in the treatment of insomnia. *CMAJ* 2000; 162:225–233.
71. Walsh JK, Erman M, Erwin CW, Jamieson A, Mahowald M, Regestein Q, Scharf M, Tigel P, Vogel G, Ware JC: Subjective hypnotic efficacy of trazodone and zolpidem in DSM-III-R primary insomnia. *Hum Psychopharm* 1998; 13:191–198.
72. Saletu-Zyhlarz GM, Abu-Bakr MH, Anderer P, Semler B, Decker K, Parapatics S, Tschida U, Winkler A, Saletu B: Insomnia related to dysthymia: polysomnographic and psychometric comparison with normal controls and acute therapeutic trials with trazodone. *Neuropsychobiology* 2001; 44:139–149.
73. Saletu-Zyhlarz GM, Abu-Bakr MH, Anderer P, Gruber G, Mandl M, Strobl R, Gollner D, Prause W, Saletu B: Insomnia in depression: differences in objective and subjective sleep and awakening quality to normal controls and acute effects of trazodone. *Prog Neuropsychopharmacol Biol Psychiatry* 2002; 26: 249–260.
74. Scharf MB, Sachais BA: Sleep laboratory evaluation of the effects and efficacy of trazodone in depressed insomniac patients. *J Clin Psychiatry* 1990; 51 Suppl:13–17.
75. Scharf MB, Roth T, Vogel GW, Walsh JK: A multicenter, placebo-controlled study evaluating zolpidem in the treatment of chronic insomnia. *J Clin Psychiatry* 1994; 55:192–199.
76. Pies RW: Dose-related sensory distortions with zolpidem. *J Clin Psychiatry* 1995; 56:35–36.
77. Hajak G, Cluydts R, Declerck A, Estivill SE, Middleton A, Sonka K, Uden M: Continuous versus non-nightly use of zolpidem in chronic insomnia: results of a large-scale, double-blind, randomized, outpatient study. *Int Clin Psychopharmacol* 2002; 17:9–17.
78. Rush CR, Baker RW, Wright K: Acute behavioral effects and abuse potential of trazodone, zolpidem and triazolam in humans. *Psychopharmacology* (Berl) 1999; 144:220–233.
79. Hedner J, Yaeche R, Emilien G, Farr I, Salinas E: Zaleplon shortens subjective sleep latency and improves subjective sleep quality in elderly patients with insomnia. The Zaleplon Clinical Investigator Study Group. *Int J Geriatr Psychiatry* 2000; 15:704–712.
80. Dooley M, Plosker GL: Zaleplon: a review of its use in the treatment of insomnia. *Drugs* 2000; 60:413–445.
81. Elie R, Ruther E, Farr I, Emilien G, Salinas E: Sleep latency is shortened during 4 weeks of treatment with zaleplon, a novel non-benzodiazepine hypnotic. Zaleplon Clinical Study Group. *J Clin Psychiatry* 1999; 60:536–544.
82. Fry J, Scharf M, Mangano R, Fujimori M: Zaleplon improves sleep without producing rebound effects in outpatients with insomnia. Zaleplon Clinical Study Group. *Int Clin Psychopharmacol* 2000; 15:141–152.
83. Rickels K, Morris RJ, Newman H, Rosenfeld H, Schiller H, Weinstock R: Diphenhydramine in insomniac family practice patients: a double-blind study. *J Clin Pharmacol* 1983; 23: 234–242.
84. Kudo Y, Kurihara M: Clinical evaluation of diphenhydramine hydrochloride for the treatment of insomnia in psychiatric patients: a double-blind study. *J Clin Pharmacol* 1990; 30: 1041–1048.
85. Richardson GS, Roehrs TA, Rosenthal L, Koshorek G, Roth T: Tolerance to daytime sedative effects of H1 antihistamines. *J Clin Psychopharmacol* 2002; 22:511–515.
86. Løndborg PD, Smith WT, Glaudin V, Painter JR: Short-term cotherapy with clonazepam and fluoxetine: anxiety, sleep disturbance and core symptoms of depression. *J Affect Disord* 2000; 61:73–79.
87. Levitan RD, Shen JH, Jindal R, Driver HS, Kennedy SH, Shapiro CM: Preliminary randomized double-blind placebo-controlled trial of tryptophan combined with fluoxetine to treat major depressive disorder: antidepressant and hypnotic effects. *J Psychiatry Neurosci* 2000; 25:337–346.
88. Nowlin-Finch NL, Altshuler LL, Szuba MP, Mintz J: Rapid resolution of first episodes of mania: sleep related? *J Clin Psychiatry* 1994; 55:26–29.
89. Malkoff-Schwartz S, Frank E, Anderson B, Sherrill JT, Siegel L, Patterson D, Kupfer DJ: Stressful life events and social rhythm disruption in the onset of manic and depressive bipolar episodes: a preliminary investigation. *Arch Gen Psychiatry* 1998; 55:702–707.
90. Wehr TA: Sleep-loss as a possible mediator of diverse causes of mania. *Br J Psychiatry* 1991; 159:576–578.
91. Walsh JK, Muehlbach MJ, Lauter SA, Hilliker NA, Schweitzer PK: Effects of triazolam on sleep, daytime sleepiness, and morning stiffness in patients with rheumatoid arthritis. *J Rheumatol* 1996; 23:245–252.

92. James DS: Survey of hypnotic drug use in nursing homes. *J Am Geriatr Soc* 1985; 33:436–439.
93. Meuleman JR, Nelson RC, Clark RL, Jr.: Evaluation of temazepam and diphenhydramine as hypnotics in a nursing-home population. *Drug Intell Clin Pharm* 1987; 21:716–720.
94. Gengo FM, Gabos C, Mechtler L: Quantitative effects of cetirizine and diphenhydramine on mental performance measured using an automobile driving simulator. *Ann Allergy* 1990; 64: 520–526.
95. Sexton JD, Pronchik DJ: Diphenhydramine-induced psychosis with therapeutic doses. *Am J Emerg Med* 1997; 15:548–549.
96. Lessard E, Yessine MA, Hamelin BA, Gauvin C, Labbe L, O'Hara G, LeBlanc J, Turgeon J: Diphenhydramine alters the disposition of venlafaxine through inhibition of CYP2D6 activity in humans. *J Clin Psychopharmacol* 2001; 21:175–184.
97. Wing YK: Herbal treatment of insomnia. *Hong Kong Med J* 2001; 7:392–402.
98. Pies R: Adverse neuropsychiatric reactions to herbal and over-the-counter "antidepressants". *J Clin Psychiatry* 2000; 61:815–820.
99. Elie R, Lavoie G, Bourgooin J, Le Morvan P: Zopiclone versus flurazepam in insomnia: prolonged administration and withdrawal. *Int Clin Psychopharmacol* 1990; 5:279–286.
100. Melo de Paula AJ: Comparative study of lormetazepam and flurazepam in the treatment of insomnia. *Clin Ther* 1984; 6: 500–508.
101. Hernandez LR, Del Rosal PL, Ponce MC: Short-term study of quazepam 15 milligrams in the treatment of insomnia. *J Int Med Res* 1983; 11:162–166.
102. Cohn JB, Wilcox CS, Bremner J, Ettinger M: Hypnotic efficacy of estazolam compared with flurazepam in outpatients with insomnia. *J Clin Pharmacol* 1991; 31:747–750.
103. Aden GC, Thatcher C: Quazepam in the short-term treatment of insomnia in outpatients. *J Clin Psychiatry* 1983; 44:454–456.
104. Juhl RP, Daugherty VM, Kroboth PD: Incidence of next-day anterograde amnesia caused by flurazepam hydrochloride and triazolam. *Clin Pharm* 1984; 3:622–625.
105. Ponciano E, Freitas F, Camara J, Faria M, Barreto M, Hindmarch I: A comparison of the efficacy, tolerance and residual effects of zopiclone, flurazepam and placebo in insomniac outpatients. *Int Clin Psychopharmacol* 1990; 5 Suppl 2:69–77.
106. Scharf MB, Fletcher K, Graham JP: Comparative amnesic effects of benzodiazepine hypnotic agents. *J Clin Psychiatry* 1988; 49:134–137.
107. Johnson LC, Chernik DA, Hauri P: A multicenter 14-day study of flurazepam and midazolam in chronic insomniacs: general discussion and conclusions. *J Clin Psychopharmacol* 1990; 10:76S–90S.
108. Judd LL, Ellinwood E, McAdams LA: Cognitive performance and mood in patients with chronic insomnia during 14-day use of flurazepam and midazolam. *J Clin Psychopharmacol* 1990; 10: 56S–67S.
109. Moskowitz H, Linnoila M, Roehrs T: Psychomotor performance in chronic insomniacs during 14-day use of flurazepam and midazolam. *J Clin Psychopharmacol* 1990; 10:44S–55S.
110. Ngen CC, Hassan R: A double-blind placebo-controlled trial of zopiclone 7.5 mg and temazepam 20 mg in insomnia. *Int Clin Psychopharmacol* 1990; 5:165–171.
111. Rickels K, Schweizer E, Case WG, Greenblatt DJ: Long-term therapeutic use of benzodiazepines. I. Effects of abrupt discontinuation. *Arch Gen Psychiatry* 1990; 47:899–907.
112. Fleming JA, McClure DJ, Mayes C, Phillips R, Bourgooin J: A comparison of the efficacy, safety and withdrawal effects of zopiclone and triazolam in the treatment of insomnia. *Int Clin Psychopharmacol* 1990; 5 Suppl 2:29–37.
113. Scharf MB: Feasibility of an every-other-night regimen in insomniac patients: subjective hypnotic effectiveness of quazepam, triazolam, and placebo. *J Clin Psychiatry* 1993; 54:33–38.
114. Cumming RG, Miller JP, Kelsey JL, Davis P, Arfken CL, Birge SJ, Peck WA: Medications and multiple falls in elderly people: the St Louis OASIS study. *Age Ageing* 1991; 20:455–461.
115. Ray WA, Griffin MR, Schaffner W, Baugh DK, Melton LJ, III: Psychotropic drug use and the risk of hip fracture. *N Engl J Med* 1987; 316:363–369.
116. Allen RP, Mendels J, Nevins DB, Chernik DA, Hoddes E: Efficacy without tolerance or rebound insomnia for midazolam and temazepam after use for one to three months. *J Clin Pharmacol* 1987; 27:768–775.
117. Walsh JK, Pollak CP, Scharf MB, Schweitzer PK, Vogel GW: Lack of residual sedation following middle-of-the-night zaleplon administration in sleep maintenance insomnia. *Clin Neuropharmacol* 2000; 23:17–21.
118. Ware JC, Walsh JK, Scharf MB, Roehrs T, Roth T, Vogel GW: Minimal rebound insomnia after treatment with 10-mg zolpidem. *Clin Neuropharmacol* 1997; 20:116–125.
119. Terzano MG, Rossi M, Palomba V, Smerieri A, Parrino L: New drugs for insomnia: comparative tolerability of zopiclone, zolpidem and zaleplon. *Drug Saf* 2003; 26:261–282.
120. Wagner J, Wagner ML: Non-benzodiazepines for the treatment of insomnia. *Sleep Med Rev* 2000; 4:551–581.
121. Rush CR, Griffiths RR: Zolpidem, triazolam, and temazepam: behavioral and subject-rated effects in normal volunteers. *J Clin Psychopharmacol* 1996; 16:146–157.
122. Hajak G, Muller WE, Wittchen HU, Pittrow D, Kirch W: Abuse and dependence potential for the non-benzodiazepine hypnotics zolpidem and zopiclone: a review of case reports and epidemiological data. *Addiction* 2003; 98:1371–1378.
123. Ancoli-Israel S, Richardson GS, Mangano RM: Long-term exposure to zaleplon is safe and effective in younger-elderly and older-elderly patients with primary insomnia. *Sleep* 2003; 26:A77.
124. Kummer J, Guendel L, Linden J, Eich FX, Attali P, Coquelin JP, Kyrein HJ: Long-term polysomnographic study of the efficacy and safety of zolpidem in elderly psychiatric in-patients with insomnia. *J Int Med Res* 1993; 21:171–184.
125. IMS Health: National Prescription Audit™ Plus. 2002.
126. Blacker R, Shanks NJ, Chapman N, Davey A: The drug treatment of depression in general practice: a comparison of nocte administration of trazodone with mianserin, dothiepin and amitriptyline. *Psychopharmacology* (Berl) 1988; 95 Suppl:S18–S24.
127. Davey A: A comparison of two oral dosage regimens of 150 mg trazodone in the treatment of depression in general practice. *Psychopharmacology* (Berl) 1988; 95 Suppl:S25–S30.
128. Moon CA, Davey A: The efficacy and residual effects of trazodone (150 mg nocte) and mianserin in the treatment of depressed general practice patients. *Psychopharmacology* (Berl) 1988; 95 Suppl:S7–S13.
129. Mashiko H, Niwa S, Kumashiro H, Kaneko Y, Suzuki S, Numata Y, Horikoshi R, Watanabe Y: Effect of trazodone in a single dose before bedtime for sleep disorders accompanied by a depressive state: dose-finding study with no concomitant use of hypnotic agent. *Psychiatry Clin Neurosci* 1999; 53:193–194.

130. Mouret J, Lemoine P, Minuit MP, Benkelfat C, Renardet M: Effects of trazodone on the sleep of depressed subjects—a polygraphic study. *Psychopharmacology* (Berl) 1988; 95 Suppl:S37–S43.
131. van Bommel AL, Havermans RG, van Diest R: Effects of trazodone on EEG sleep and clinical state in major depression. *Psychopharmacology* (Berl) 1992; 107:569–574.
132. Montgomery I, Oswald I, Morgan K, Adam K: Trazodone enhances sleep in subjective quality but not in objective duration. *Br J Clin Pharmacol* 1983; 16:139–144.
133. Maxmen JS: Antidepressants. In: *Psychotropic Drugs: Fast Facts*. New York: W.W. Norton & Company; 1991: 57–97.
134. Bucknall C, Brooks D, Curry PV, Bridges PK, Bouras N, Anker SI: Mianserin and trazodone for cardiac patients with depression. *Eur J Clin Pharmacol* 1988; 33:565–569.
135. Warner MD, Peabody CA, Whiteford HA, Hollister LE: Trazodone and priapism. *J Clin Psychiatry* 1987; 48:244–245.
136. Rausch JL, Pavlinac DM, Newman PE: Complete heart block following a single dose of trazodone. *Am J Psychiatry* 1984; 141:1472–1473.
137. Mathias S, Wetter TC, Steiger A, Lancel M: The GABA uptake inhibitor tiagabine promotes slow wave sleep in normal elderly subjects. *Neurobiol Aging*. 2001; 22:247–253.
138. Cohrs S, Rodenbeck A, Guan Z, Pohlmann K, Jordan W, Meier A, Ruther E: Sleep-promoting properties of quetiapine in healthy subjects. *Psychopharmacology* 2004; 174:421–429.
139. Muller MJ, Rossbach W, Mann K, Roschke J, Muller-Siecheneder F, Blumler M, Wetzel H, Russ H, Dittmann RW, Benkert O. Subchronic effects of olanzapine on sleep EEG in schizophrenic patients with predominantly negative symptoms. *Pharmacopsychiatry* 2004; 37:157–162.
140. Karam-Hage M, Brower KJ. Open pilot study of gabapentin versus trazodone to treat insomnia in alcoholic outpatients. *Psychiatry Clin Neurosci*. 2003; 57:542–544.
141. Foldvary-Schaefer N, De Leon Sanchez I, Karafa M, Mascha E, Dinner D, Morris HH. Gabapentin increases slow-wave sleep in normal adults. *Epilepsia*. 2002; 43:1493–1497.
142. Sharpley AL, Vassallo CM, Cowen PJ. Olanzapine increases slow-wave sleep: evidence for blockade of central 5-HT(2C) receptors in vivo. *Biol Psychiatry*. 2000; 47:468–470.
143. Davies M, Newell JG, Derry JM, Martin IL, Dunn SM: Characterization of the interaction of zopiclone with gamma-aminobutyric acid type A receptors. *Mol Pharmacol* 2000; 58:756–762.
144. Fernandez C, Martin C, Gimenez F, Farinotti R: Clinical pharmacokinetics of zopiclone. *Clin Pharmacokinet* 1995; 29: 431–441.
145. Leese P, Maier G: Eszopiclone: Pharmacokinetic (PK) and Pharmacodynamic (PD) effects of a novel anti-insomnia agent after daytime administration in healthy subjects. *Sleep* 2002; 25:A45.
146. Krystal AD, Walsh JK, Roth T, Amato DA, Wessel TC: Sustained efficacy of eszopiclone over six months of nightly treatment: Results of a randomized, double-blind, placebo controlled study in adults with chronic insomnia. *Sleep* 2003; 26:793–799.
147. Walsh JK, Lankford DD, Krystal A, Roth T, Jochelson P, Garber M, Alexander T, Burke J: Efficacy and tolerability of four doses of indiplon (NBI-34060) modified-release in elderly patients with sleep maintenance insomnia. *Sleep* 2003; 26:A78.