Cognitive-behavioral Therapy of Insomnia

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- Cognitive-behavioral therapy
  Rationale, objectives, and indications
  Sleep restriction
  Stimulus control therapy
  Relaxation-based interventions
  Cognitive therapy
  Sleep hygiene education
- Outcome evidence
  Evidence for efficacy
- *Short-term versus long-term outcomes*
  Treatment of comorbid insomnia
  Combined cognitive-behavioral therapy and medication
  Practical considerations
  Challenges and areas of uncertainty
- Summary
- References

Insomnia is a prevalent health complaint in the general population and is the most common of all sleep disorders. Population-based estimates indicate that 10% of adults report persistent and troublesome insomnia [1,2], and this rate increases to up to 30% among primary care patients [3]. Persistent insomnia carries an important burden for the individual and for society, as evidenced by indices of functional impairments, quality of life, risks of depression, and health-care costs [1,4–8].

Despite its high prevalence and associated burden, insomnia often goes undiagnosed and remains untreated. Most patients who initiate treatment do so without professional consultation and often resort to a host of self-help remedies of unknown risks and benefits [9,10]. When insomnia is brought to professional attention, typically to a primary care physician, treatment usually involves medication. Although hypnotic medications are indicated and useful in situational insomnia, psychological and behavioral factors are almost always involved in perpetuating sleep disturbances, and these factors must be addressed in the management of chronic insomnia [11,12]. Significant advances have been made in

the psychological and behavioral management of insomnia in the past decade [13,14]; although these approaches are well accepted by patients, they are not well known and remain underused by health care practitioners. This article summarizes the current state of evidence on the efficacy and effectiveness of cognitive-behavioral therapy (CBT) for insomnia. The rationale, indications, and nature of this approach are described, a summary of the evidence regarding its efficacy and generalizability is presented, and practical issues related to treatment implementation and feasibility, as well as areas for further research, are discussed.

Cognitive-behavioral therapy

Psychological and behavioral therapies for insomnia include sleep restriction, stimulus-control therapy, relaxation-based interventions, cognitive strategies, sleep hygiene education, and combined CBT. A summary of these interventions is provided here and in Table 1; more extensive descriptions are available in other sources [15,16]. In this article these interventions are referred to more generically

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Table 1:	Psychological and behavioral treatments for primary insomnias
Therapy	**Description**
Stimulus-control therapy	A set of instructions designed to strengthen the association between the bed/bedroom with sleep and to reestablish a consistent sleep-wake schedule: (1) Go to bed only when sleepy; (2) get out of bed when unable to sleep; (3) use the bed/bedroom for sleep only (no reading, watching TV, etc); (4) arise at the same time every morning; (5) no napping.
Sleep-restriction therapy	A method designed to restrict time spent in bed as close as possible to the actual sleep time, thereby producing mild sleep deprivation. Time in bed is then gradually increased over a period of few days/weeks until optimal sleep duration is achieved.
Relaxation training	Clinical procedures aimed at reducing somatic tension (eg, progressive muscle relaxation, autogenic training) or intrusive thoughts (eg, imagery training, meditation) interfering with sleep. Most relaxation requires some professional guidance initially and daily practice over a period of a few weeks.
Cognitive therapy	Psychotherapeutic method aimed at reducing worry and changing faulty beliefs and misconceptions about sleep, insomnia, and daytime consequences through Socratic questioning and behavioral experiments. Other cognitive strategies may involve paradoxical intention to alleviate performance anxiety associated with the attempt to fall asleep.
Sleep hygiene education	General guidelines about health practices (eg, diet, exercise, substance use) and environmental factors (eg, light, noise, temperature) that may promote or interfere with sleep. Sleep hygene education also may include some basic information about normal sleep and changes in sleep patterns with aging.
Cognitive-behavioral therapy	A combination of any of the above behavioral (eg, stimulus control, sleep restriction, relaxation) and cognitive procedures.

as CBT. CBT is a multimodal intervention that includes at least one therapeutic component targeting cognitive and psychological factors (beliefs, expectations, appraisal, worry) and one component addressing more behaviorally based factors (maladaptive sleep habits, irregular sleep scheduling) that are presumed to perpetuate insomnia. Treatment may also involve clinical procedures designed to reduce arousal (relaxation) and didactic sleep hygiene education about factors interfering with or promoting sleep. There is a trend among investigators and clinicians for combining multiple interventions, with CBT becoming the standard nonpharmacologic approach in the field [13].

Rationale, objectives, and indications

The rationale of CBT for persistent insomnia is best understood by examining three types of contributing factors involved at different times during the course of insomnia: predisposing, precipitating, and perpetuating factors [12]. Predisposing factors are risk factors hypothesized to increase vulnerability to insomnia: age, female gender, hyperarousability, anxiety-prone personality, and a family or personal history of insomnia. Precipitating factors are events that trigger the onset of insomnia, including major life events (eg, illness, hospitalization, separation), less severe but more chronic daily hassles (eg, occupational stress, family conflicts), or other important changes in life (eg, birth of a child,

menopause) [17]. Although most individuals resume normal sleep patterns after the initial triggering event has disappeared, or when the individual has adjusted to its more permanent presence, some individuals, perhaps those with higher vulnerability to insomnia, continue to experience sleep difficulties. Regardless of the initial precipitating factor, it is believed that psychological and behavioral factors are almost always involved in maintaining insomnia over time.

In persistent insomnia, a vicious cycle develops in which poor sleep habits, irregular sleep scheduling, and the fear of not sleeping feed into the insomnia problem (Fig. 1). A person may spend excessive amounts of time in bed or nap during the day in a misguided effort to compensate for poor nocturnal sleep. Apprehensions about not sleeping and excessive worrying about the possible consequences of insomnia further interfere with sleep. Although some behavioral strategies (eg, bed rest) may be adaptive to cope with insomnia initially, they may become maladaptive in the long run.

Thus, the main objective of CBT is to alter those factors that perpetuate or exacerbate sleep disturbances: poor sleep habits (eg, spending too much time in bed), irregular sleep-wake schedules (eg, arising at different times), hyperarousal, inadequate sleep hygiene, and misconceptions about sleep and the consequences of insomnia. Another implicit goal of CBT is to teach patients self-management
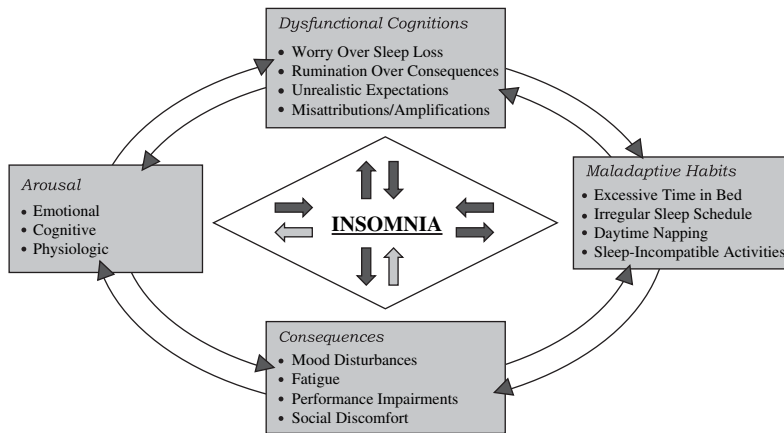
Fig. 1. A cognitive-behavioral model of chronic insomnia. (*From* Morin CM. Psychological assessment and management. NewYork: Guilford Press; 1993. p. 57; with permission.)

skills to cope more adaptively with residual sleep disturbances that may persist after therapy. The primary indication of CBT is in the management of persistent insomnia, both for primary and co-morbid insomnia. There is no contraindication to using CBT, although caution is advised when using some of its components (eg, sleep restriction).

Sleep restriction

Poor sleepers often increase their time in bed in a misguided effort to provide more opportunity for sleep, a strategy that is more likely to result in fragmented and poor-quality sleep. Sleep restriction consists of curtailing the amount of time spent in bed to the actual time spent sleeping [18]. For example, if a person reports sleeping an average of 6 hours per night out of 8 hours spent in bed, the initial sleep window (ie, from initial bedtime to final arising time) would be set at 6 hours. Subsequent adjustments to this sleep window are based on sleep efficiency (SE) for a given period of time (usually the preceding week); time in bed is increased by about 20 minutes for a given week when SE exceeds 85%, decreased by the same amount of time when SE is lower than 80%, and kept stable when SE falls between 80% and 85%. Periodic (weekly) adjustments are made until optimal sleep duration is achieved. Changes to the prescribed sleep window can be made at the beginning of the night (ie, postponing bedtime), at the end of the sleep period (ie, advancing arising time), or at both ends. To prevent excessive daytime sleepiness, time in bed should not be reduced to less than 5 hours per night in bed. Caution is needed when using sleep restriction with patients operating heavy equipment or required to drive long distances (eg, truck drivers). The presumed mechanisms of this procedure to improve sleep continuity are through a mild sleep deprivation and reduction of sleep-anticipatory anxiety. Three controlled studies have documented the efficacy of sleep restriction for treating insomnia in older adults [19–21], and several more have reported on its use in combination with other behavioral and cognitive procedures (Table 2).

Stimulus control therapy

Individuals who have insomnia often become apprehensive around bedtime and come to associate the bedroom with frustration and arousal rather than with sleep. Stimulus-control therapy [46] consists of a set of instructions designed to reassociate temporal (bedtime) and environmental (bed and bedroom) stimuli with rapid sleep onset and to establish a regular circadian sleep/wake rhythm. These instructions are

1. Go to bed only when sleepy.
2. Get out of bed when unable to sleep (eg, after 20 minutes); go to another room and return to bed only when sleep is imminent.
3. Curtail all sleep-incompatible activities (ie, no television watching or problem solving in bed).
4. Arise at a regular time every day, regardless of the amount of sleep the night before.
5. Avoid daytime napping.

Despite the straightforward nature of these behavioral recommendations, the main challenge for most patients is to comply with all of them, which is essential to reverse the conditioning processes perpetuating insomnia. When combined with sleep restriction, some stimulus-control procedures (eg, getting out of bed when unable to sleep) may not be necessary early in treatment when the initial sleep window is restricted to 5 to 6 hours per night, but those procedures become particularly relevant as the sleep window is increased. Several controlled studies have reported on the efficacy of stimulus-control therapy for both sleep-onset and

Table 2:   Key studies supporting efficacy of psychological and behavioral treatments of insomnia

Treatment	Study [Reference]	Evidence
Stimulus control	Espie et al (1989) [22]	SC > Pla & Rel
	Lacks, Bertelson, Sugerman et al (1983) [23]	SC > Pla
	Lacks, Bertelson, Gans et al (1983) [24]	SC > Pla
	Morin & Azrin (1987; 1988) [25,26]	SC > IT
	Turner & Asher (1979) [27]	SC > Pla
	Riedel et al (1998) [28]	SC > WL
Relaxation	Edinger et al (2001) [29]	Rel > Pla
	Lichstein et al (2001) [21]	Rel > Pla
	Lick & Heffler (1977) [30]	Rel > Pla
	Nicassio et al (1982) [31]	Rel > no treatment
	Turner & Asher (1979) [27]	Rel > Pla
	Woolfolk & McNulty (1983) [32]	Rel > WL
	Means et al (2000) [33]	Rel > No treatment
	Rybarczyk et al (2002) [34]	Rel > WL
Sleep restriction	Friedman et al (1991) [19]	SR > Pla
	Friedman et al (2000) [20]	SR + SHE > SHE
	Lichstein et al (2001) [21]	SR > Pla
CBT	Edinger et al (2001) [29]	CBT > Rel > Pla
	Mimeault & Morin (1999) [35]	CBT > WL
	Morin et al (1993) [36]	CBT > WL
	Morin et al (1999) [37]	CBT > Pla
	Morin et al (2004) [38]	CBT > medication taper
	Perlis et al (2004) [39]	CBT > contact control
CBT (with Rel)	Currie et al (2000) [40]	CBT > WL
	Currie et al (2004) [41]	CBT > WL
	Espie et al (2001) [42]	CBT > WL
	Jacobs et al (2004) [43]	CBT > Pla
	Morgan et al (2003) [44]	CBT > no treatment
	Rybarczyk et al (2002) [34]	CBT > WL
Paradoxical intention	Espie et al (1989) [22]	PI > Pla
	Turner & Ascher (1979) [27]	PI > Pla
	Broomfield et al (2003) [45]	PI > WL

Abbreviations: CBT, cognitive-behavioral therapy; IT, imagery training; PI, Paradoxical intention; Pla, placebo; Rel, relaxation; SC, stimulus control; SHE, sleep hygiene education; SR, sleep restriction; WL, wait-list control.
Adapted from Morin CM, Bootzin RR, Buysse DJ, et al. Psychological and behavioral treatment of insomnia: an update of recent evidence (1998–2004). Sleep, in press.

sleep-maintenance insomnia [22–28], and many more have used it in the context of combined therapies (see Table 2).

Relaxation-based interventions

Relaxation is the most commonly used nondrug therapy for insomnia. Of the different relaxation-based interventions, some methods (eg, progressive-muscle relaxation) focus primarily on reducing physiologic arousal, whereas attention-focusing procedures (eg, imagery training, meditation) target mental arousal in the form of worries, intrusive thoughts, or a racing mind. Most of these methods are equally effective for treating insomnia. The most critical issue is to practice regularly (ie, daily) the selected method for at least 2 to 4 weeks.

Professional guidance often is necessary in the initial phase of training. Relaxation is helpful for individuals who have elevated tension or anxiety; however, caution is needed, because some individuals may have a paradoxical response and become more anxious. Relaxation is often integrated with CBT (see Table 2), but several controlled clinical trials have shown several relaxation interventions, when used alone, to be more effective than wait-list [32,34], placebo [21,27,29,30], and no-treatment controls [31,33].

Cognitive therapy

Cognitive therapy is a psychotherapeutic method that seeks to alter sleep-disruptive cognitions (eg, beliefs, expectations, attributions) and maladaptive

cognitive processes (eg, excessive self-monitoring, worrying) through Socratic questioning and behavioral experiments. The basic premise of this approach is that appraisal of a given situation (sleeplessness) and excessive monitoring of sleep-related cues (eg, fatigue, heart rate, time) can trigger an emotional response (fear, anxiety) that is incompatible with sleep. For example, when a person is unable to sleep at night and worries about the possible consequences of sleep loss on the next day's performance, this worry can set off a spiral reaction and feed into the vicious cycle of insomnia, emotional distress, and more sleep disturbances. Cognitive therapy is designed to identify dysfunctional cognitions and reframe them into more adaptive substitutes to short-circuit the self-fulfilling nature of this vicious cycle. Treatment targets may include unrealistic expectations ("I must get my 8 hours of sleep every night"), faulty causal attributions ("My insomnia is entirely caused by a biochemical imbalance"), and amplification of the consequences of insomnia ("Insomnia may have serious consequences on my health") [15]. Cognitive therapy is particularly useful in modifying these maladaptive cognitions and teaching patients more adaptive skills to cope with insomnia. Although formal cognitive therapy is increasingly used as part of CBT, [29,35–39] it has not been evaluated as a single therapy for insomnia.

Paradoxical intention is a special form of cognitive therapy that involves specific instructions to the patient to engage willingly in the most feared behavior (ie, staying awake). The rationale is that trying to stay awake at bedtime or upon awakening at night will produce a paradoxical effect and override the performance anxiety associated with the attempt to fall asleep. Although there is evidence supporting the efficacy of this treatment for initial insomnia [22,27,45], use of this procedure has declined in recent years.

Sleep hygiene education

Sleep hygiene education is a didactic method intended to provide information about lifestyle (diet, exercise, substance use) and environmental factors (light, noise, temperature) that may either interfere with or promote better sleep. General sleep hygiene guidelines [47] include

1. Avoiding stimulants (eg, caffeine) several hours before bedtime
2. Avoiding alcohol around bedtime, because it fragments sleep
3. Exercising regularly (especially in late afternoon or early evening) because it may deepen sleep
4. Allowing at least a 1-hour period to unwind before bedtime

5. Keeping the bedroom environment quiet, dark, and comfortable

In addition to these guidelines, it is useful to provide basic information about normal sleep, individual differences in sleep needs, and changes in sleep physiology over the course of the life span. This information is particularly useful to help some patients distinguish clinical insomnia from short sleep or from normal (age-related) sleep disturbances. Although inadequate sleep hygiene is rarely the primary cause of insomnia, it may potentiate sleep difficulties caused by other factors or interfere with treatment progress. Addressing these factors should be an integral part of insomnia management, even though it is rarely sufficient for more severe insomnia, which often requires more directive and potent behavioral interventions.

Outcome evidence

Evidence for efficacy

Several meta-analyses [48–50] and systematic reviews commissioned by the American Academy of Sleep Medicine [13,51] have summarized the findings from clinical trials evaluating the efficacy of psychological and behavioral therapies for insomnia. Table 2 lists single therapies (and supporting evidence) that have been judged to meet criteria for well-established treatments according to American Psychological Association criteria for empirically supported psychological treatments [52].

Evidence from these different sources show that treatment produces reliable changes in several sleep parameters, including sleep latency (effect sizes ranging from 0.41 to 1.05), number of awakenings (0.25–0.83), duration of awakenings (0.61–1.03), total sleep time (0.15-0.49), and sleep quality ratings (0.94–1.14). The magnitude of those therapeutic effects is considered large (ie, $d > 0.8$) for sleep latency and sleep quality, respectively, and moderate (ie, $d > 0.5$) for other sleep parameters. When transformed into a percentile rank, these data indicate that 70% to 80% of patients who have insomnia benefit from psychological and behavioral treatments.

In terms of absolute changes, treatment reduces subjective sleep-onset latency and time awake after sleep onset from averages of 60 to 70 minutes at baseline to about 35 minutes after treatment, and total sleep time is increased by 30 minutes, from 6 hours to 6.5 hours after treatment. Thus, for the average patient who has insomnia, treatment effects may be expected to reduce sleep latency and time awake after sleep onset by about 50% and to bring the absolute values of those sleep parameters below or near the 30-minute cut-off initially used to define

insomnia. Treatment effects are similar for sleep-onset and maintenance problems, although fewer studies have targeted the later type of insomnia, particularly early morning awakenings. Overall, findings from meta-analyses represent fairly conservative estimates of treatment effects because they are based on averages computed across all nonpharmacologic interventions and insomnia diagnoses (ie, primary and secondary). On the other hand, although most patients benefit from treatment, only a small proportion (20%–30%) achieves full remission, and a significant proportion of patients continues to experience residual sleep disturbances [37,42].

Treatment outcome has been documented primarily by prospective daily sleep diaries, although several studies have complemented those findings with data from polysomnography [29,37,53] and with wrist-actigraphy [42,54,55]. In general, the magnitude of improvements is smaller on polysomnographic measures, but those changes tend to parallel sleep improvements reported in daily sleep diaries. Polysomnographic findings indicate that treatment alters sleep perception, as measured by patient-reported outcomes, and also produces objective changes on electroencephalographic sleep-continuity measures. Except for a modest increase in stages 3 and 4 after sleep restriction, there is little evidence of changes in sleep architecture with CBT.

Although there are several distinct psychological and behavioral therapies for insomnia, these interventions can be combined effectively, and multicomponent approaches are becoming standard in the field. The most common combination involves a behavioral component (stimulus control, sleep restriction and, sometimes, relaxation), a cognitive component, and an educational component (sleep hygiene), hence the CBT label. Although there has been no complete dismantling of CBT to isolate the relative efficacy of each component, direct comparisons of some of those components indicate that sleep restriction, alone or combined with stimulus-control therapy, is more effective than relaxation alone which, in turn, is more effective than sleep hygiene education alone [13,48,49]. Sleep restriction tends to produce better outcomes than stimulus control for improving sleep efficiency and sleep continuity, but it also decreases total sleep time during the initial intervention. Sleep hygiene education is incorporated in most treatments, but it should be seen as a minimal intervention, because this didactic approach alone produces little impact on sleep.

There is no strong evidence that a multicomponent approach is more effective than any of its single components for improving sleep. Nonetheless, the appeal of a multicomponent approach may come from its addressing different facets assumed to perpetuate sleep disturbances [11,12,15,56], and it may produce broader treatment effect beyond the reduction of insomnia symptoms (ie, reduction of fatigue, psychological distress). Although little information is available about the active treatment mechanisms of CBT, some evidence suggests that stimulus control and sleep restriction are particularly effective for improving sleep continuity [57], whereas changes in sleep-disruptive cognitions are associated with lowered psychological distress and better maintenance of sleep changes over time [58]. With increasing evidence that hyperarousal is involved in insomnia, there is a need for more attention to identify the biologic as well as the psychological mechanisms responsible for sleep changes.

Short-term versus long-term outcomes

Because insomnia is often a recurrent problem, and patients entering treatment typically have had insomnia for several years, it is important to evaluate outcome beyond the initial treatment, which usually lasts 6 to 8 weeks. A fairly robust finding across clinical trials of CBT is that sleep improvements are well sustained over time, with data available up to 24 and even 36 months after treatment completion [37,59]. This sustained improvement is a clear advantage over medication treatment. Although interventions that restrict the amount of time spent in bed may yield only modest increases (and even a reduction) of sleep time during the initial treatment period, this parameter usually is improved at follow-up, with total sleep time often exceeding 6.5 hours. Long-term outcome must be interpreted cautiously, however, because few studies report long-term follow-up, and, among those that do, attrition rates increase over time. In addition, a substantial proportion of patients who have chronic insomnia and who benefit from short-term therapy may remain vulnerable to recurrent episodes of insomnia in the long term. As such, there is a need to develop and evaluate the effects of long-term, maintenance therapies to prevent or minimize the occurrence of those episodes [60].

Treatment of comorbid insomnia

Insomnia often is a pervasive problem among patients suffering from other medical and psychiatric conditions. Although the comorbid condition may subside with appropriate treatment, sleep disturbances often persist. Until recently, most treatment studies had focused on primary insomnia in otherwise healthy, young, and medication-free patients. Evidence from recent clinical case series [56,61,62] suggests that patients who have medical and psychiatric conditions also can benefit from

insomnia-specific treatment, even though the outcome in those patients is more modest than in those who suffer from primary insomnia [63]. Controlled studies have also shown that CBT is effective for treating insomnia associated with chronic pain [40], fibromyalgia [64], cancer [65], and various medical conditions in older adults [66,67]. In general, insomnia symptoms are more severe among patients who have comorbid disorders, but the absolute changes on those outcomes during treatment are comparable to those obtained by patients who have primary insomnia.

Recent studies have also shown that older adults respond to insomnia treatment, particularly when they are screened for other sleep disorders that may increase in incidence in older age (eg, restless legs syndrome, sleep apnea). A recent meta-analysis suggested that effect sizes were comparable (moderate to large) for middle-aged and older adults on subjective measures of sleep latency, wake after sleep onset, and sleep quality [68]. There is also increasing evidence that older adults who have comorbid medical or psychological conditions can benefit from sleep-specific treatment [34,44,66,67,69]. Three recent clinical trials have shown that a supervised, structured, and time-limited withdrawal program, with or without psychological treatment, can facilitate discontinuation of hypnotic medications among older adults who have a prolonged history of using these medications to treat insomnia [38,44,70].

Combined cognitive-behavioral therapy and medication

CBT and medication therapies can play complementary roles in the management of insomnia. Comparisons from meta-analyses [48,50,71] of effect sizes on different sleep variables indicate that CBT may have a slight advantage on measures of sleep-onset latency and sleep quality, and that pharmacotherapy (benzodiazepine-receptor agonists) may have a more favorable effect on total sleep time. There also are practical and clinical reasons for considering combined therapies. For example, no single treatment is effective for all forms of insomnia or acceptable to all patients. Even among those who respond to treatment, few patients reach complete remission, and some residual sleep disturbances often persist after treatment. Thus, in theory, combined approaches should optimize outcome by capitalizing on the more immediate and potent effects of hypnotics and the more sustained effects of behavioral interventions.

Only a few studies have directly compared the effects of behavioral and pharmacologic therapies for insomnia. Three studies compared triazolam with relaxation [72,73] or sleep hygiene [54], and three

other investigations compared CBT with temazepam [37], zolpidem [43], or zopiclone [74]. Collectively, findings from these studies indicate that both therapies are effective in the short term (4–8 weeks), with medication producing faster results in the acute phase (first week) of treatment. Combined interventions seem to have a slight advantage over single-treatment modalities during the initial course of treatment, but it is unclear whether this advantage persists over time. Long-term effects are consistent for the single-treatment modalities; patients treated with CBT maintain their improvements, whereas therapeutic effects typically are lost after discontinuation of medication. Long-term effects of combined interventions are more equivocal. Some studies indicate that a combined intervention (ie, triazolam plus relaxation) produces more sustained benefits than medication [72,73], but others report more variable long-term outcomes [37,54]. Some patients retain their initial sleep improvements, but others return to their baseline values. Because behavioral and attitudinal changes are often essential to sustain sleep improvements, patients' attributions of the initial benefits may be critical in determining long-term outcomes. Attribution of therapeutic benefits to the hypnotic alone, without integration of self-management skills, may place a patient at greater risk for recurrence of insomnia once medication is discontinued. In addition, there is a risk that availability of medications may undermine patient's effort and motivation to change sleep habits and sleep scheduling. One recent study examined different sequences of CBT and medication therapies [74]. The best results were obtained when CBT was introduced first in the sequence, but medication was found helpful to improve total sleep time, which may be an important advantage, given that one component of CBT (ie, sleep restriction) reduces total sleep time during the initial course of therapy and could lead some patients to discontinue therapy prematurely. Despite the intuitive appeal of combining behavioral and medication therapies, it is not entirely clear when, how, and for whom these combined treatments for insomnia are indicated. Additional research is needed to examine optimal methods for integrating these therapies.

Practical considerations

Some potential barriers to treating insomnia with CBT include the time and cost of treatment and the limited availability of clinicians with CBT expertise. Some of these barriers may need to be revisited based on available evidence. For instance, direct consultation time averages 5 hours per patient, usually spread over four to eight visits [13]. The

amount of clinical contact and the number of follow-up visits are likely to vary as a function of insomnia severity, comorbidity, and patient's motivation. Because insomnia is often a very persistent condition (for patients enrolled in clinical studies the average duration of insomnia often exceeds 10 years), this investment of time may be relatively very small. In addition, this treatment period is considerably shorter than that of other forms of psychotherapy and is shorter than CBT applied to other health and psychological problems (eg, chronic pain, depression). Although it still may not be feasible for primary care physicians to spend that much time with a single patient, it perhaps is not realistic, either, to expect primary care physicians to manage chronic insomnia. Although acute and milder forms of insomnia may require less time and be manageable within the time constraints of primary care clinics, more complicated cases requiring formal CBT might be best handled by behavioral sleep medicine specialists.

Access to such specialists who have CBT expertise may be limited in some areas, and there is a definite need for training additional behavioral sleep medicine specialists. Although formal CBT usually is implemented by trained clinical psychologists, some procedures (eg, sleep restriction, stimulus control) are less time consuming and can be implemented successfully by other health care practitioners, including primary care physicians [75]. Studies have shown that treatment also can be implemented effectively by trained nurse practitioners [42] or through self-help manuals with some therapist guidance [35,76]. Group therapy is another cost-effective method for implementing insomnia [76a,77,78]. The costs of CBT may be another deterring factor, because CBT comes under mental health coverage and is not always covered by insurance carriers. This lack of coverage is puzzling given the preliminary evidence suggesting that short-term CBT may pay for itself in offsetting medical costs and, perhaps, may be more cost-effective than long-term pharmacotherapy [44,79].

Regardless of the format for treatment implementation, the success of CBT depends largely on the patient's willingness to comply with the recommended self-management procedures. For this reason, it is particularly important to schedule follow-up visits after the initial evaluation to address compliance issues. Although treatment generally is well accepted by patients, it is more time consuming and requires more effort than drug therapy, both for patients and clinicians. As such, compliance may not always be optimal. For example, Riedel and Lichstein [80] found a difference of 28 minutes between the recommended time in bed and the actual time spent in bed after treatment, with greater consistency in bedtime and arising time predicting a better outcome.

Challenges and areas of uncertainty

Despite increasing evidence supporting the efficacy and utility of CBT for treating insomnia, there are still several unresolved issues and challenges for the future. These issues are concerned with the specificity of treatment effects, the magnitude and clinical significance of therapeutic outcomes, and the transfer of knowledge, more specifically the poor dissemination of the evidence-based information, and limited access to CBT in most health-care systems.

Despite increasing evidence supporting the efficacy of CBT for insomnia, there still is little information about the specificity of this treatment modality and its active therapeutic mechanisms. With a few notable exceptions that have used attention-placebo conditions, most clinical trials of CBT have used wait-list control groups, precluding the unequivocal attribution of treatment effects to any specific cognitive, behavioral, or psychological treatment. The lack of a pill-placebo control equivalent in psychological outcome research makes it difficult to determine what percentage of the variance in outcomes results from specific therapeutic ingredients (ie, restriction of time in bed, cognitive restructuring), from the measurement process (ie, self-monitoring), or from nonspecific factors (eg, therapist attention, patients' expectations). There is a need to examine more specifically which treatment mechanisms and components operate with multicomponent CBT for insomnia.

Another future challenge is to optimize outcome. Although most CBT-treated individuals are considered responders, only a minority (15%–20%) achieves full remission, and a substantial proportion continues to experience residual, although occasional, sleep difficulties. Additional studies are needed to examine the optimal dosage of therapy and whether the addition of long-term maintenance and individualized therapy would enhance outcome. Clinical trials also are needed to evaluate whether the addition of medication to CBT has an additive or subtractive effect on short- and long-term outcomes. Because current evidence suggests that CBT is indicated primarily for persistent insomnia and medication for acute insomnia, there also is a need to examine more closely the role of CBT for situational insomnia. This question is important, because individuals who start taking hypnotic medication for acute insomnia may continue to use medication longer than initially intended.

Despite increasing evidence documenting the costs of insomnia in absenteeism and reduced productivity at work and the effect of insomnia

on quality of life [6], there is little evidence that treatment-produced sleep improvements significantly reduce this morbidity [10]. This issue remains an important challenge, because there is a significant discrepancy between the estimated prevalence of insomnia and the actual number of individuals who receive treatment. A related issue is the frequent assumption that medication is less expensive and produces faster results than the behavioral interventions. With the evidence showing that treatment gains with CBT are better sustained over time, one might hypothesize that CBT would be more cost effective than medication therapy. Randomized and prospective clinical trials evaluating the cost effectiveness of alternative therapies would help explicate this critical issue.

On the practical side, an important challenge will be to disseminate more efficiently the evidence that is currently available. Despite the accumulation of evidence suggesting that CBT is as effective as medication in the short term and is more effective in the long term, insomnia remains for the most part untreated, and treatment, when initiated, typically is limited to pharmacotherapy. There is a need to enhance the knowledge of clinicians (both physicians and mental health practitioners) about empirically validated interventions for insomnia and to increase access to such interventions through primary care or more specialized services. Recent studies have documented the utility and feasibility of treatment implementation models using nurse practitioners [42], the Internet [76a], telephone consultations [76], and self-help materials [35] that would facilitate access to CBT.

Summary

Insomnia is a prevalent health complaint that is associated with significant morbidity and health care costs. Progress has been made in developing and validating therapeutic approaches for the management of chronic insomnia, and CBT now is recognized as an effective treatment option. Despite these advances, insomnia remains undertreated in clinical practice, and CBT is underused by health care practitioners. An important future challenge will be to disseminate validated therapies and practice guidelines more efficiently and to increase their use in clinical practice. Additional research also is needed to optimize therapeutic outcomes in reducing insomnia symptoms and in increasing the impact of treatment on other indicators of morbidity and cost effectiveness.

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