Insomnia and Its Effective Non-pharmacologic Treatment

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Insomnia is the most common sleep disorder characterized by nocturnal symptoms; difficulties initiating or maintaining sleep; and daytime symptoms, such as difficulty with concentration, memory, fatigue, decrease in pleasurable activities, and impairment in function and mood. Insomnia symptoms and insomnia disorder have been often used interchangeably in the literature. In 2004, sleep researchers proposed the term “insomnia disorder” defined as sleep difficulties associated with daytime impairment or distress about the difficulty sleeping.1 Insomnia disorder also requires the presence of symptoms for at least 1 month and it is often classified by its duration: transient (<1 month); short term (between 1 to 6 months); and chronic insomnia (more than 6 months). Estimates of prevalence of insomnia disorders vary based on methodologies, with best estimates arising from epidemiologic studies. Such studies suggest that chronic insomnia is present in approximately 6% to 10% of persons in the United States2,3 and between 5% and 12% in other countries.4–6

There are two classification systems for the diagnosis of insomnia: the Diagnostic and Statistical Manual for Mental Disorders (DSM), which is published by the American Psychiatric Association7 and used by mental health professionals, such as psychologists and psychiatrists; and the International Classification of Sleep Disorders (ICSD), which is most commonly used by sleep specialists.8 The two diagnostic classifications identify subtypes of insomnia. The current version of the DSM includes primary insomnia, insomnia related to another mental disorder, insomnia caused by a general medical condition, and substance-induced insomnia. The current ICSD system includes insomnia that has 10 subcategories: adjustment insomnia, psychophysiologic insomnia, paradoxical insomnia, idiopathic insomnia, inadequate sleep hygiene, insomnia caused by mental disorder, insomnia caused by drug or substance, insomnia caused by medical
condition, insomnia unspecified, and physiological (organic) insomnia. The DSM-V (diagnostic and statistical manual of mental disorders, 5th edition) advisory committee on sleep nosology has proposed a single diagnosis of insomnia disorder with the use of qualifiers to specify presence of medical and psychiatric comorbidities. This proposed diagnosis will replace the existing DSM diagnoses of primary insomnia and insomnia related to other medical or psychiatric conditions, thus eliminating causal implications inherent with the use of terms, such as “sleep disorder due to a general medical condition” and “sleep disorder related to another mental disorder”.9

INSOMNIA IS A PUBLIC HEALTH PROBLEM

In 1995 the direct cost of substances used and health care costs related to insomnia in the United States were estimated to be $13.9 billion per year.10 A broader insomnia-related estimate includes direct costs (inpatient, outpatient, emergency room health care utilization, over-the-counter supplements and pharmaceuticals); indirect costs (workplace absenteeism, loss of work productivity); and related costs (those that do not fall into direct/indirect, such as damages caused by on the job accidents). With this broader definition, a 1994 study estimated that the cost of insomnia is $30 billion to $35 billion per year.11 More recent estimates for direct and indirect costs in the United States are even higher, more than $100 billion.12 The relative direct and indirect costs for adults (under 64 years of age) with and without insomnia is $1253 per 6 calendar months, with slightly lower differential cost among people aged 65 years or older ($1143).13 Emerging data underscore the public health and economic burden of insomnia. These data can be divided into the following three categories: health risks, health utilization, and work domain deficits (absenteeism and reduced productivity).

HEALTH RISKS

Prolonged insomnia is associated with significant health problems. In a study of 3445 primary care subjects, in which 50% had chronic insomnia, individuals who experienced insomnia symptoms defined as most or all nights a week for the previous 4 weeks were more likely to also have physician-diagnosed myocardial infarction (odds ratio [OR]: 0.9); congestive heart failure (OR: 2.5); and diabetes mellitus (OR: 1.0); and patient-reported comorbidities, such as osteoarthritis (OR: 1.6); rheumatoid arthritis (OR: 1.3); peptic ulcer (OR: 1.8); and bowel problems (OR: 0.9).14 A new study of 1440 women suggests that the well-documented association between anxiety and cardiovascular diseases is mediated by insomnia as evidenced by a threefold reduction in the association between anxiety and cardiovascular symptoms when insomnia was added as a predictor.15 Poor sleep quality is also associated with next morning worsening of irritable bowel syndrome symptoms16 and pain associated with rheumatologic disorders.17,18 Recent data also suggests an association between poor sleep and obesity.19 The direction of the link between poor sleep and health indices has not been fully explored. For pain conditions, this relationship appears to be a bidirectional relationship20 but less is known about other conditions.

HEALTH UTILIZATION

Insomnia is associated with increased health care utilization, such as medical visits and hospitalizations.21 In a sample of 350 subjects with insomnia in a sleep clinic, who were receiving behavioral management of insomnia, 82% reported having a medical office visit in the past 2 months and 44% had reported having a mental
health visit in the past 2 months. Simon and VonKorff found a relationship between insomnia and greater general medical service utilization. Specifically, those with insomnia had significantly higher total health services costs than those without. Insomnia is more strongly associated with health problems thus it is not surprising that there is an increase in use of health care services and subsequently increased cost. Data is lacking on the cost savings and reduction in health care utilization that result from treating insomnia.

**Impact on Work Domain**

Insomnia is associated with lost work days and reduced productivity. It is estimated that employees who meet ICD diagnosis of insomnia miss on average 3.1 more days per year than those who do not. In addition to absences, insomnia is associated with an average of 27.6 days in lost productivity on the job, likely related to poor concentration and fatigue. Absenteeism and lost productivity related to insomnia have a significant economic toll. A recent study of 948 participants estimated that $970 million Canadian dollars are lost annually because of absences related to insomnia and an additional $5 billion Canadian dollars annually are lost because of lost productivity on the job. Leger and colleagues suggest that greater absenteeism in people with insomnia might be attributable to the health issues that are comorbid with insomnia but this possibility has not been directly tested.

**INSOMNIA IS UNDERTREATED**

Only one in five individuals with difficulty sleeping in the United States makes an appointment to see a physician with a chief complaint of difficulty sleeping. Of the 30% that have discussed sleep with their doctor four out of five mentioned concern about sleep within the context of a visit about a different chief complaint. Predictors of whether patients would discuss insomnia with a physician include perceived daytime fatigue, symptoms of depression and anxiety, poor physical well being, longer insomnia duration, older age, and higher income level. Less is known about the reasons patients are hesitant to bring up insomnia symptoms with their doctor. Some possibilities may include uncertainty whether insomnia will be taken seriously, concern that only medication treatment is available, ambivalence about taking medication, and being unaware of alternative non-pharmacologic treatments for insomnia; however, these possibilities have not been examined systematically in representative samples. There is also a lack of systematic investigations of how patients who do not seek treatment cope with insomnia. One study found that two thirds of people with insomnia reported lacking knowledge of available treatments for insomnia and 4 out of 10 reported self medicating with over-the-counter medication or alcohol.

Physician-specific reasons for under treating insomnia include insufficient time and a belief that insomnia is secondary to another medical or mental disorder and will resolve when the parent disorder is treated. Indeed, in primary and tertiary settings insomnia is often comorbid with other medical or psychiatric conditions. However, the belief that insomnia will resolve with the treatment of the parent disorder has been challenged by new evidence to the contrary. For example, 44% of patients with a depressive disorder continue to experience poor sleep even after their depression improves. It is now believed that when insomnia is experienced in the context of another disorder, the two conditions impact each other. Insomnia may hinder treatment of the coexisting condition. For example, a person with insomnia and depression may not respond as favorably to treatment of the depression as would those with only depression and no insomnia. Conversely, coexisting medical and psychiatric
conditions may impact response to insomnia treatment. Terminology, such as secondary insomnia, is not helpful for patient care in that it does not change how the provider would approach treatment. The challenge for the clinician is in determining when the insomnia is significant enough to warrant clinical attention.

WHO IS AT RISK FOR THE DEVELOPMENT OF INSOMNIA

Some groups have been identified as being more at risk for the development of insomnia. One such group is women who are two times more likely than men to have insomnia. Sleep disruptions increase during certain junctures in a woman’s life, such as pregnancy, postpartum, and menopause. However, the prevalence of insomnia disorder during these junctures has not been fully assessed. Another risk factor for insomnia is aging. Older adults are more likely to have insomnia, which may be related to poor health, chronic illnesses, and multiple medication use. Those that have irregular sleep-wake schedules, such as workers with rotating shifts; frequent travel across time zones (such as airline personnel); or those that frequently sleep irregular schedules, are at significant risk for developing insomnia. This risk is because irregular sleep-wake schedules can dampen the circadian clock signals that help regulate sleep and wakefulness, as described later in this article. Self described night owls tend to have more irregular sleep-wake schedules than those who are not. People with some medical or psychiatric conditions and those who describe themselves as worriers are at an increased risk for the development of insomnia. People who have experienced insomnia disorder in the past have a lower threshold for the reemergence of insomnia.

NON-PHARMACOLOGIC TREATMENT OF INSOMNIA

Cognitive behavioral therapy for insomnia (CBTi) is a brief and effective non-pharmacologic treatment for insomnia that is grounded in the science of sleep medicine, the science of behavior change and psychological theories. There is strong empirical evidence that CBTi is effective. Direct comparisons of CBTi with sleep medication in randomized control trials demonstrate that CBTi has comparable efficacy with more durable long-term maintenance of gains after treatment discontinuation. These studies carefully selected subjects with insomnia with no comorbid medical, sleep, or psychiatric disorders. Evidence is mounting that CBTi is also effective when insomnia is experienced in the context of medical disorders (eg, cancer, HIV, fibromyalgia, and pain) and psychiatric disorders, such as depression and anxiety. National Institutes of Health consensus and the American Academy of Sleep Medicine Practice Parameters recommend that CBTi be considered standard treatment for insomnia. Despite the high level of empirical support, health care providers and consumers are largely unaware of this treatment option. The remainder of this article is dedicated to describing CBTi, beginning with a conceptual model of insomnia that underlies the therapy, continuing with descriptions of the components of CBTi, and concluding with practical issues related to its implementation in primary care.

A MODEL OF INSOMNIA

A behavioral model of insomnia, put forth by Spielman and colleagues in 1987, identifies predisposing characteristics, precipitating events, and perpetuating attitudes and practices – three factors that together explain the development and course of insomnia. Predisposing characteristics are individual attributes that lower the threshold for the development of insomnia during unsettling or stressful periods and
hence increase the likelihood of the development of insomnia. These characteristics include biological and psychological factors. For example, people who tend to be restless or anxious and those who worry excessively are at increased risk for insomnia during periods of increased stress and distress.

Precipitating events are life events, such as significant loss, that lead to increased stress and trigger sleep disruptions. Approximately 75% of people with insomnia can identify a clear trigger. Sleep disruptions that emerge during periods of acute stress often resolve when the stress subsides, but in some cases poor sleep persists and insomnia develops.

An individual’s response to the experience of poor sleep may perpetuate the problem. Exaggerated distress about poor sleep leads to increased sleep effort, characterized by worrying about not getting enough sleep, apprehension about sleep at bedtime, and frustration when sleep onset is delayed. It is as if the person develops performance anxiety about sleep, which of course interferes with the process of sleep. Trying to get to sleep, stay asleep, or get more sleep may take different forms, such as extending time in bed by going to bed earlier than before, avoiding previously enjoyable activities in the evening for fear that they will interfere with sleep, cancelling engagements or obligations during the day, and using alcohol to induce sleep.

In addition, continued frustration and distress when unable to sleep leads to conditioned arousal, which means that the bed or the bedroom become a trigger for increased arousal, rather than sleep. Some patients with insomnia report that as they get into the bed at night their minds become active and their heart rate increases even though they were dozing on the couch just before going to bed. CBTi targets perpetuating attitudes and practices. It is a set of interventions aimed at modifying cognitions and behaviors that interfere with sleep and breaking the cycle of conditioned arousal. The interventions that constitute CBTi are time-in-bed restriction, stimulus control, relaxation therapy, cognitive therapy, and sleep hygiene.

**TIME-IN-BED RESTRICTION (SLEEP RESTRICTION)**

Time-in-bed restriction (also known as sleep restriction) is a procedure designed to increase the homeostatic sleep drive, one of two components involved in the regulation of sleep. The homeostatic drive to sleep, known as process S, increases in a linear fashion from rise time to bedtime. The longer we are awake the stronger the sleep drive. The second component involved in the regulation of sleep is the circadian clock, known as process C. Process C, generated in the suprachiasmatic nucleus, opposes process S by sending alerting signals that initially increase in magnitude as the homeostatic drive to sleep increases and later wanes in magnitude, thus permitting sleep. The alerting signals increase again approximately 2 hours before rise time. The optimal time to sleep is when the homeostatic drive (process S) to sleep is high and the alerting signals (process C) begin to dampen.

Time-in-bed restriction (sleep restriction) was initially developed by Spielman to address middle-of-the-night awakenings, but it has since been used even for initial sleep onset difficulties. It is an iterative process that starts with limiting the allowed time in bed to the patients’ current average reported actual sleep time and subsequently slowly increasing the allowed time in bed as sleep improves by small increments. Typically, improvement in sleep quality is seen within the first week of implementing this procedure. Individuals with insomnia tend to underestimate their total sleep time. Therefore limiting time in bed to the reported sleep time is likely to result in mild sleep deprivation and increased homeostatic sleep drive, thus reducing sleep latency or time awake in the middle of the night. Increased sleep drive
may lead to sleepiness during the day. Patients should therefore be cautioned against driving while sleepy when undergoing this procedure. The decision to increase the allowed time in bed is based on the percent of actual sleep time relative to the time spent in bed (sleep efficiency). When the average sleep efficiency for more than 1 week is at least 0.85, the time in bed is extended by 15 minutes. The initial time in bed is never less than 5.5 hours, even if the initial reported sleep time is less than that. Each new time-in-bed prescription is followed for at least 1 week before the next extension is proposed. The process stops when the patients’ sleep need is met as reflected by optimal daytime alertness and functioning. Sleep logs that are completed each morning are very helpful during this process as they aid in providing more accurate estimates of total sleep time than retrospective recollection.

Ideally the placement of the sleep window (the times in and out of bed) should maximize the likelihood that sleep will occur and therefore needs to be informed by the patients’ circadian tendency (chronotype). For example, the prescribed bedtime is not at a time during which the circadian clock still generates strong alerting signals. To maximize the likelihood of adherence with the prescribed time in bed, the decision of the times in and out of bed should be done in collaboration with patients. Consideration of the patients’ current sleep-wake schedule and life constraints that might impact bed time and rise time, such as work schedule, child care, and so forth, impact the chosen sleep window.

A caveat to time-in-bed restriction and CBTi is that unresolved medical conditions may continue to cause sleep disruption, such as those associated with pain, abnormal thyroid function, acid reflux disorder, increased nighttime urinary frequency, dementia, depression, and anxiety. Trouble breathing during sleep can also lead to fragmented sleep, such as with sleep apnea, asthma, and congestive heart failure.

**STIMULUS CONTROL**

Stimulus control, developed by Bootzin, is a set of instructions aimed at breaking conditioned arousal and strengthening the bed and bedroom as stimuli for sleep.50

Stimulus control is used for sleep onset and sleep maintenance insomnia. The four instructions and their rationale are

- Go to sleep only when sleepy. This instruction will likely increase the probability of sleeping by aligning the bedtime to coincide with low arousal and strong homeostatic drive to sleep. It is important that patients learn to distinguish sleepiness from fatigue and tiredness. Sleepiness is a state requiring effort to stay awake. It is more closely associated with low arousal and high homeostatic drive and is therefore more conducive for sleep. Fatigue and tiredness are states of low energy but may also be accompanied by an active mind and high arousal, which are not conducive to sleep. Patients with insomnia often report feeling “tired but wired” at bedtime, wishing to sleep but not feeling sleepy, most likely because of conditioned arousal and high activation of the arousal system.

- If unable to sleep at the beginning or middle of the night get out of bed and return only when sleepy. When out of bed engage in quiet non-arousing activities and use the minimum amount of lighting necessary for the activity. This instruction removes the frustration and other negative emotions experienced by individuals with insomnia when they are unable to sleep, which helps break the conditioned arousal.

- Set a regular morning wake time. This instruction applies irrespective of how much total sleep was acquired the night before. This important instruction aims at strengthening the circadian clock, as rise time is important for the
entainment of the clock. This instruction also reduces sleep effort by eliminating the end of the night tossing and turning.

- Avoid napping during the day. For people with insomnia who also experience daytime sleepiness, this original stimulus control instruction can be modified to allow short (15–20 minutes) naps. Naps are kept short to avoid reducing the homeostatic drive. It is recommended that when naps are taken they are initiated 7 to 9 hours after the morning wake time.

**RELAXATION THERAPY**

There are a variety of factors, such as cognitions and emotions, that influence the activation of the arousal system that can interfere with or supersede the sleep promoting system. A person should attempt to sleep when they feel calm because wakefulness and sleep are two distinct systems and do not operate like an on-off switch but rather on a continuum of continual communication. Research has shown that those with insomnia compared with good sleepers have higher heart rates, stress hormones, and metabolic levels. Techniques to help in reducing this hyperarousal activation are relaxation therapy, such as progressive muscle relaxation, diaphragmatic breathing, visual imagery, and stress management skills. They are designed to reduce somatic and psychic anxiety related to sleep.

A common reaction to difficulties with sleeping is to try harder to sleep or to force sleep to happen, which may actually lead to an increase in arousal activation. This process has been likened to the Chinese finger trap; you put your fingers into the trap and the harder you try to pull them out the more stuck you become. The key to getting your fingers out is letting go and easing them out. Relaxation therapy can be an adaptive replacement to trying and forcing sleep to occur, but with the goal of using the techniques to calm the mind and relax the body thus decreasing the hyperarousal. However, the caveat to relaxation therapy is to not use the relaxation techniques for the purpose of trying to get to sleep.

**COGNITIVE THERAPY**

The cognitive therapy component of the CBTi targets thoughts and beliefs that interfere with sleep directly by increasing arousal in bed or indirectly by interfering with adherence to sleep restriction and stimulus control. A common reaction to difficulties with sleeping is to worry about sleep or lack thereof. As times goes on and poor sleep continues, an anticipation of not sleeping well each night begins to emerge. The daytime consequences of not sleeping well also become worries, such as “how will I function at work tomorrow”; “I will be unable to get through my day”; or “I may lose my job because I am not functioning optimally.” These worries about getting to sleep and daytime consequences of not getting enough sleep serve to increase the arousal response. Cognitive therapy is employed to address these sleep-related cognitions and worries. In some patients, the behavioral components of treatment (time-in-bed restriction and stimulus control) may increase patients’ anxiety about getting enough sleep leading to a paradoxical reaction. In these instances treatment may focus more on components that reduce the anxiety and arousal activation.

**SLEEP HYGIENE**

Standard sleep hygiene therapy includes “limiting caffeine intake, avoiding alcohol before bed, incorporating daily exercise, having a bedtime snack, and keeping the bedroom quiet, dark, and at a comfortable temperature.” There is insufficient
evidence to support sleep hygiene as a lone intervention but it is often included along with other more potent interventions. A comparison of standard sleep hygiene with CBTi in a sample of 81 subjects revealed that CBTi produced greater decrease in wakefulness after sleep onset than standard sleep hygiene education. Sleep hygiene recommendations, like dental hygiene, might be best conceptualized as a set of preventative rather than therapeutic strategies.

MULTIMODAL APPROACH

CBTi is a multimodal approach that combines behavioral and cognitive strategies. The most commonly used behavioral components are time-in-bed restriction and stimulus control, which can be combined into a single set of instructions. The cognitive component is added as a means for reducing cognitive and emotional hyperarousal and for increasing adherence with the behavioral components. Sleep restriction and stimulus control are counter-intuitive. Some patients may respond to a reduction in the time they are allowed to spend in bed with a significant increase in anxiety about sleep, which may interfere with sleep. The task of the CBTi provider is to tailor its components to each individual based on the unique presentation. A brochure with instruction is often not sufficient. Research has shown that for individuals with insomnia and no comorbid conditions, four individual sessions, each approximately 1 hour, are optimal length of therapy. When the presentation is more complex, additional sessions are needed. CBTi can also be provided effectively in a group format. In fact, one of the seminal randomized control trials compared group CBTi to the benzodiazepine temazepam and pill placebo. The study found that the two active interventions were statistically equivalent in reducing time awake after sleep onset after 8 weeks of treatment and both were more effective than pill placebo. The study also found that group CBTi had more durable effects 2 years later.

COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA PROVIDERS AND WHERE TO FIND THEM

CBTi is a form of cognitive behavioral therapy, an approach to therapy that was developed by psychologists to deal with many psychiatric conditions and aims to modify cognitions and behaviors relevant to each disorder. Historically, CBTi was developed and provided by psychologists whose training included the science of behavior change, cognitive and behavioral interventions, psychological assessment, and additional specialized training in sleep medicine. Specialized training in sleep medicine is important for an effective delivery of CBTi. General psychotherapy is not effective for improving sleep. At the same time, knowledge of sleep medicine alone, without training in the science of behavioral change and principles of cognitive behavioral therapy, is not likely to produce optimal results. Currently, the American Academy of Sleep Medicine offers certification for providers of behavioral sleep medicine, including CBTi. A list of certified providers can be found at http://www.aasmnet.org/BSMSpecialists.aspx.

SUMMARY

Cognitive behavioral therapy for insomnia is an effective non-pharmacologic treatment for insomnia. In direct comparisons with sleep medication in randomized control trials, CBTi demonstrates that it has comparable efficacy with more durable long-term maintenance of gains after treatment discontinuation. Because of the strong empirical support of CBTi, the National Institutes of Health Consensus and the American
Academy of Sleep Medicine Practice Parameters recommend that CBTi be considered standard treatment for insomnia. The importance of identifying and treating insomnia is underscored by the public health and economic burden of insomnia currently estimated at $100 billion annually. Increased awareness is needed in the primary and tertiary settings for health care providers and patients regarding the availability and the short- and long-term efficacy of CBTi.

REFERENCES