

REVIEW

Non-pharmacological management of primary and secondary insomnia among older people: review of assessment tools and treatments

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Abstract

Background: primary and secondary insomnia, especially among older adults, is frequently encountered by family physicians. Pharmacological interventions, although effective in some circumstances, can be detrimental in others. Non-pharmacological management of insomnia may allow the patients to self-administer the treatment.

Objectives: review of published literature of assessment tools and treatments for primary and secondary insomnia.

Results: two frequently used self-reporting methods for obtaining sleep data are sleep diaries and Pittsburg Sleep Quality Index. A large amount of research supports the use of non-pharmacological treatments such as stimulus control, sleep restriction, sleep hygiene education, cognitive therapy, multi-component therapy and paradoxical intention.

Conclusion: assessing the nature of insomnia by using an effective assessment tool and providing patients with a non-pharmacological treatment should be the first intervention for insomnia. It is shown that non-pharmacological treatments for primary and secondary insomnia are feasible and effective alternatives to the use of benzodiazepines, and that family physicians should consider these when managing older patients with insomnia.

Keywords: *insomnia, non-pharmacological treatments, assessment tools, older people, benzodiazepines*

Insomnia is a heterogeneous complaint that may involve difficulties falling asleep (initial or sleep onset insomnia), trouble staying asleep with prolonged nocturnal awakenings (middle or maintenance insomnia), or early morning awakening with inability to resume sleep, causing dissatisfaction with day time function [1]. Insomnia may be short term (less than a month), or chronic. It may also occur in a single episode, but more frequently it is a recurrent problem [2]. Estimated prevalence rates of insomnia in older people is over 30% [3]. Rockwood *et al.* documented from a large sample of community dwelling Canadians 65 years and older that 18.6% experienced early morning awakenings, 18.1% had difficulty falling asleep, and 30.9% suffered from day time sleepiness [4]. In an American study of 9,000 older adults, 88% of the sample reported sleeping difficulties [5].

Some changes in sleep patterns are normal as one ages [6]. They include an increased amount of light sleep (stages 1 and 2 of the sleep cycle), a decreased amount of deep sleep (stages 3 and 4 of the sleep cycle), and less time spent in the rapid eye movement (REM) stage of sleep. Overall, sleep quality and sleep efficiency (total sleep time/total bed time) seem to decrease with normal aging to 70–80%. Patients may express this as an experience of lighter and more fragmented sleep.

Total sleep time changes across all ages. These sleep time requirements include over 18 h for neonates, 11 h for young children, 9 h for adolescents, and about 7.5 h for adults [7]. Caüter and colleagues found that total sleep time decreased on average by 27 min per decade from mid-life until the eighth decade [8]. The slow wave sleep of stage 3 and 4 that determines sleep intensity

decreased from young adulthood to middle age from 18.9 to 3.4% of total sleep time [7].

A recommended sleep pattern for the older person includes a sleep latency (time until fall asleep) of up to 30 min, obtaining 5–10 (average 6) h of sleep at night, possessing a sleep efficiency of 85%, and not experiencing daytime impairment because of sleepiness [6]. When sleep changes become pathological, they tend to interfere with healthy functioning. This may cause attention deficits, delayed reaction, short-term memory difficulties, functional problems and increased risk of falls [9, 10]. Data from the Canadian Study on Health and Aging report that the feeling of being constantly tired during the day was related to a higher 5-year mortality for both genders aged 65 or more [4].

In the older person, increasing circadian dysfunction with forward shift and advanced sleep phase results in getting to bed earlier and waking up earlier [11, 12]. Normal sleep patterns include tiredness in the mid-afternoon and before bed at night. Older individuals tend to catch up with sleep requirements by daytime napping. As individuals differ significantly regarding the amount of optimal sleep they need, sleep requirements should be dependent on levels that prevent daytime dysfunction or mood impairments rather than on sleep time averages [13].

Primary insomnia, although rare among the elderly, is defined as having difficulty initiating or maintaining sleep for a minimum of one month. The sleep disturbance must also produce clinically significant distress and is associated with impaired social or occupational function. It is independent of narcolepsy, other sleep and mental disorders, and is not directly related to medication side effects or to a medical condition [14].

Sleep problems amongst older patients are generally caused by secondary insomnia [11, 15]. This type of insomnia may occur as a result of medical, psychiatric, environmental, behavioural, or drug side effects. Medical causes of secondary insomnia include any physically disturbing condition such as pain, thyroid disease, acid reflux, coronary artery disease or pulmonary problems [16]. Sleep related movement disturbance (nocturnal myoclonus, restless leg) is another medical condition that may cause insomnia. This condition may be genetic, or secondary to iron or folic acid deficiency anaemia [17]. Insomnia is a common complaint in individuals with anxiety and depression [16]. Environmental and behavioural factors may include a decreased exposure to bright light and a lack of exercise [18]. Medications and other substances that may cause insomnia as a side effect include steroids, theophylline, anticancer drugs, beta-blockers, caffeine, alcohol and nicotine [16, 19].

Circadian rhythm changes (such as a tendency to feel sleepy earlier and wake up earlier), sleep disorders (such as sleep apnea), and psychological factors (such as isolation), also increase as one ages. An example of circadian rhythm changes is shift-work sleep disorder, which causes sleep disturbances. These changes are not

primary insomnia conditions, but they are disorders of sleep timing rather than sleep production [12].

Insomnia assessment tools

Many different tools are used to assess insomnia. A self-reporting measure such as Sleep Diary is the primary subjective method, while Polysomnography and actigraphy are the objective methods used for measuring sleep initiation and maintenance variables [20, 21]. Polysomnography, if appropriately used, is very reliable for obtaining sleep duration and frequency information. Its use for the evaluation of primary insomnia may not be feasible due to cost, accessibility, and the fact that insomnia may be caused by a patient's sleeping environment [22]. Actigraphy is a wristwatch-sized device that records frequency of movement [23, 24]. It is worn around the wrist or ankle and can be down loaded onto a computer. Some studies have shown that actigraphy is a valid and reliable tool for assessing sleep duration. It has been associated with absent first-night effects among normal sleepers sleeping at home.

Measures such as self-reporting could potentially provide an inaccurate estimation of sleep initiation and maintenance [15]. For example, when waking after sleep onset (WASO) duration is below 3–4 min, individuals tend not to remember the episode. Subjects tend to think their sleep latency and wakefulness are longer than they actually are and their total time asleep is shorter than it actually is. Despite these, studies have shown an important correlation between self-reports and objective sleep measures [25, 26].

Two frequently used self-reporting methods for obtaining sleep data are sleep diaries and the Pittsburgh Sleep Quality Index. Sleep diaries may be simplified to solely include time in bed, sleep and wake time estimates with sleep efficiency calculations [27]. Sleep diaries should be filled out for a minimum of two weeks prior to therapy, as well as throughout and after any treatments. They easily show sleep changes occurring with treatment and assist the clinician in determining the individual level of compliance to treatment. Sleep diaries are subject to the same standardisation difficulties as self-reports, although, they can provide reliable and valid estimates of sleep parameters [28]. They capture data on the time between sleep onset and the moment at which the electric encephalogram displays stage 2 sleep pattern [26]. Sleep diaries are the most valid tools for measuring insomnia in general practice.

The Pittsburgh Sleep Quality Index is a 19-item questionnaire with seven sub scales (subjective sleep quality, sleep latency, sleep duration, habitual sleep disturbances, use of sleep medication and day time dysfunction) [29]. Each sub-scale is rated from 0–3 with the higher scores reflecting more severe sleep complaints. The addition of all the scores permits an analysis of the patient's overall sleep experience. The lower the

overall score, the better the person sleeps. The tool has an adequate internal reliability, validity and consistency for clinical and community samples of the elderly population, however, the questions are heavily based on the memory over the past month.

Pharmacological treatment for insomnia

Benzodiazepine hypnotics are frequently prescribed for insomnia. However, they cause impairment of sleep quality (decrease slow wave sleep), and some potential significant adverse effects [30]. Residual sedation and memory or functional impairment occurring the day following drug administration tend to be associated with hypnotics that have a long half-life or active metabolites [31]. Rebound insomnia is associated with short half-life hypnotics [32]. Other adverse effects of benzodiazepine use include increased risk of falls, drowsiness, dizziness, cognitive impairment and motor vehicle crashes [33]. Despite such findings, benzodiazepine prescription rates have not been reduced [34]. Among independently living individuals over the age of 65, benzodiazepine use is 12% for women and 9% for men [35]. The use of hypnotics among institutionalised patients is much higher at 34%.

Non-benzodiazepine hypnotics, such as zolpidem (an imidazopyrine) and zopiclone (a cyclopyrrolone), are newer, short-acting drugs for treating insomnia. They are type I selective gamma-aminobutyric acid (GABA) receptor agents. Zolpidem produces less withdrawal and tolerance effects than benzodiazepines, while its efficacy is comparable to them [36, 37]. Zolpidem and zopiclone have inactive metabolites, short half-lives, and absence of respiratory depressive side effects. In post marketing surveillance, it appears that these drugs do not result in increased risk of falls, daytime sedation, driving impairment, tolerance, rebound, respiratory depression, or exacerbation of sleep-disordered breathing [7]. However, some side effects that have been associated with zolpidem use may be undesirable. They include dizziness, somnolence, nausea, vomiting and falls [36]. Zopiclone has produced improvements in sleep parameters among patients previously taking benzodiazepines. Some of the improvements were maintained following zopiclone cessation. Long term use of zopiclone, among patients taking dosages above the prescribed amount, has been associated with dependence and withdrawal symptoms such as anxiety and insomnia [37].

In view of the potential for serious side effects of hypnotics use in the older person, family physicians need to consider non-pharmacological interventions as their first line of treatment for insomnia. Non-pharmacological treatments not only cause fewer side effects, but they can sustain long-term improvements more successfully than pharmacological treatments [38]. However, if sleep improvements remain absent after such interventions, hypnotics can be considered. It is recommended that pharmacological treatment should

be limited to 4 weeks. Benzodiazepine effectiveness is rarely maintained over the long term [30].

Bright light therapy

The purpose of bright light therapy in the context of insomnia is to advance or delay the circadian clock independently of the sleep-wake pattern. The treatment involves making the patient perceive determined dosages of light for determined time intervals. Light boxes and head-mounted visors are available. Although the mechanism of action still requires more research, the treatment has been stated to normalise sleep. In general, for older adults with advanced sleep phase, bright light exposure (≥ 1000 Lux) in the evening or late afternoon is recommended to delay the sleep phase [39].

Non-pharmacological treatments for primary and secondary insomnia

A large amount of research has supported the use of certain non-pharmacological treatments for insomnia. Each of these treatments are summarised in a manner that allows the physician to easily guide the therapy or would allow the patient to self-administer the treatment.

Stimulus control

The purpose of stimulus control is to help the patient associate rapid sleep onset with the bed and bedroom. This is achieved by reducing activities that interfere with sleep [38, 40, 41].

At the first session, the physician must explain to the patient the rationale of each step of the protocol so that the significance of each component of the overall treatment is understood. The physician should provide a copy of the instructions to the patient following this review (Table 1). Subsequent sessions are used to encourage the patient to comply with the protocol and to address any new concerns or difficulties. It can produce clinically significant results among adults with chronic insomnia when administered by a general practitioner or another health care professional who receives brief training.

Table 1. Stimulus control therapy

1. Go to bed only when you feel tired.
2. Use the bed and bedroom for sleep and sex. For example, do not read books or magazines, watch TV, eat or worry while in bed.
3. Leave the room if you do not fall asleep within 15–20 min. Remain in the other room for as long as you wish or need. Return to bed only when you feel sleepy again.
4. If you still cannot sleep, repeat step 3. Do this as often as necessary throughout the night.
5. Get up at the same time every morning regardless of how much sleep you obtained the night before (use an alarm clock if necessary).
6. Avoid napping.

It is shown that sleep onset and sleep maintenance insomnia among the elderly can be improved with stimulus control [42]. In fact, with stimulus control, sleep onset latency and wake after sleep onset are often reduced to or below 30 min. With this treatment, the total amount of sleep is frequently increased by 30–40 min. Moreover, it is not only effective on primary insomnia, but secondary insomnia responded well to this treatment after four weeks when combined with sleep hygiene and relaxation therapy [41]. The observed improvements were substantial and sustained throughout the follow up.

Although the above evidence suggests that stimulus control is a promising control for insomnia, the therapy requires a high level of motivation and compliance on behalf of the patient. More research is required to learn how to enhance the patients' compliance with the therapy without compromising the treatment's efficacy [40]. Overall, stimulus control appears to be the insomnia treatment most supported by the literature.

Sleep restriction

The purpose of sleep restriction is to limit the time spent in bed to the actual time sleeping and to prolong sleep time, so as to increase sleep efficiency [38, 43–45]. The reasoning behind this approach is the belief that excessive time in bed causes fragmented sleep and seems to be a critical factor in perpetuating insomnia. Restricting time in bed can create a mild sleep deprivation and can provide a more solid sleep (Table 2).

Sleep restriction requires less time to implement than other non-pharmacological insomnia treatments such as relaxation training [38]. While family physicians can easily administer restriction therapy, patient compliance may be difficult to obtain [40, 42]. Other practical considerations for family physicians are the tendency for the treatment results to be long term and a trend toward

Table 2. Sleep restriction therapy

1. Determine the average estimated total sleep time. The data used to do this can be obtained from a sleep diary that has been filled out for at least 2 weeks.
2. Restrict the time in bed to the average estimated total sleep time.
3. Each week, determine the patient's weekly sleep efficiency (total sleep/time in bed×100) from the data obtained from the sleep diary.
4. Increase total time in bed by 15–20 min when sleep efficiency exceeds 90%. Decrease it by 15–20 min when sleep efficiency is below 80%. Keep total time in bed the same when sleep efficiency is between 80–90%.
5. Each week, adjust the total time in bed until the ideal sleep duration is obtained.
6. Do not reduce time in bed to below 5 h.
7. Brief midday naps may be permissible, especially in the early phase of treatment.
8. When applying this protocol to the elderly, some recommend reducing the time in bed only when sleep efficiency is below 75% [44].

excessive day-time sleepiness in older people undertaking the therapy [45].

Sleep hygiene education

This approach attempts to change patient's lifestyles and environment to optimise sleep quality (Table 3).

Poor sleep hygiene is the frequent cause of primary insomnia [40]. However, insufficient evidence exists to conclusively recommend sleep hygiene as a single effective insomnia treatment [42]. One study observed that good sleep hygiene was less common among poor sleepers [46]. Hence, it may be a good place to begin treatment so as to avoid bad habits. Another study reported that subjects partaking in good sleep hygiene appeared to possess improved mood on morning awakenings [45]. It also showed that sleep hygiene education seemed to initially improve sleep continuity and depth. In the same study, however, the patients participating in sleep restriction therapy developed higher sleep efficiency than the subjects of the sleep hygiene education. Overall, sleep hygiene education appears to be necessary in treating insomnia and it should be included in interventions [38].

Cognitive therapy

The purpose of cognitive therapy is to help patients identify, challenge and change dysfunctional beliefs and attitudes about sleep and to replace them with more adaptive substitutes [40]. Maladaptive sleep beliefs and

Table 3. Sleep hygiene education

1. Avoid the use of caffeine containing products, nicotine and alcohol especially later in the day.
2. Avoid heavy meals within 2 h of bedtime.
3. Avoid drinking fluids after supper to prevent frequent night-time urination.
4. Avoid environments that will make you really active after 5 pm (i.e. avoid noisy environments).
5. Only use your bed for sleep. Sit in your chair when you just want to relax.
6. Avoid watching television in bed (i.e. watch it in your chair).
7. Establish a routine for getting ready to go to bed.
8. Set time aside to relax before bed, and utilise relaxation techniques.
9. Create an atmosphere conducive to sleep:
 - Keep yourself at a comfortable temperature by modifying the number of blankets you use.
 - Use earplugs if it is too noisy.
 - Make the room darker if there is too much light (e.g. close the door).
 - Put an extra mattress on your bed if is uncomfortable.
10. When in bed, relax and think pleasant thoughts to help you fall asleep.
11. Get up at the same time every day, including weekends. Use an alarm clock if it will help.
12. Avoid taking daytime naps. If you have to take them, make sure you do so before 3.00 pm and that the total time napping does not exceed one hour.
13. Pursue regular physical activity, like walking or gardening but avoid vigorous exercise too close to bed time.

attitudes are more frequent in older chronic insomniacs than in self-defined good sleepers [2]. Cognitive therapy is an important component of insomnia management and perhaps more important for older insomniacs [47, 48]. It seems to be particularly useful in identifying pathological from normal changes in sleep patterns among the elderly. It can provide patients with a sense of control and self-efficacy over sleep.

Cognitive therapy usually requires significant professional involvement. The time required to do so is frequently unavailable in a family physician's schedule. The intervention involves preparing a patient for treatment by providing him/her with a conceptual framework of relationships between cognition, effect and behaviour. Afterwards, the therapist must explain the purpose of cognitive therapy to the patient. The therapist proceeds in identifying dysfunctional sleep cognition by using tools and measuring dysfunctional attitudes and beliefs about the sleep. Maladaptive beliefs and attitudes are addressed and replaced. A more effective method of treating maladaptive beliefs and attitudes about sleep is to provide the patient with a fact sheet listing what is normal and abnormal sleep.

Chesson *et al.* [42] indicated that cognitive therapy lacks sufficient evidence to be recommended as a single treatment. However, Morin *et al.* [38] showed that cognitive therapy as part of a multifaceted treatment tends to produce positive results. Another study observed improved sleep patterns when dysfunctional sleep patterns were reduced [49]. Cognitive therapy helps to prevent the aggregation of emotional distress and sleep disturbances normally caused by maladaptive beliefs and attitudes about sleep.

Multi-component therapy

Multi-component therapy is an insomnia treatment that involves combining several different interventions [50]. For example, it can include cognitive, behavioural and sleep hygiene components. Multi-component therapy protocols are determined by the protocols of each treatment included in therapy.

The American Psychological Association considers multi-component therapy as probably efficacious [38]. It has been reported that the best outcomes for this treatment occurred when stimulus control or/and restriction therapy were combined with other interventions such as cognitive restructuring and relaxation therapy [50]. It has been shown that multi-component therapy produced better results than no treatment, but it is not always more effective than stimulus control or sleep restriction alone [38]. Overall this approach requires additional research.

Paradoxical intention

Paradoxical intention seeks to remove performance anxiety by having the patient partake in his or her most

feared behaviour (i.e. remaining awake). An example of the protocol is adapted from Ascher and Turner [51]:

1. When you are in bed, remain awake as long as possible. Do not try to fall asleep. Just lie in bed in a darkened room and keep your eyes open for as long as you can.
2. Do not partake in activities that are incompatible with sleep. For example, do not keep the lights on and do not read or watch TV.

Physicians should explain the rationale for the treatment to their patients. The American Psychological Association empirically supports paradoxical intention [38]. Morin *et al.* [38] reported that all of the six studies analysed for paradoxical intention, concentrated on the treatment effectiveness for sleep onset insomnia. Patients' responses to treatment were variable. Paradoxical intention seems less effective than stimulus control or relaxation therapy, although it appears to be a treatment that can be administered by family physicians with ease [42].

Relaxation therapy

There are many forms of relaxation therapy that patients can use to improve their sleep [38, 40]. Some, such as progressive muscle relaxation [52], and autogenic training [53], attempt to decrease somatic arousal. Others, such as imagery training [54], or meditation [55], try to minimise cognitive arousal. Most relaxation therapies can be self-administered by the patient through listening to the treatments verbatim or music/sounds on tape. Hence, their implementation requires only a small amount of the family physician's time. However, not all relaxation treatments have a significant amount of support in the literature.

Conclusion

Physicians frequently encounter primary and secondary insomnia, especially among older adults. Pharmacological interventions, although effective in some circumstances, can be detrimental in others. Assessing the nature of insomnia by using an effective assessment tool such as a sleep diary or the Pittsburgh Sleep Quality Index and providing the patient with a non-pharmacological treatment should be the first intervention for insomnia. The most frequently used non-pharmacological treatments include stimulus control, sleep restriction, sleep hygiene education, cognitive therapy, multi-component therapy, paradoxical intention and relaxation therapy. Bright light therapy can also be used in the treatment of insomnia. It is shown that non-pharmacological treatments for primary and secondary insomnia are feasible and effective alternatives to the use of benzodiazepines, and that physicians should consider these when managing older patients with insomnia.

Key points

- Sleep requirements should be dependent on levels that prevent daytime dysfunction or mood impairment rather than on sleep time averages.
- In the older person, increasing circadian dysfunction with forward shift and advanced sleep phase results in getting to bed earlier and waking up earlier.
- Non-pharmacological treatments for primary and secondary insomnia are feasible and effective.
- Newer short-acting non-benzodiazepine hypnotics, such as zolpidem and zopiclone produce less withdrawal and tolerance effects than benzodiazepines.

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