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Sleep Disorders in the Elderly

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Abstract Sleep disorders are not a part of a normal aging process. Sleep is a vital physiological process with important restorative functions that are essential for health, wellbeing, optimal daytime functioning, and longevity. Quite often, sleep-related complaints are neither reported by the patients nor investigated by the primary care provider. Sleep disorders are common in the elderly population due to coexisting medical conditions including cardiopulmonary, neuropsychiatric, and psychosocial issues. This situation is further accentuated by a wide variety of medications and habitual use of alcohol, nicotine, and caffeine use. Clinical consequences often include hyper somnolence, impaired intellect, disturbed cognition, increased risk of cardiopulmonary complications, and risk of falls. Inadequate sleep can compromise quality of life and cause significant social and economic burden for the caregiver. Diagnosis of sleep disorders in the elderly requires a high index of suspicion by a skilled and experienced physician. A multifaceted and comprehensive approach is required for successful management of this complex conglomerate of conditions.

Keywords Geriatrics · Elderly · Sleep disorders · Insomnia · Aging

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Introduction

Physiological Changes in Sleep Pattern with Age

Sleep physiology is a complex biological phenomenon as described in Fig. 1. After decades of extensive research, we still do not have a complete understanding of sleep disorders. Human sleep cycle progresses through several stages in a predictable pattern. It is composed of two states. Rapid eye movement (REM) and non-REM sleep (NREM). NREM is again divided into four stages on a depth of sleep continuum. The first segment is composed of light sleep (stage 1 and 2) and second segment includes deep sleep (stage 3 and 4). Together stage 3 and 4 are referred to as delta sleep or slow wave sleep (SWS). SWS constitutes the most restorative part of the sleep.

The complete sleep cycle is approximately 90–120 min long and occurs 4–5 times a night, beginning with stage 1 of NREM and progressing through REM sleep. REM are initially shorter, approximately 10 min in first sleep cycle and then becomes progressively longer [1].

With aging, the predictable changes in sleep architecture includes less time spent in deep sleep (reduction in stage 3 and 4) and increased time in light sleep (stage 2) [2].

With aging, the proportion of the REM remains unchanged but latency to REM decreases (more time on bed awake after retiring) and overall amount of REM sleep may decrease due to reduction of nocturnal sleep time. This suggests that the elderly are more somnolent than younger adults [2, 3]. Both the frequency and duration of the day time naps increase, although the increase in duration is small relative to increase in napping frequency. This excessive day time napping eventually leads to reversal of sleep wake cycle [4], more day time sleeping and less nighttime sleeping.

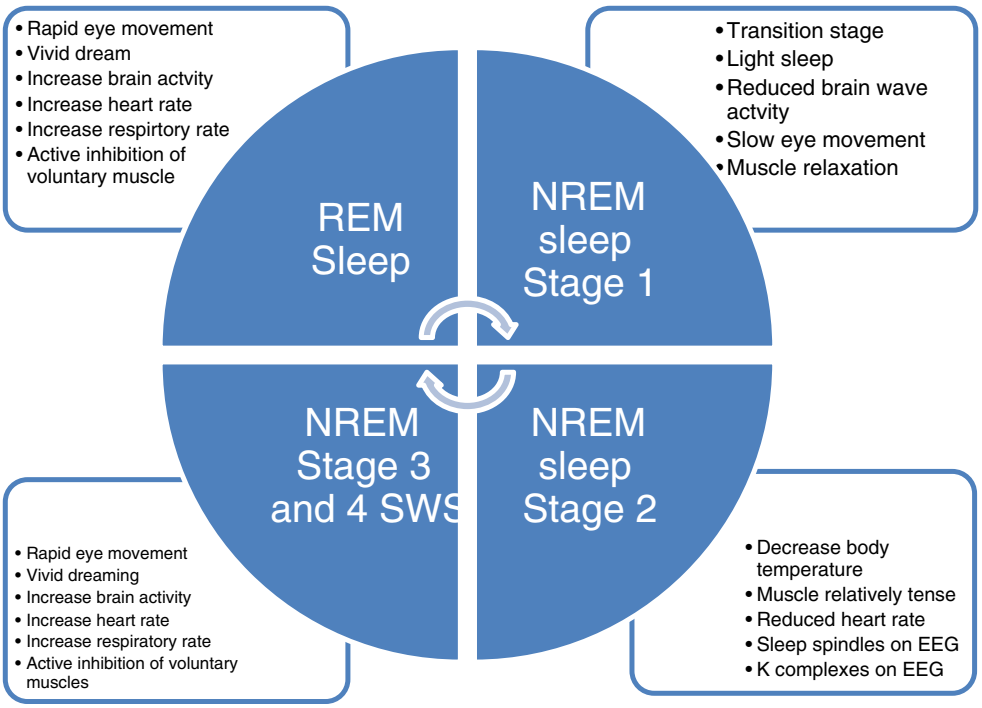


Fig. 1 Physiology of human sleep cycle

The physiologic effects of sleep on our body include, reduction in BP, and pulse rate during NREM and REM, episodic cardiac arrhythmia during REM, regular respiration during NREM and irregular breathing during REM, thermoregulatory response to heat or cold decreases during NREM, and absent during REM. Nocturnal secretion of endogenous melatonin gradually decreases with age. Optical changes in the eye (senile miosis, increased crystalline lens opacity) decreases light reaching the retina and affect circadian rhythm.

Natural physiologic changes in circadian rhythm influence many older individual to go to bed early and to wake up early [5]. Melatonin, which is associated with sleep efficiency, is reduced in normal aging and can lead to deterioration of circadian rhythm [6, 7].

These factors can contribute to sleep fragmentation, reduced sleep efficiency, and deterioration of quality of the sleep [3, 5].

Insomnia

Difficulty with initiation, maintenance, duration, or quality of sleep that results in the impairment of daytime functioning despite adequate opportunity and circumstances for sleep. It can lead to fatigue, mood disturbance, interpersonal and job problems, and reduced quality of life (DSM IV).

The third edition of international classification of sleep disorders (ICSD-3) lists seven major categories of sleep disorders, one of them is insomnia. Insomnia is subcategorized in three forms.

Short Term Was previously named as acute insomnia, stress related insomnia or transient insomnia and usually last less than 3 months. Symptoms may be temporally related to an identified stressor. Short term insomnia is expected to resolve when the stressor resolve or when the individual adapt to the stressor.

Chronic Insomnia Now represent historical terms including primary insomnia, secondary insomnia and comorbid insomnia. Hear the symptoms occur at least three nights per week for 3 months or more and are not related to inadequate opportunity for sleep or another sleep disorders. Unlike ICSD-2 [8], the ICSD-3 [9•] classification system no longer contains a sub-classification for chronic insomnia, i.e., psychophysiological insomnia, idiopathic insomnia, inadequate sleep hygiene, and paradoxical insomnia.

Other Insomnias Condition not meeting the criteria for acute or chronic insomnia.

Prevalence of Insomnia

Prevalence of sleep disturbance increases with age. Prevalence of sleep disturbance in geriatric population is 50 % or greater depending upon which study is being referenced [10, 11]. Late-life insomnia is often persistent and may prompt self-medication with over the counter sleep aids or alcohol [12]. Age and gender are the most clearly identified demographic risk factors, with an increased prevalence in women and older adults [13].

While the cause of this increased risk in the elderly is not well defined, it may be due to the partial decline in functionality of sleep control systems that may contribute to insomnia in older population. Importantly, the presence of comorbid medical conditions is also a significant contributor to the increased prevalence of insomnia in the elderly. Additionally, in women, insomnia is more prevalent with both the onset of menses and menopause [14].

In general the presence of primary sleep insomnia without any preexisting medical or psychiatric condition is uncommon. Most cases of insomnia in geriatric patient group are multifactorial and underlying etiology has to be addressed.

Sleep-Related Breathing Disorders

OSA, central sleep apnea and apnea of mixed origin are among the most common causes of insomnia among geriatric patient age group. Geriatric patients presenting with insomnia should be screened for sleep-related breathing disorders based on history and physical exam. Those patients who endorse daytime somnolence, apneic episodes while sleeping and snoring should lower the threshold for further investigations. Neck size greater than 16 in in females while 17 in in males with or without high Mallampati score is suspicious for OSA. With appropriate clinical history, further investigation in form of polysomnography is warranted in patient group without any comorbidities but high suspicion. Apnea-Hypopnea Index (AHI) is used in the diagnosis of sleep apnea. This scoring system basically measures apneic episodes (defined as cessation of breathing for 10 seconds or more) associated with blood oxygen desaturation. Greater than five episodes per hour are diagnostic for sleep apnea diagnosis. The main stay of therapy thereafter is on positive airway pressure (PAP) therapy. Constant airway pressure (C-pap) is used for majority of patients. Weight loss, surgeries for deviated nasal septum and jaw repositioning devices are some of the other measures employed in treatment of sleep apnea treatment.

Restless Leg Syndrome (RLS)/Periodic Limb Movement Disorder (PMLD)

These two entities are closely related but PMLD requires sleep study for establishing a diagnosis while RLS can be diagnosed solely on history.

RLS presents as an uncontrollable desire to move the lower extremities, which commonly get worse during resting and ease with movement. These sensations increase in the later part of the day and are bothersome for the patient especially at nighttime when they are trying to fall asleep. This condition is commonly associated with iron deficiency; thus, screening for iron deficiency is a common practice in this patient population.

PLMD is defined by a series of four or more limb movements which last between 0.5 to 5 s with an interval between these movements of 4 to 90 s. This condition is considered pathological if there are more than 15 such events per hour.

In patients with RLS with ferritin stores 45 mg below the treatment includes replete iron stores. The treatment for RLS and PMLD is otherwise similar and not surprisingly these two conditions are usually present together. The first-line therapy includes dopaminergic agents with ropinirole being the agent which has been approved by FDA for this purpose. Opioids and benzodiazepines are other available alternatives but they have to be used judiciously in our geriatric population because of respiratory depression being the serious side effect.

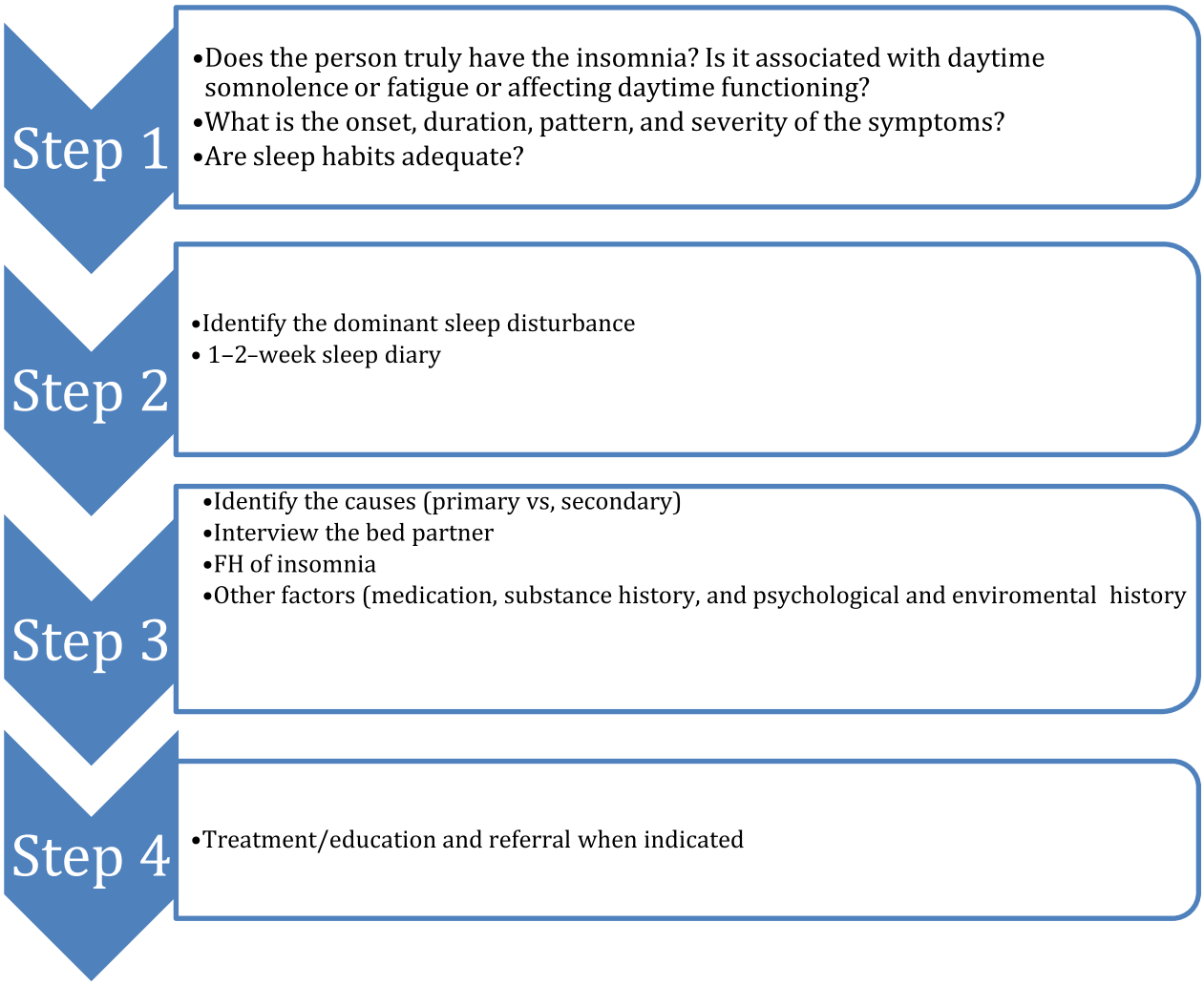
Evaluation of Sleep Disorders in the Geriatric Population

A thorough evaluation of patient's symptoms and habits is necessary to discern if the patient has insomnia or some other sleep or non-sleep disorder. Table 1 delineates a methodical approach to this workup and management.

The following are the questions that one should ask patients to glean information required to follow the algorithm outlined in Table 1.

Do you have difficulties falling asleep or staying sleep?
Do you feel sleepy, tired or fatigued during the day?
What is your sleep schedule during the weekdays and on weekends?
How many hours do you sleep during the night?
How long does it take you to fall asleep after deciding to go to sleep?
How many times do you wake up during a typical night?
Do you feel refreshed when you wake up in the morning?
Has anyone told you that you snore or stop breathing in your sleep?
Do you have restlessness or crawling or aching sensations in your legs when trying to fall asleep?
Do you repeatedly kick your legs during sleep?
Do you act out your dreams?
Do you have pain in the joints or abdomen and back (to exclude painful arthropathy or peptic ulcer or lumbar spondylosis, etc.)?
Do you get up many times during sleep due to acid regurgitation (gastroesophageal reflux disease)?
Do you have nocturia, night sweats (and other menopausal symptoms)?
Pertinent safety related questions like propensity to fall asleep in situation like driving or propensity to fall during conversation are important [15].

Table 1 A methodical approach to the work-up and management of sleep disorders in elderly



Practical Approach to the Diagnosis and Management of Insomnia in the Elderly

Diagnostic Paradigm

Past and present sleep history
Personal history
Medication history
Environmental history
Psychological history
Clinical evaluation
Sleep laboratory evaluation

The first step in the assessment of sleep disorder in the elderly requires establishing that person truly has insomnia [4]. This can be approached with a detailed history of specific sleep complaints.

Clinician may consider supplementing history by having patient keep a 1–2-week sleep diary documenting bed time, sleep time, and wake time. When possible interviewing with a bed partner is advisable with focus on sleep habits, day time functioning, snoring apnea like spells, morning headache, confusion or leg movement. However, many older adults do not have bed partners which makes the evaluation challenging.

Another objective indictor involves the use of an actigraph, a device worn on the wrist to record body movement [16].

Personal History

A comprehensive evaluation of the medications and its indications includes dose and timing of the medication is a must with particular attention to psychotropic, OTC, herbal, vitamins. Special attention to antidepressant, antipsychotics, and anxiolytics.

This include history of substance use such as alcohol intake in the evening, caffeinated beverages in a day, going to bed hungry, smoking before bed time are important as they induce

insomnia. It is not uncommon to see the use of alcohol as a sleep aid. Alcohol is metabolized slowly in the elderly population and can have a sedating effect by initially decreasing sleep latency but producing sleep arousal, sleep fragmentation, REM deprivation, and REM rebound [17]. Caffeine, not only comes in the form of coffee, tea, soda, or chocolate drinks but energy drinks, headache aid can be missed and notoriously causes increased sleep latency, reduced sleep efficiency, and spontaneous arousal. Caffeine withdrawal causes depression, irritability, and hyper somnolence. Nicotine induces insomnia and sleep fragmentation.

Environmental History

Inquiry should be made about disruption in the sleeping environment at bed time, e.g., noise around the bed room, bright light, uncomfortable mattress, bed partner snoring and also about shift work or jet leg which may all cause insomnia.

Psychological History

The clinician should delve into the intimate aspect of the patient's psychology—whether there has been bereavement in the family, any relationship problems, examination stress or work worries.

Clinical Examination

Thorough clinical examination to exclude evidence of heart failure, chronic obstructive pulmonary disease (COPD), bronchial asthma, active arthropathy, peptic ulcer, Parkinson's disease, and dementia (including Alzheimer's disease) is of prime importance as they constitute secondary causes of insomnia [18]. The physician should try to find positive evidence of depression like anhedonia, gloom, weepiness, and suicidal ideations and of psychoses like hallucinations, delusions, withdrawal, ideas of reference, lack of insight, behavioral abnormalities including violent acts, etc.[18].

Management

Non-Pharmacological and Pharmacological Interventions

Non-pharmacological treatment includes the following:

1. Sleep Hygiene
2. Cognitive behavior therapy

Management of insomnia regardless of symptomatology should begin with a focus on the treatment of the primary disease. Using sleep hygiene as an intervention while targeting the source of problem can be implemented first in any situation and should be continued even when a medication is required [19].

- Stimulus control therapy: these are a set of instructions designed to re-associate the bed/bedroom with sleep and to reestablish a consistent sleep/wake schedule. These instructions usually include, go to bed only when sleepy, get out of bed when unable to sleep, use the bed/bedroom for sleep only (e.g., no reading, watching TV), rise at the same time every morning and no napping during the day.
- Sleep restriction therapy: a method to control time in bed to the actual sleep time, thereby creating mild sleep deprivation, which results in more consolidated and more efficient sleep.
- Relaxation training: clinical procedures aimed at reducing somatic tension (e.g., progressive muscle relaxation, autogenic training) or intrinsic thoughts (e.g., imagery training, medication) interfering with sleep.
- Cognitive therapy: method aimed at changing faulty beliefs and attitudes about sleep, insomnia and the next day consequences. This includes brief counseling and education on how anxiety participates in the vicious circle that exacerbates and maintains the condition. This also includes establishing realistic and reasonable expectation by the patient [11].
- Other cognitive strategies are used to control intrusive thoughts at bedtime and prevent excessive monitoring of the daytime consequences of insomnia
- Sleep hygiene education: general guidelines about health practices (e.g., diet, exercise and substance use) and environmental factors (e.g., light, noise, and temperature) that may interfere with or promote sleep. Some of the pertinent recommendations include the following [20]:

  - Minimize the use of caffeinated beverages during day time and strictly avoiding caffeinated beverages, alcohol and smoking at bed time.
  - If medically able, increase the activity level in the afternoon or early evening (not close to bedtime) by walking or exercising outdoors.
  - Increase exposure to natural light and bright light during day and early evening.
  - Avoid napping particularly after 2 p.m. and limit naps to one nap of less than 30 min.
  - Avoid the intake of stimulating and diuretic medication in the evening.
  - Go to bed only when sleepy.
  - Maintain a comfortable temperature in bedroom.
  - Ensuring quiet ambience in the bedroom and a comfortable bed and mattress
  - Avoiding large volumes of fluid or heavy and sugary/fatty meals near bedtime.
  - Minimize light and noise exposure as much as possible.
  - Switching off the TV and electronics and room lights, etc.
  - Eat a light snack if hungry.

If sleep hygiene therapy does not help, the patient may be referred to a clinical psychologist for cognitive behavior therapy [18].

Other Therapies

Stress Reduction Techniques

Stress reduction techniques like breathing exercises (yogic pranayama), massage therapy or warm baths before bedtime may aid sleep.

Acupuncture

Acupuncture hypothetically increases level of central nervous system endorphins and this helps insomnia patients. No RCTs are available.

Herbal Remedies

Herbal remedies (e.g., valerian, chamomile, hop pillows) are not standardized and are not necessarily safe. These remedies are not safer than hypnotics. Efficacy of these remedies is not proven [15].

Dark Therapy

Dark therapy [21•] is an experimental treatment, which involves eliminating all light in the subject's environment for a period of 6–16 hours/day in combination with a regular sleep schedule. It manipulates circadian rhythms action on hormones and neurotransmitters. It is hypothesized that the benefits of being in the dark are due to melatonin production by the pineal gland, which occurs when the eyes are deprived of light.

Pharmacotherapy of Sleep Disorders

The choice of pharmacotherapy is a tricky one since it involves choosing the medication at lowest effective dose, having least amount of potential for dependence or tolerance, good safety profile and least probability for causing rebound insomnia at discontinuation. Medications with shorter half-life have the advantage of decreased daytime somnolence. Before initiating therapy with medications, non-pharmacological therapy should ideally be employed.

The broad pharmacological category includes antidepressants, benzodiazepines, non-benzodiazepines, and melatonin agonist and non-prescription medications. The aim of pharmacologically is to ideally improve sleep quality with shortest possible duration of treatment.

Trazodone a non-tricyclic antidepressant is used for insomnia on very frequent basis. Its hypnotic properties are evident at very lower doses as compared to the antidepressant role. It is very effective in depressed patients suffering from insomnia but no major trials have been done on non-depressed insomniac. Studies have shown this drug may be of benefit in patients suffering insomnia secondary to psychiatric illness and monoamine oxidase inhibitor induced insomnia.

Benzodiazepines are commonly used in clinical practice for treating insomnia but their safety profile is of particular importance in geriatric patient population. Due to various factors, the concentration of unbound drug and elimination half-life are increased in geriatric patients which increases the incidence of side effects. The frequently occurring side effects due to Benzodiazepines include drug tolerance, cognitive impairment with or without psychomotor involvement, daytime sedation, increase risk of falls/fracture, postural instability and respiratory depression. Triazolam, flurazepam, estazolam, and temazepam are few of the benzodiazepines with shorter half-lives thus have a better side effect profile. They are usually administered at nighttime to avoid daytime somnolence.

Zolpidem and eszopiclone are non-benzodiazepines with (Food and Drug Administration (FDA) approval which are used more frequently than benzodiazepines in the geriatric patient population because of its better side effect profile. As compared to benzodiazepines this group of medications has shorter half-life, sedating effect and tolerance. Unfortunately, it is also associated with respiratory depression with recommendations of not to use this drug in patients with respiratory depression, sleep-related breathing disorders and severe hepatic impairment.

Ramelteon is another FDA-approved, highly selective melatonin receptor agonist for the treatment of chronic primary insomnia. It has not been associated drug tolerance or dependence.

Barbiturates have fallen out of favor due to their poor safety profile, particularly respiratory depression. Antihistamines are not recommended for the treatment of insomnia due to their side effects such as cognitive impairment and other anticholinergic side effects. Many patients start using alcohol to treat their insomnia. In short term it might decrease the duration to fall asleep but the side effects of respiratory depression, drug interactions, sleep fragmentation and addiction makes its use undesirable.

There are many herbal supplements available in market for treatment of insomnia. Their safety profiles and efficacies have not been established.

Melatonin is not commonly recommended. The use of this medication is supported in patients suffering from delayed sleep-wake phase syndrome and patients with low melatonin levels. The lack of quality control in different preparations of this drug and insufficient evidence to support its widespread use has led to the limited prescription of this drug.

Quality of Life and Financial impact

There are multiple direct and indirect costs associated with insomnia which society as whole has to bear. Insomnia has a

negative impact on health-related quality of life (HRQoL) but more studies need to take place for better utilization of this index specifically for our geriatric patient population. Poor quality of sleep can negatively impact memory, cognitive ability and psychomotor performance. In 1995, a study done showed that nursing care homes spent $10.9 billion in costs related to insomnia in the geriatric population [10]. In 1996, it was estimated that direct and indirect costs related to insomnia in general population would be between $30 to $35 billion each year.

Conclusion

Chronic insomnia is associated with a wide range of health problems including but not limited to mental disorders, discomfort, anxiety, and substance abuse. Chronic insomnia is associated with older age. Many factors that impair sleep in older adults can be diagnosed and treated. True sleep disorders are rare in healthy older adults. Elderly with poor sleep often have contributing comorbidities. Screening for sleep disorders as a new vital sign is suggested as sleep/sleepiness is emerging as an important aspect of health promotion and disease prevention. Relaxation and cognitive/behavioral therapy are effective in the management of chronic insomnia in subsets of the chronic insomnia population.

Compliance with Ethical Standards

Conflict of Interest Sorathia Lubna and Uzair Ghori declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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