

# Insomnia and cognitive behavioural therapy—how to assess your patient and why it should be a standard part of care

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**Abstract:** Hippocrates recognized the importance of asking about sleep as long ago as 400 BC when he wrote “*sleep and watchfulness, both of them when immoderate, constitute disease*”. Disrupted sleep for any reason has immediate and long term consequences on physical and mental health. Insomnia disorder (“immoderate watchfulness”) remains the commonest sleep disorder in primary and secondary care with an estimated 5–10% of the adult population affected. While it is commonly comorbid with other physical and mental health problems, the new diagnostic classification has been helpfully simplified such that it is considered a disorder in itself. If it is the patient’s main concern, it warrants treatment. Patients and health professionals have often had limited teaching about effective strategies for insomnia which leaves many untreated and insomnia can be unfairly perceived as a challenging symptom to manage. The first line treatment is now well established as insomnia-specific cognitive behavioural therapy (CBTi) in the most recent US and European treatment guidelines. Over 25 years of high quality research have shown evidence for sustained improvements in sleep in those with insomnia alone or insomnia comorbid with other conditions. This is a simple CBT to deliver with better and safer outcomes than prescription hypnotics. Therefore, this review will cover the initial assessment of insomnia, including insomnia mimics, the selection of patients for treatment and the key components of CBT therapy. Finally, the review will cover evidence for different modes of delivery (online, self, help, group or individual face to face) in a variety of clinical settings.

**Keywords:** Insomnia; cognitive behavioural therapy (CBT); hypnotics

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## Introduction

Normal sleep relies upon two distinct but overlapping neuronal circuits. The homeostat drives an increasing pressure to sleep after every hour awake and the circadian rhythm drives alertness in the day and sleep at night with light intensity as the strongest external timekeeper (1). Both total sleep time and the circadian rhythm change over the course of our lives and tend to fragment and weaken over time (2). Teenagers and young adults need 8–9 hours of sleep on average with a delay in sleep phase such that many fall asleep after rather than before midnight (3). There is phase advance (i.e., falling asleep earlier) with every decade that passes with adults falling asleep by 30 minutes earlier a decade on average from the third decade onwards. There

is increasing sleep fragmentation and increased time to fall asleep in otherwise healthy older adults with and without sleep complaints (4).

In modern life, we manipulate our light levels to disrupt and confuse our circadian rhythm. First the industrial revolution and then, more recently, the digital revolution have led to shift work and sleep restriction as a widespread phenomenon across society. At least 30% of US adults sleep less than 6 hours a night on a regular basis (5). This may be at least part of the reason that insomnia and other sleep disorders remain under diagnosed and undertreated (6). In addition there may be a tendency to attribute insomnia in those with mental or physical health problems to an existing diagnosis, rather than consider insomnia as a distinct and

**Table 1** Diagnostic criteria for chronic insomnia according to DSM5

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The patient reports one or more of the following

(I) Difficulty initiating sleep

(II) Difficulty maintaining sleep characterized by frequent awakenings or problems returning to sleep after awakenings

(III) Early morning awakening with difficulty returning to sleep

The sleep disturbance causes clinically significant distress or impairment in social, occupational, educational, academic, behavioural, or other important areas of functioning

It occurs at least 3 nights a week

It is present for at least 3 months

It occurs despite adequate opportunity for sleep

It is not explained by and does not occur exclusively in the course of another sleep-wake disorder

It is not attributable to the physiological effects of illicit substances or medications

Coexisting mental disorders and medical conditions do not adequately explain the predominant complaint of insomnia

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treatable disorder.

### What is insomnia disorder and why does it develop?

Simply put, insomnia is difficulty falling asleep and difficulty staying asleep with impact on daily function which is not due to a disruptive sleeping environment or another sleep disorder.

Insomnia disorder remains the commonest sleep disorder in primary care with multiple cohort studies estimating at least 5–10% of the population affected (7-9). The diagnostic criteria have been simplified and insomnia disorder is now a diagnostic entity in its own right in the most recent ICSD3 and DSM5 classifications (10,11). The current criteria emphasize impact on a variety of daytime functions, difficulty for at least 3 or more nights a week and for more than 3 months (*Table 1* for DSM5 diagnostic criteria).

Increasing age is a risk factor due in part to the natural tendency for a more fragmented night and decreasing melatonin output. It is more common in women and it is commonly comorbid with other mental and physical health problems (12). At least 40% will have anxiety disorder. (Insomnia disorder is now called comorbid insomnia if it is associated with another physical or mental health problem). Persistent insomnia remains the single biggest risk factor for depression (13).

Acute stressors are a common cause of acute insomnia, for example an argument at work or a systemic illness. This

usually resolves when the stressor is removed (14). However for chronic insomnia to develop, there usually have to be perpetuating factors. One of the most widely accepted models for chronic insomnia is based on the Spielman three 'P's model (15) with predisposing factors (certain personality traits), a precipitating trigger (the acute stressor) but then perpetuating or maladaptive behaviours that worsen sleep and disrupt both the normal homeostatic and circadian drivers to sleep. The typical example is people who nap during the day and disrupt the natural drive to night sleep.

A hypervigilant phenotype is typical with a "racing mind" that finds it hard to switch off. "As soon as I climb the stairs, the lights go on in my head" are typical statements heard in clinic. An increased effort around sleep is often part of the description. Espie and others have emphasized the increased attention to sleep and effort to control sleep that paradoxically increases rather than decreases alertness in the bedroom (16). Hyperarousal develops such that those with insomnia have a fragmented nocturnal electroencephalogram (EEG) with microarousals, increased heart rate and blood pressure relative to normal sleepers (17). Increased worry and rumination around sleep often maintain the problem (16). All of this is a combination of factors that leads to "immoderate watchfulness".

### How to diagnose insomnia and common mimics

For many the diagnosis can be made with a careful history alone (a suggested sleep history with necessary screening

**Table 2** A suggested sleep history screening proforma—key questions

Questions	Answers
Do you snore heavily? Has anyone witnessed prolonged pauses in breathing (apnoeas)	For typical obstructive sleep apnoea the snoring is very loud, often heard outside the bedroom door, sometimes by neighbours, the pauses are typically 20–30 seconds rather than brief <5–10 seconds, with a snort or a start at the end of apnoea
Do you have unpleasant tingling or discomfort in the legs, which makes you need to kick or to move? Is it worse in the evenings, is it helped by moving? (restless in the body rather than a racing mind)	Everybody needs to be asked specifically about restless legs; people can find it hard to describe the dysaesthesia “wriggly, itchy, worms under the skin”. Bed partners can be asked about the infuriatingly regular kicks that may wake them but not the patient—every 20–30 seconds is typical
What drugs do you take and when do you take them? Including the dose and timing of caffeine/alcohol and nicotine. Consider over the counter medication that might affect sleep	So short acting painkillers, sedative opiates, adrenergic drugs that exacerbate insomnia such as inhalers or some nasal sprays, counting the cups of coffee or tea is important not just time of last cup
“Take me through your typical 24 hours”—describing the sleep/wake pattern over a day	Particularly helpful for those with sleep restriction, circadian rhythm disorder and insomnia
Do you nap during the day—if so when and for how long	You can get through the day without sleeping and examples of when they might sleep can help to distinguish fatigue from true hypersomnia, few of us would sleep in the middle of a conversation or with food in our mouths
Do you have any history of nightmares, acting out of dreams, sleepwalking out of the bedroom? If so, what time of night do things tend to happen	Typically the first cycle of REM sleep starts 90 minutes into the night so REM parasomnias are more likely in the second half of the night. NREM parasomnias can occur within the first hour of sleep

REM, rapid eye movement; NREM, non-rapid eye movement.

questions is listed in *Table 2*) alongside patient completed sleep diaries over at least 1 week. For many the most helpful question is to ask the patient to talk through a typical 24 hours; the description of being fatigued but awake during the day with frustrated long gaps awake at night is characteristic. It is usually distinct to those with, for example, sleep apnoea, which may have a fragmented night but usually can't maintain daytime wakefulness and gaps awake at night are much briefer.

A systemic examination is required (but rarely helpful—cases of nocturnal paroxysmal atrial fibrillation or hyperthyroidism that has been missed or presents with insomnia alone are uncommon). Review of the prescription list for all medications that can be stimulant is important (for example evening inhalers, adrenergic nasal sprays) and an assessment of mood is also needed given the common comorbidity of affective disorder. If daytime symptoms of depression or anxiety dominate then this needs to be addressed.

Patients complain about the impact of poor sleep upon work and driving but there is often a mismatch between perceived performance and more objective assessments of for example car crashes or failure at work. This is different

to the sleep apnoea history where driving and daytime function is usually affected (18). The prior and current use of sleeping tablets including over the counter preparations needs to be documented as these can be contributing to some of the daytime fatigue.

There are a number of insomnia mimics and patients may have more than one sleep disorder so further investigations may be needed. Polysomnography is not required for the diagnosis unless another sleep disorder is suspected and actigraphy is rarely used outside of research. If done, polysomnography typically shows a fragmented night with reduced sleep efficiency, a prolonged sleep latency and short rapid eye movement (REM) latency (17). There is often an element of sleep misperception with patients estimating less time asleep in the lab than is objectively measured. However, explaining this rarely helps the patient's perception of a poor night.

Common insomnia mimics (particularly in those without a bed partner) include restless legs syndrome (RLS) and periodic limb movement disorder, obstructive sleep apnoea (OSA) where patients may perceive night awakenings, a circadian rhythm disorder and in particular delayed sleep phase syndrome in younger patients where

the key problem is difficulty initiating but not usually maintaining sleep. There are a small number of truly short sleepers who awake refreshed after just 5 hours but feel this is not enough compared to societal norms but for insomnia disorder there has to be associated daytime functional impairment.

Those with daytime sleepiness should prompt screening for secondary causes of insomnia.

At least 10% of those seen in our regional sleep service have RLS (19) as the cause for a fragmented night. A highly specific question to screen is “when you try to relax in the evening or sleep at night, do you ever have unpleasant, restless feelings in your legs that can be relieved by walking or movement?” (20). RLS can be episodic but should be treated if symptomatic before insomnia-specific cognitive behavioural therapy (CBTi) regimes are started.

Twenty percent of those with OSA perceive a restless and unrefreshing night although the other clues of snoring, dry throat and daytime sleepiness should prompt further investigations. Gastro-oesophageal reflux can be surprisingly toxic to sleep as another secondary cause. It can be hard to distinguish insomnia alone from insomnia with comorbid OSA in those over 65 (21) who can often have atypical presentations with lower body mass index (BMI). Therefore, there should be a lower threshold for screening for OSA in older patients with a respiratory sleep study with any daytime sleepiness or snore as it will affect treatment. The clue is often falling asleep easily but waking in the second half of the night.

The other common mimic in younger patients is the circadian rhythm disorder of delayed sleep phase syndrome where patients can't initiate sleep but then stay asleep well. Sleep diaries and an accurate history can usually distinguish the two. Delayed sleep phase syndrome is more often a persistent problem from late childhood, in particular males (22,23), For many the key question is “if you were allowed to sleep when you wanted, would you sleep well?”

Shift work can produce shift work sleep disorder. At least 20% of the western world carry out shift work and, for at least 20%, this significantly disrupts sleep. Shift work decreases total sleep time and disrupts circadian rhythm with substantial evidence for increased mortality, morbidity and metabolic dysregulation compared to non-shift workers (24). Groups at increased risk include; women, those over 40 and those working rotating or back to back night to day shifts (25). However, CBTi is not appropriate for those who remain on a variable schedule due to the very nature of the therapy which focuses upon a fixed pattern of

bed and wake time.

### *The sleep diary—necessary for diagnosis and therapy*

The cornerstone of both diagnosis and subsequent therapy is sleep diaries where a typical pattern of far more time in bed than asleep is usually seen.

One of the most simple and cost effective diagnostic tests available to all wherever they work is asking the patient to keep a sleep diary for at least 1 week, ideally 2. This may be the only diagnostic test needed for insomnia disorder; it can also distinguish between insomnia and circadian rhythm disorder such as delayed sleep phase syndrome. There are a number available as online or paper records but as a minimum this needs to include; lights out, time in bed and estimated time asleep, any daytime napping and ideally lifestyle factors such as caffeine intake, alcohol, meals and exercise. There is debate about the length of time needed for diagnosis but the recent ICSD3 highlights that certain circadian rhythm disorders will be missed with a single week of diaries (10). For all of us, weekends are different to weekdays even in those who are not employed or work shifts.

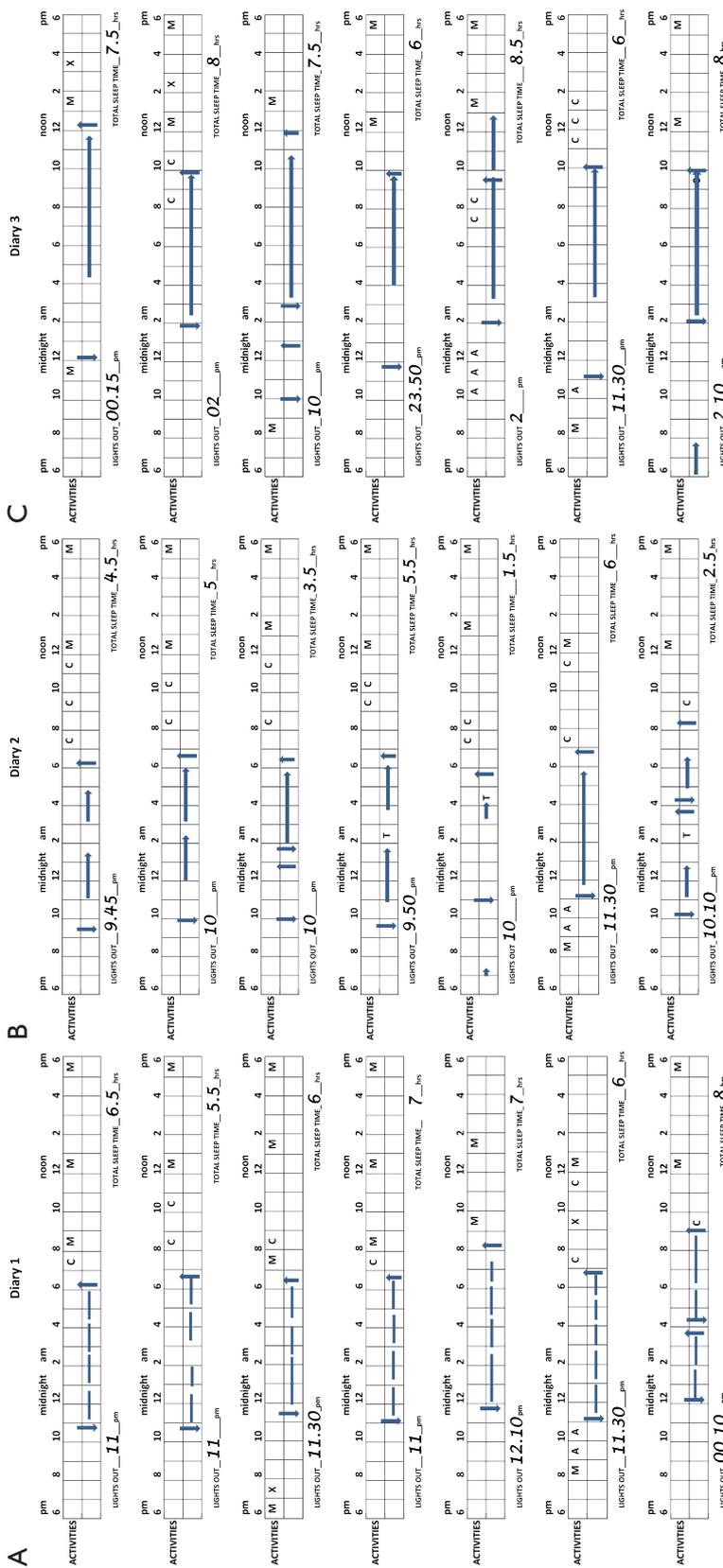
Some diaries ask patients to rate satisfaction with sleep on a nightly basis but the author does not do this—generally if they were satisfied with sleep they wouldn't be attending a sleep clinic or completing a diary!

One key instruction is to complete the diary once a day and not in the middle of the night. Increasing numbers of patients wear and look at data from commercial accelerometers including fitbits, jawbones and smart phones. However these devices overestimate movement as wake (26) so should not be used as a substitute for the diary. They can in themselves exacerbate insomnia. If patients awake refreshed and do not perceive a problem falling asleep then they should largely avoid looking at movement based data. Some typical diaries are shown from normal and abnormal sleepers (*Figure 1*).

The sleep efficiency (total sleep time/time in bed) over 7 or 14 days can then be calculated. Normal sleep is typically >85% sleep efficiency, those with severe insomnia often have sleep efficiency <50%. Most patients will not describe daytime naps and there is often a waxing waning pattern with occasional nights of more normal sleep. Documented daytime naps should be infrequent or non-existent.

### *Additional screening questionnaires—which scales to use?*

The Epworth Sleepiness Scale (ESS) is familiar to many in



**Figure 1** Sleep diaries. The patient should be instructed to complete the diary once a day, typically in the morning and think about their best estimate of the night. Lights out, lights on and night time awakenings should be noted. Any daytime naps should be noted and their estimates of total sleep time in hours. Daytime activities such as meals (M), exercise (X), caffeinated drinks (C) and each alcoholic drink (A) can be noted. Ideally the diary should be completed for 2 weeks. Three separate patient diaries are shown in the same format completed over one week. (A) Diary 1: a normal (albeit slightly introspective) 45-year-old male with occasional brief awakenings and rapid returns to sleep. Taking up to 30 minutes to fall asleep is normal and increased sleep time at weekends and non-work days are within current societal norms. Treatment was a clear explanation about normal sleep and advising him to avoid using his phone to record his sleep; (B) diary 2: insomnia disorder in a 53-year-old female where time in bed is far longer than time perceived asleep, both difficulty initiating and maintaining sleep is seen without day time naps. The variability among nights is seen with occasional good nights of prolonged sleep; (C) diary 3: delayed sleep phase syndrome in a 23-year-old male who had this sleep pattern since the age of 15. Despite getting into bed early, the pattern is of falling asleep typically between 02:30 and 04:00 but waking well after 9 a.m. with few night awakenings. The estimated total sleep time is far greater than the patient with insomnia.

sleep clinics to assess daytime sleepiness (27). The typical insomnia patient should have a low normal score of 0–2. Advantages include speed and simplicity for the patient despite poorly correlating to more objective measures of sleep in the laboratory (28), we expect most of our patients to have low scores, and those scoring >10 should prompt screening for a secondary cause of insomnia.

The Insomnia Severity Index (ISI) is more often used within insomnia clinics and research studies and is validated to assess both severity and improvement after therapy with scores ranging from 0–24 (29) (>14 for moderate to severe insomnia). It is quick and easy to complete but will not distinguish between primary or secondary causes of insomnia.

### **CBTi as treatment of insomnia**

The latest guidelines from the European Sleep Research Society and the American Academy of Sleep Medicine have all performed systematic reviews of relevant meta-analyses and concluded that CBTi should be the first line therapy offered to patients (30,31).

CBTi consists of a specific set of techniques that strengthen the bed-sleep connection, realign the homeostatic mechanisms and the circadian rhythm and decrease anxiety and rumination about sleep.

Typically therapy includes a combination of: psychoeducation about sleep and sleep hygiene, sleep restriction therapy, stimulus control therapy and cognitive therapy to decrease rumination about sleep as well as relaxation training. It is typically delivered over an average of six weekly sessions with most of the published manuals describing a need for 4–8 hours of therapy alongside weekly sleep diaries. The diaries are kept throughout therapy and help patient and treating therapist to see improvement and to personalize the behavioural components of bed and wake times.

The techniques are outlined in brief below.

#### ***Sleep hygiene/psychoeducation about sleep***

Psychoeducation includes ‘sleep hygiene’. This is an explanation of the role of caffeine, alcohol and nicotine as sleep fragmenting lifestyle behaviours. The role of light and exercise in maintaining daytime alertness and the role of dark in the bedroom and the need for quiet is reviewed. Clock watching as an unhelpful bedtime behavior is explained but what tends to be key, is describing the normal

sleep/wake cycle and age related changes. Many patients are genuinely surprised to understand that nobody “sleeps through” the night and the fact that waking during the night is normal. In the authors’ experience, the explanation of the role of light (outside daily whatever else is being done) and the effect of exercise to improve daytime alertness and night time sleep quality is often key. Exercise was not expanded upon in detail in the original CBTi regimes but more recent research has highlighted positive impacts on sleep (32). Being prescriptive about 30 minutes of moderate to high intensity exercise seems simple and effective adjuvant therapy that warrants further research but has a wealth of basic science and public health research to support its inclusion.

#### ***Relaxation techniques***

This largely focuses upon the techniques of progressive muscle relaxation (a well-established method to decrease somatic tension by clenching and then releasing muscles in an orderly sequence moving down from top to toe over minutes) and simple imagery techniques to decrease a racing mind. In principle something a little more complex than counting sheep such as subtraction sums, detailed visual imagery or a version of simple alphabet games. Patients practice in the day and then use the techniques if it is difficult to fall asleep or if they wake.

#### ***Behavioural strategies***

These techniques are undoubtedly difficult but considered highly effective including as stand-alone therapy (15,33). Using the sleep diary—patients restrict time in bed to achieve high sleep efficiency, therefore if someone records an average sleep time of 4.75 hours, then they have 5 hours in the bed room. The simple but fixed rules include:

- (I) fixing wake time to the same time 7 days a week;
- (II) get out of bed if unable to sleep (the quarter hour rule—i.e., no long periods awake and frustrated);
- (III) no daytime napping;
- (IV) bedroom only for sleeping/sex;
- (V) only getting into bed when very sleepy.

Driving safety needs to be considered and discussed and it is not recommended to sleep restrict for long periods, without support or review, in those with prior mania or for more than 2–3 weeks before gradually allowing increased time in bed again.

### *Cognitive therapy*

These are psychological strategies to decrease any rumination prior to bed to change catastrophic thinking and beliefs about sleep and to reduce excessive worry and monitoring about sleep itself.

### **How to deliver CBTi therapy**

Initial randomized controlled trial (RCT) studies provided evidence for benefit in individual or small group face to face therapy treating patients with insomnia disorder alone without comorbidities. Most studies concluded that somewhere between 4–8 sessions was effective averaging 6 hours of therapist time. The meta-analyses of these studies confirmed a large effect size both on completion of therapy but also stability of sleep over long term follow up [for review of RCTs to date 30].

Possibly of more relevance to general medicine is understanding that one can treat comorbid insomnia effectively with CBTi. A wide variety of co-morbid conditions were assessed with a recent large meta-analysis (34) and showed continued large effect sizes for the insomnia with modest benefits on the co-morbid conditions including chronic pain and depression.

In practice, this translates into 70–80% of patients within RCTs reporting a meaningful improvement in sleep efficiency and decreased insomnia severity at completion of therapy. Follow up studies suggest that 40–60% of people maintain these benefits over long term follow up.

There is more limited evidence for briefer versions of the therapy for example using just two face to face sessions (35) and two telephone calls or a single session and self-help material (36). There are now also several published self-help manuals available (37).

A number of computerized versions of CBTi have been developed in the US and UK such SHUTi, Sleepio and Sleepstation. The most recent meta-analyses of computerised CBTi show similar benefit to face to face CBTi (38). There were smaller effect sizes in an earlier meta-analysis published in 2012 (39). This may simply reflect increasingly sophisticated use of internet technology with the ability to incorporate more personalized and interactive systems. Possibly unsurprisingly—internet CBTi that incorporates a personalized feedback element had higher success rates (39). The health economic effects for internet based CBT have been explored given far lower costs and convenience for the patient (40). This is

an increasingly standard method of delivery across health care systems and seems likely to increase in the coming years. Challenges will be ensuring safe screening for other sleep disorders and ensuring patient choice for those who need a higher intensity therapy. CBTi may be particularly appropriate as a computerized therapy given that the key measurement of sleep efficiency within sleep diaries can be easily digitalized.

### *The role of drugs—should patients have CBTi and medication?*

At present, the hypnotics licensed for use are approved for short term therapy but in practice often used long term or issued on multiple occasions as for many insomnia is a chronic problem. In reality, hypnotic prescribing remains common in the UK and elsewhere because of a lack of knowledge of CBTi as an available therapy and because many patients essentially present in crisis or with acute distress, despite a chronic problem. Despite an initial fall in the high rates of long term prescriptions for hypnotics in the 1980s and 90s, prescribing patterns have been relatively stable over the last 10 years based on UK government prescribing data (9). Reviews of the effects of benzodiazepine and the Z drugs show very modest effects on sleep and a high rate of adverse events, particularly in the elderly (41). However there is some evidence that a combination of hypnotic and CBTi has greater benefit than CBTi alone when treatments were studied in combination (42,43) but during maintenance, discontinuation gave the best outcome in these studies where 68% of patients were in remission at 6 months. While many physicians perceive intermittent hypnotic use to allow fewer side effects and longer term benefit, there is really no RCT data to support this view at present.

Sedating antidepressants have very weak evidence for benefit and tolerance develops quickly, as it does for antihistamines which are not recommended in any of the current guidelines for chronic insomnia (31).

### **Conclusions**

- (I) Insomnia disorder is common, is a risk factor for subsequent depression and warrants treatment. There are many mimics and a careful history and sleep diaries are needed for diagnosis.
- (II) CBT for insomnia is an effective and well established therapy. This is now the recommended first line

therapy so future challenges include increasing awareness about CBTi and increasing access for patients.

- (III) With a sleep diary—a combination of behavioural measures, relaxation strategies, education about sleep and cognitive techniques significantly improve sleep and can be delivered either face to face in small groups, by a range of different health care professionals, online or with self-help. Delivery is effective with primary or secondary care settings.
- (IV) CBTi outperforms hypnotic medication and has fewer side effects but there is some evidence that if medication is used, then using it at the start of a CBTi programme and then weaning produces the best long term benefits to sleep.

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### Footnote

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