Chapter 8
Insomnia

"Each night, when I go to sleep, I die. And the next morning, when I wake up, I am reborn."

Mahatma Gandhi

CHAPTER ASSETS

OVERVIEW

Today's society is fast-moving and thousands of people travel daily, often across time zones. Regularity and sleep patterns are constantly disturbed as new sounds and unfamiliar surroundings compound the sense of timelessness caused by continuous movement. Sleep has become a commodity to be bought and sold. Approximately 30% of the general population has insomnia (Jahangir et al 2008). It is estimated that 40% of all insomnia patients have a coexisting psychiatric condition (Ancoli-Israel 2006). Insomnia and depression share a common pathologic process. This makes people susceptible to both conditions—specifically, abnormal regulation of corticotropin-releasing factor (CRF). Arroll et al (2012) found 50% insomnia participants (n = 388) had depression. Insomnia impairs cognitive and physical functioning and insomniacs are more prone to accidents. Insomnia affects job performance and results in time off work. Insomnia affects quality of life. Women are 1.4 times more likely to have insomnia than men with elderly females the most at risk (Jahangir et al 2008).

Patients in the hospital are separated from everything that enables them to feel relaxed. They are in a strange bed, with strange smells, strange noises, and a strange routine. Unsurprisingly, many patients feel apprehensive and are unable to sleep. Even frequently hospitalized patients find sleep difficult (Boonstra et al 2011;

Haynes et al 2011; Isaia et al 2011). Good sleep hygiene, for example, going to bed when sleepy and not napping during the day, can alleviate symptoms in 30% of insomniacs (Falloon et al 2011) and, in some studies, is as effective as sleeping pills. However, good sleep hygiene may be difficult in a hospital environment. Cognitive behavioral therapy (CBT) has been successful for insomnia (Morgenthaler et al 2006). However, CBT is not available in hospitals; therefore, night sedation may be the only choice for hospital patients.

Sleep

Sleep is defined by Brooker (2008) as a "naturally altered state of consciousness occurring in humans in a 24 hour biological rhythm." Sleep occurs in two forms: rapid eye movement (REM), when dreaming occurs, and non-rapid eye movement (NREM). Both types are important. REM sleep occurs three to four times each night and lasts from 5 minutes to over 1 hour (Hsieh et al., 2012). During this time, the brain waves are fast, low voltage and both heart rate and respiration are irregular. During NREM, brain waves are slow, high voltage and both heart rate and blood pressure are low and regular. Humans have a 24-hour circadian rhythm that is controlled by a central circadian pacemaker located in the suprachiasmatic nucleus (SCN) of the hypothalamus (Dijk et al 2012). Twelve percent of insomniacs have delayed sleep circadian rhythm disorder (Falloon et al 2011). Hospitalized patients sometimes require high-dose opioids. This produces a complete lack of REM sleep (Gay 2010). Patients who require mechanical ventilation also lack a normal circadian rhythm. Sleep is controlled by melatonin—a signaling hormone secreted by the pineal gland. Melatonin is also synthesized in various other organs and tissues in the body (Hardeland 2012).

Insomnia

Insomnia is either primary, with no underlying cause, or secondary, with an underlying condition (Falloon et al 2011). According to the American Sleep Disorders Association (2005), insomnia is repeated difficulty in falling asleep, staying asleep, or poor quality of sleep for at least 1 month. Roth (2007) states this difficulty is "present despite adequate opportunity and circumstance to sleep. The impairment in sleep is associated with daytime impairment or distress. Sleep difficulty occurs at least 3 times per week and has been a problem for at least 1 month." All the above types of insomnia may occur in hospital patients, where strange noises and smells permeate dreams or prevent sleep from occurring.

Night Sedation

Several websites, including The Mayo Clinic, suggest there are two types of night sedation: sedatives (anxiolytics) and sedative/hypnotics. Thorpy and Roth (2013) suggest dividing sedative/hypnotics that induce and/or maintain sleep into the following categories (Tables 8-1 and 8-2).

1. Benzodiazepine receptor agonists (BZDs). These can be short, medium, or long acting and are for short-term use—up to 1 month. Examples are estazolam (ProSom), flurazepam (Dalmane), quazepam (Dormalin), temazepam (Restoril),

TABLE 8-1 *Some Short-Acting Drugs That Initiate Sleep*

Name	Type	Precautions	Side Effects
Zopiclone (Lunesta)	Z	Drug/alcohol abuse Depression Respiratory problems	Heavy meals may slow absorption Sudden withdrawal may lead to unpleasant symptoms
Ramelteon (Rozerem)	M	Pregnancy, breast-feeding Liver, kidney, or respiratory disease Depression or sleep apnea	May interact with alcohol Heavy meals may slow absorption
Triazolam (Halcion)	B	Pregnancy, breast-feeding Depression, respiratory conditions History of drug abuse	Interacts with grapefruit juice, alcohol, and some medications Drug must be halted gradually Seldom prescribed because of habit-forming property
Zaleplon (Sonata)	Z	Pregnancy, breast-feeding Liver, kidney, or respiratory disease Depression	May interact with other medications Heavy meals may slow absorption Fast and short acting Can be habit-forming
Zolpidem (Ambien, Edluar)	Z	Liver, kidney, or respiratory disease Depression	May become less effective over time Sleep effects such as sleep-driving and sleep-eating may occur

Information has been gleaned from individual drug websites and The Mayo Clinic website (2012).
B = Benzodiazepine; *M* = melatonin receptor agonist; *Z* = nonbenzodiazepine (Z medicine).

triazolam (Halcion), diazepam (Valium), lorazepam (Ativan), and nitrazepam (Mogadon).

2. Nonbenzodiazepines (Z medicines). Examples are zolpidem, zaleplon, and zopiclone. These act via γ-aminobutyric acid (GABA)ergic neurotransmission. It is important to have at least 7 hours sleep after taking Z medicines (NHS Choices 2013).
3. Histamine-1 receptor antagonists. Examples are doxepin and diphenhydramine.
4. Melatonin receptor agonists. Ramelteon (Rozerem) is approved for sleep-onset insomnia in the United States and Japan, but not yet in Europe (Takeda 2011). Circadin is the brand name for melatonin in the UK (NHS Choices 2013). Melatonin plus light box therapy can also be useful for circadian rhythm sleep disorder (Murakami et al 2012). Melatonin is available online as a food supplement.
5. Circadian regulators. These drugs reset the circadian clock in the SCN of the hypothalamus. Agomelatine (Valdoxan, Melitor, Thymanax) is a melatonergic antidepressant that appears to also have positive effects on insomnia (O'Neill et al 2013).

TABLE 8-2 *Some Drugs That Prolong Sleep*

Name	Type	Precautions	Pointers
Estazolam (ProSom)	B	Pregnancy, breast-feeding Elderly patient	May interact with many medications Can be habit-forming Falls in the elderly
Eszopiclone (Lunesta)	Z	Depression, lung disease Alcohol abuse Metabolic disorders	Heavy meals may slow absorption Sudden withdrawal may lead to unpleasant symptoms
Temazepam (Restoril)	B	Pregnancy, breast-feeding Kidney or liver problems Depression, substance abuse Lung disease	May interact with many medications May react with alcohol Can be habit-forming
Zolpidem (Ambien CR)	Z	Pregnancy, breast-feeding Kidney or liver problems Depression	Extended-release formula

Information has been gleaned from research (Jacob et al., 2012; Majdan et al., 2012), individual drug websites and The Mayo Clinic website (2012).
B = Benzodiazepine; *Z* = nonbenzodiazepine (Z medicine).

AROMATHERAPY FOR INSOMNIA

Background

Nearly 30 years ago, the headline "Lavender Beats Benzodiazepines" (Tisserand 1988) introduced the idea that aromatherapy could be useful for insomnia. Tisserand outlined the use of essential oils of lavender, marjoram, geranium, mandarin, and cardamom as sleep aids in a hospital. Aromatherapy can be beneficial to relax patients, thus enabling them to sleep or to restore a normal sleep pattern.

Helen Passant, possibly the most holistic nurse after Florence Nightingale, introduced aromatherapy into the Churchill Hospital in Oxford, England, in the 1980s, when she was in charge of a ward for the elderly. Remarkably, Passant reduced her original drug bill by one third by gradually replacing analgesia and night sedation with essential oils. She found her patients seemed to "get off to sleep just as easily, if not better, with oils of lavender or marjoram, either vaporized or applied by massage" (Tisserand 1988). Around the same time, another hospital in Oxford, The Radcliffe Infirmary, introduced aromatherapy into the Beeson Ward. Patients were given the option of aromatherapy instead of night sedation or analgesics. Nearly all of the patients chose aromatherapy (Tisserand 1988).

In a survey of six countries (Canada, Germany, Japan, Mexico, UK, and the United States), 84% of UK residents could recall "the distinct smell of how their bedroom smelled" (National Sleep Foundation 2013, http://www.sleepfoundation.org). More than 50% of residents of all other countries in the survey (except Japan) could

also remember. According to this study, 50% of residents of five countries (except Germany) liked the smell of lavender or jasmine in their bedroom. Seventy percent of residents of five countries (except Japan) said the smell of antiseptic detracted them from sleep. This is not surprising because aromas have an affect even when we are sleeping (Arzi et al 2010). If we can make a hospital bed smell more like the patient's bed at home, there is increased chance they will be able to sleep.

Published Aromatherapy Studies

The following selection has been chosen to give a broad overview of some of the aromatherapy studies that have been published on insomnia. It is not intended to be a systematic review. New additions to this third edition include studies from 2000 onwards. I have selected studies from as many countries as possible, using a range of databases (Pubmed, Science Direct, Royal College of Nursing, Quintessential.co.uk, and Herbalgram), and I have chosen essential oils that are readily available and safe to use on hospital patients. It is difficult to conceal aroma, and lavender is well recognized and associated with relaxation. However, the studies outlined below will hopefully give some credence to a nurse or physician's wish to try aromatherapy for their patient's insomnia.

Lavender

Background

True lavender *(Lavandula angustifolia)* has a long history of use in aromatherapy to promote sleep and relaxation and to relieve anxiety. In Bulgaria, Atanassova-Shopova et al (1973) found that linalol and terpineol were the active components of lavender and they had a depressing effect on the central nervous system (CNS). Oral doses of linalool were found to be hypnotic and anticonvulsant in mice in a study by Elisabetsky et al (1995a). Elisabetsky et al (1995b) also established that linalol inhibited glutamate binding in rat cortex in a way similar to phenobarbital. The glutamate binding involved all receptor subtypes investigated. A Japanese study (Yamada et al 1994) concurred that inhaled lavender had anticonvulsant effects in mice. Linalool, one of the main components of lavender, was found to induce sleep in mice in a later study by de Moura Lincke et al (2009).

In France, Guillemain et al (1989) agreed that oral doses of lavender (diluted 1:60 in olive oil) had marked sedative effects on mice and enhanced barbiturate sleep time. In Germany, Buchbauer et al (1991) in Germany discovered that lavender had a sedative effect when inhaled by mice. Interestingly, the more agitated the animal was (as a result of injecting caffeine), the stronger the sedative effect of the lavender. Jager et al (1992a) established that lavender diluted in peanut oil was absorbed through the skin.

Henry et al (1994) carried out a 7-week study on human subjects at Newholme Hospital in Bakewell, England. Lavender was diffused at night in a ward of patients with dementia. Diffused lavender had a statistically significant sedative effect. Hudson (1996) also found lavender was effective for elderly patients in a long-term unit. Eight of the nine patients in the study had improved sleep at night and

improved alertness during the day. Lavender straw (the byproduct of distillation) was itself found to reduce the stress of pigs in transit in a study by Bradshaw et al (1998).

Recent Studies

Recent published studies include an American one by Goel et al (2005) who found that inhaled lavender increased the percentage of deep or slow-wave sleep (SWS) in 31 men and women in a sleep laboratory. Goel describes aromatherapy as an "anecdotal method for modifying sleep and mood." At the end of the study, Goel concludes "lavender serves as a mild sedative and has practical applications as a novel, nonphotic method for promoting deep sleep in young men and women and for producing gender-dependent sleep effects." His study showed a difference between the effect of lavender on sleep patterns in men and women. A 12-week controlled trial in Taiwan monitored the effect of lavender on heart rate variation (HRV) in 67 women with insomnia (Chien et al 2012). Outcomes measured included the Chinese version of the Pittsburgh Sleep Quality Index (PSQI). The experimental group received lavender inhalation twice a week for 12 weeks. The control group received a health education program on sleep. Women receiving aromatherapy experienced a significant improvement in sleep quality after intervention ($P = 0.001$). A Korean study (Lee & Lee 2006) explored the effects of inhaled lavender on 42 women college students with insomnia. The 4-week protocol comprised 1 week baseline, 1 week lavender, 1 week washout, and 1 week lavender. The length of time taken to fall asleep plus quality of sleep and satisfaction of sleep all improved by 60% ($P = 0.0001$).

A British study in 2005 led by Lewith, a physician, explored the effects of lavender using a diffuser. The 4-week protocol was similar to the Korean study with a baseline, lavender week, washout week, and second lavender week. Ten volunteers with insomnia rated PSQI as well as other questionnaires rating treatment credibility and attitudes to complementary alternative medicine (CAM). The lavender group had a 2.5 point reduction in the PSQI scale ($P = 0.07$). Women and younger volunteers improved the most.

An Iranian study (Moeini et al 2010) explored the use of lavender for insomnia in patients with ischemic heart disease in a hospital coronary care unit (CCU). Sixty-four patients took part in the controlled study that lasted three nights. Each time, aromatherapy was diffused for 9 hours. The sleep quality of the lavender group was better than that of the control group ($P = 0.001$).

Expectancy may play a role in aromatherapy and a double-blind, placebo-controlled trial study by Howard & Hughes (2008) concluded "previous associations of lavender aroma with assisted relaxation may have been influenced by expectancy biases." Because of this, a Moroccan team led by Alnamer (2012) explored the sedative and hypnotic effects of methanolic and aqueous extracts of lavender on mice (who could not be accused of being biased by expectancy) using diazepam as the control. They found that "extracts of *Lavandula officinalis* have potent sedative and hypnotic activities." However, a systematic review of all complementary therapies

TABLE 8-3 *Published Studies on Insomnia and Essential Oils*

Author	Year	Number	Essential Oil	Method	Result
Lewith et al	2005	10	Lavender	Inhaled	+ve
Goel et al	2005	31	Lavender	Inhaled	+ve
Lee & Lee	2006	42	Lavender	Inhaled	+ve
Fewell et al	2007	36	Sweet orange	Topical	−ve
Howard & Hughes	2008	96	Lavender	Inhaled	−ve
Komori et al	2006	29	Mixture*	Inhaled	+ve
Jahangir et al	2008	36	Rose	Oral	+ve
Hongratanaworakit	2009	40	Rose	Topical	+ve
Arzi et al	2010	36	Lavender, vetivert	Inhaled	Affected respiration during sleep
Moeini et al	2010	64	Lavender	Inhaled	+ve
Chien et al	2012	67	Lavender	Inhaled	+ve
Alnamer	2012	Mice	Lavender	Inhaled	+ve
Johannessen	2013	24	Lavender	Inhaled	+ve

*A mixture of sandalwood (35%), juniper berry (12%), rose (8%), and orris (6%).

used in insomnia concluded that aromatherapy was poorly represented (Sarris & Byrne 2011). Table 8-3 shows that there are surprisingly few studies on aromatherapy and insomnia and most involve lavender. This is disappointing because aromatherapy is a very simple complementary therapy to try.

Despite this lack of evidence, essential oils are being used for insomnia. A recent Norwegian survey of 12 nurses working in four different establishments found that lavender *(Lavandula augustifolia)* essential oil had been diffused nightly and this had reduced insomnia in all four residential homes for dementia patients (Johannessen 2013). In the UK, a 28-month audit of aromatherapy at the Royal Marsden Hospital, London showed that aromasticks (containing either lavender plus petitgrain or lavender plus mandarin) were offered to cancer patients with insomnia (Dyer et al 2013).

RJ Buckle students have conducted 21 pilot studies on insomnia (Table 8-4). Seven of these studies used lavender. The patient populations included children, adults, night nurses, and children with autism. Methodology was varied and used topical application, inhalers, and diffusers. Blyth (2011) explored the effect of aromatherapy on the sleep patterns of children with autism. Parents applied 2% *Lavandula angustifolia* cream to the forearms of their children just before bedtime (n =10). The parents documented the hours of sleep and the waking episodes for a 3-week period. The first week was baseline, followed by the lavender week, then washout. The length of time the children slept did not change. However, 8 of the 10 children had a dramatic reduction in the number of times they awoke and needed

TABLE 8-4 *Studies Carried out by RJ Buckle Students*

Name	Year	State	N	Adults/Children	Essential Oil
Davis	1997	NM	11	Adults	Lavender
Weihbrecht	1999	PA	9	Adults	Lavender
Knuteson	2000	IN	8	Children	Mandarin
Hull	2000	WA	12	Adults	Ravensara
King	2001	IN	10	Adults	Sweet marjoram and Roman chamomile
Cashman	2002	PA	10	Adults	Clary sage and sweet marjoram
Tisdale	2002	PA	10	Night nurses	Ravensara
Knowles	2002	WA	20	Adults	Lavender
Dupos	2002	PA	12	Adults	Lavender and Roman chamomile
Vought	2003	MN	10	Adults	Lavender and sweet marjoram
Tomanino	2005	MN	9	Adults	Lavender and sweet marjoram
Schauer	2006	MN	10	Children	Lavender
Esch	2006	WI	10	Adults	Lavender
Hebert	2006	MN	10	Adults	Sweet marjoram and Roman chamomile
Luedtke	2006	MN	10	Night nurses	Roman chamomile
Anderson	2007	CT	10	Adults	Sweet marjoram
Dolcimascola	2007	PA	10	Night nurses	Lavender
Nickman	2007	NE	10	Adults	Ravensara
Fandrich	2007	WI	9	Children	Mandarin
Blyth	2011	WI	10	Autistic children	Lavender
Goodwin	2011	MA	13	Adults	Lavender and clary sage

attention during the lavender week. As every mother will tell you, that is important! The effect could be attributed to the rubbing, the gentle evaporation of lavender that was inhaled by the child while he/she was asleep, or the combination of the two.

Neroli

Jager et al (1992b) found that neroli (*Citrus aurantium var. amara* [flos]) had a sedative effect on mice. In this study, the sedative effects were observed during the first 30 minutes of exposure to the aroma. More recent studies have focused on gerbils inhaling neroli (Chen et al 2008). In this study, neroli showed a measurable anxiolytic effect with Xanax as the control. Xanax is a benzodiazepine that is sometimes

used to treat insomnia. Neroli is often suggested for anxiety. However, as one of the most expensive essential oils, this could be why there is so little published research.

Passionflower and Lime Blossom

Buchbauer et al (1992) found that essential oils of passionflower *(Passiflora incarnata)* and lime blossom *(Tilia cordata)* had sedative effects. Lime blossom and its major component, benzyl alcohol, decreased the motility of animals in both normal and induced-agitation states. Interestingly, passionflower and its main components, maltol and 2-phenylethanol, only reduced motility when the animals were in an agitated state. A recent review of herbal preparations used for anxiety, depression, and insomnia in humans (Sarris et al 2011) found that although human studies indicated that passionflower had a measurable anxiolytic effect, more studies were required. Passionflower appears to work by modulating the GABA system (Appel et al 2011). In these studies, passionflower was taken internally.

Black Cumin

Khanna et al (1993) found that black cumin *(Nigella sativa)* essential oil had a sedative effect more powerful than the drug chlorpromazine (Largactil) and was also an analgesic. The study suggested that black cumin contained an opioid-like component. More recent studies on animals have concentrated on anxiolytic effects (Gilhotra & Dhingra 2011) and anticonvulsant effects (Hosseinzadeh & Parvardeh 2004) in mice. It would be interesting to study inhaled black cumin on human insomnia. Because black cumin has a strong, pungent aroma, it would probably need to be "softened" with another calming aroma such as lavender, clary sage, or Roman chamomile.

Roman Chamomile

Surprisingly, there are few published studies on Roman chamomile (*Chamaemelum nobile*) for insomnia; those that are in the literature focus on chamomile extract. It is well known that chamomile tea has a sedative effect (Gould et al 1973). RJ Buckle students have conducted five pilot studies on insomnia using Roman chamomile on its own or in a mixture. However, the studies have been inconclusive, either because the participants did not keep to the research protocol or because the effects, although positive, were very small. Roman chamomile may be a useful essential oil to add to a mixture for insomnia, but I am not convinced that it is effective enough on its own. It certainly has a more pleasing aroma than German chamomile *(Matricaria recutita)*.

Ravensara

This is an interesting choice and not one that would immediately come to mind. Nevertheless, three RJ Buckle students carried out studies on insomnia using ravensara. Nickman (2007) explored the effects of inhaled *Ravensara aromatica* for three nights (n = 10). Participants inhaled three drops of ravensara on a cotton ball and

then placed the cotton ball by their pillow. Each night they replaced the old cotton ball with a new cotton ball with three drops of ravensara. In the aromatherapy group, three participants slept better, one experienced reduced snoring, and one noticed some sinus clearing. In the control group, two participants said the placebo had no effect, two participants had congested sinuses and did not sleep, but one participant said they had the best sleep ever! Ravensara would not be my first choice for insomnia. However, it would be an excellent addition to a mixture if the person had a cold or sinus problems.

Rose

Most people enjoy the smell of roses. Rose is perhaps the most recognized and popular aroma in the world. Despite essential oil of rose being expensive, the cost may be justified where chronic insomnia is concerned. Both Macht and Ting (1921) and Rovesti and Columbo (1973) demonstrated that rose *(Rosa damascena)* essential oil has sedative effects. The sedative effects were replicated in a later study by Hongratanaworakit (2009). This study found that rose oil caused "significant decreases of breathing rate and systolic blood pressure that indicate a decrease of autonomic arousal." Jahangir et al (2008) compared the effect of steam-distilled rose petals (Ruh gulaab), rose distillate, or diluted rose distillate when given orally (three times daily) to 36 people with insomnia. The distilled rose petals had the greatest effect on insomnia with 66.6% (eight people) claiming total relief from insomnia. An added bonus was that rose had a positive effect on constipation.

In my experience, as well as that of my students and patients, rose is a strong contender to use for anxiety and for insomnia. Rose is in my own personal sleep potion when I travel and it certainly works for me.

Mixtures

Komori et al (2006) explored the effect of a mixture of inhaled essential oils on 29 primary insomniacs with benzodiazepine dependency. The mixture was sandalwood (35%), juniper berry (12%), rose (8%), and orris (6%). Twenty-six participants were able to reduce their drug dose and 12 participants were able to come off the sleeping pill completely. Seong et al (2013) used a mixture of ylang ylang *(Cananga odorata)*, sweet marjoram *(Origanum majoranum)*, lavender *(Lavandula angustifolia)*, and neroli (*Citrus aurantium* var *amara* [flos]) in this randomized, controlled 2-week study. Participants were newly enlisted soldiers (undergoing training before placement) who were diagnosed with essential hypertension. Soldiers in the experimental group used aroma stones at night and wore aroma necklaces during the day. Results showed a significant reduction in blood pressure and pulse. It would be interesting to repeat this study and look at levels of insomnia.

It would be simple to design an insomnia study using personal patches or personal packets (please see the chapter on application methods) for patients in hospital. These modern methods of application would give constant delivery, or ready availability to the patient and not affect other people in the room (unlike a

diffuser). It would be useful if such studies could include a baseline week, an intervention week, and a washout week. The oils I suggest could include some of the following: lavender, ylang ylang, mandarin, neroli, rose, clary sage, Roman chamomile, and sweet marjoram. The mixture I use when I can't sleep contains rose, lavender, mandarin, and frankincense.

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