Promoting healthy sleep

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Abstract
Nurses are accustomed to helping others with their sleep problems and dealing with issues such as pain that may delay or interrupt sleep. However, they may be less familiar with what constitutes a healthy night’s sleep. This article examines what is known about the process and purpose of sleep, and examines the ways in which factors that promote wakefulness and sleep combine to help establish a normal circadian rhythm. Theories relating to the function of sleep are discussed and research is considered that suggests that sleep deficit may lead to metabolic risks, including heart disease, obesity, type 2 diabetes mellitus and several types of cancer.

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Keywords
circadian rhythm, health promotion, sleep, sleep deficit, sleep hygiene

Introduction
The importance of sleep is generally acknowledged. However, there has been relatively little guidance for healthcare professionals on what constitutes a healthy night’s sleep and how different factors might influence that. Nurses have focused instead on the problems of loss or lack of sleep, especially insomnia, and on dealing with illness or injuries that might compromise sleep. In August 2015, UK news media emphasised a forthcoming Public Health England campaign to improve sleep as part of a healthy lifestyle for middle-aged and older adults (The Telegraph 2015). Links have been made between inadequate sleep and significant risks to health, including heart disease, diabetes and obesity (The Independent 2015).

Adults typically require between seven and nine hours of good quality sleep every 24 hours and yet many achieve less than this.
Defining sleep

Sleep may be defined in terms of stages and types of neurological activity. However, it is important to recognise that sleep is also

(Sleep Health Foundation 2015). In society today, five or six hours sleep per night might be all that is managed (Luckhaupt et al 2010). As shift workers, nurses are prone to disrupted sleep and resultant sleep deficits. If they are parents, they may encounter additional challenges associated with the sleep patterns of their children (Meltzer and Mindell 2007). Older people experience changes in their sleep patterns associated with ageing, whereby sustaining sleep becomes more difficult (Mander et al 2013).

Sleep is defined as a state of reduced consciousness, progressing through four stages: N1, N2, N3 (slow-wave sleep) – collectively known as non-rapid eye movement (NREM) sleep – and rapid eye movement (REM) sleep (Table 1) (Lockley and Foster 2012). The time an individual spends in the different stages of sleep depends on the time of day or night at which sleep is initiated (the sleep gate), any residual sleep deficit and the length of time available for sleep. There are typically four or five cycles of the four stages of sleep in a seven or eight-hour sleep period (Lewis 2013). Sleep is restorative to physiological functioning and mental health, and is regulated by two factors.

Sleep is prompted by increasing tiredness (sleep drive, a homeostatic mechanism associated with the build-up of chemicals in the body) and by circadian rhythms that are influenced by natural or artificial light levels (Mistlberger 2015).

Nurses should be able to summarise the basic mechanisms which induce and sustain sleep to enable them to review sleep requirements and challenges. Scientific information about the functions and mechanisms of sleep is incomplete. However, there are sufficient data available to enable nurses to examine factors that might result in better sleep: sleep hygiene.

An easy to use and printable sleep diary can be accessed from the Sleep Council website at www.sleepcouncil.org.uk/wp-content/uploads/2015/09/Sleep-Council-2015-Sleep-Diary.pdf. An excerpt from a sleep diary is provided in Table 2.

Complete time out activities 1 and 2

### TABLE 1

<table>
<thead>
<tr>
<th>Stages of sleep</th>
<th>Percentage of time asleep (in a normal sleep pattern with no sleep deficit)</th>
<th>Important features and associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1 (NREM)</td>
<td>5</td>
<td>Drowsy sleep, when muscles may twitch. The individual is easily aroused and distracted from sleep if an inappropriate stimulus is present, for example bright lights, noise, music or close conversation.</td>
</tr>
<tr>
<td>N2 (NREM)</td>
<td>45</td>
<td>Muscle relaxation and awareness of the environment disappears. It is difficult to arouse the individual.</td>
</tr>
<tr>
<td>N3 (slow-wave sleep) (NREM)</td>
<td>25</td>
<td>Period associated with parasomnias such as night terrors, sleepwalking, talking in one’s sleep and bed wetting. This stage features strongly in the first half of the sleep period as the brain addresses the sleep drive requirements, and may be extended if there is a sustained sleep deficit.</td>
</tr>
<tr>
<td>REM</td>
<td>25</td>
<td>The electrical activity of the brain mimics activity during wakefulness. The muscles of the body are paralysed. Patients awakened during this stage recall vivid dreams, suggesting that dream work, used to reorder thoughts and experiences as memory, is particularly important. REM sleep is more common during the second half of the night, once sleep drive requirements have been addressed.</td>
</tr>
</tbody>
</table>

NREM = non-rapid eye movement; REM = rapid eye movement

(Adapted from Lockley and Foster 2012)

1 Summarise your attitude towards sleep. How do you think about sleep? What experiences have helped shape your attitude towards sleep? Do you think that people have always thought about sleep in the same way?

2 Keep a sleep diary (www.sleepcouncil.org.uk/wp-content/uploads/2015/09/Sleep-Council-2015-Sleep-Diary.pdf) for 14 nights. The purpose of this diary is to help you discover: whether you put into practice the attitudes towards sleep that you identified in time out activity 1, the volume and regularity of sleep you achieve each night and the thoughts and experiences that you link with sleep on each occasion. You should be able to identify what seemed to aid or limit sleep in some way. Identify how your attitudes influence your actions, for example, do you extend a waking day to achieve objectives that are important to you or protect sufficient sleep time to enable you to feel refreshed in the morning?
Excerpt from a nurse’s sleep diary

**Morning: Complete each morning**

<table>
<thead>
<tr>
<th>Day of week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to bed</td>
<td>Early shift.</td>
<td>11.30pm.</td>
<td>11.30pm.</td>
<td>11.30pm.</td>
<td>11.30pm.</td>
<td>11.30pm.</td>
<td>11.30pm.</td>
</tr>
<tr>
<td>Getting to sleep</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
<td>15 minutes.</td>
</tr>
<tr>
<td>Number of times you awakened during the night</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
<td>Once 5am (toilet).</td>
</tr>
<tr>
<td>Length of time awake during the night</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
<td>5 minutes.</td>
</tr>
<tr>
<td>Total sleep</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
<td>6 hours 15 minutes (alarm clock wake).</td>
</tr>
<tr>
<td>Sleep disturbance factors</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
<td>Often need to visit toilet between 5 and 6am.</td>
</tr>
<tr>
<td>Quality of sleep on a scale of increasing satisfaction from 1-5</td>
<td>It didn’t feel great, I was anxious in a dream but can’t recall details (3).</td>
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</tr>
<tr>
<td>How I feel this morning</td>
<td>A little under-resourced for a shift plus anticipating parents evening at the school with my son.</td>
<td>A little under-resourced for a shift plus anticipating parents evening at the school with my son.</td>
<td>A little under-resourced for a shift plus anticipating parents evening at the school with my son.</td>
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<td>A little under-resourced for a shift plus anticipating parents evening at the school with my son.</td>
</tr>
</tbody>
</table>

**Evening: complete at end of day**

<table>
<thead>
<tr>
<th>Day of week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caffeine drinks after 5pm</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
<td>Four coffees.</td>
</tr>
<tr>
<td>Alcohol units before 5pm</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>Alcohol units after 5pm</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
<td>One glass of wine.</td>
</tr>
<tr>
<td>Exercise before 9pm</td>
<td>Only work!</td>
<td>Only work!</td>
<td>Only work!</td>
<td>Only work!</td>
<td>Only work!</td>
<td>Only work!</td>
<td>Only work!</td>
</tr>
<tr>
<td>Exercise after 9pm</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>Medications taken today</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
<td>Two paracetamol for toothache.</td>
</tr>
<tr>
<td>Feelings during the day</td>
<td>Stressed, the shift was short staffed. Better evening at the school though, glowing reviews of my son’s learning.</td>
<td>Stressed, the shift was short staffed. Better evening at the school though, glowing reviews of my son’s learning.</td>
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<td>Stressed, the shift was short staffed. Better evening at the school though, glowing reviews of my son’s learning.</td>
</tr>
<tr>
<td>Bedtime routine</td>
<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
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<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
<td>This evening I checked my Facebook account last thing and got involved in a political discussion. I usually read for a few minutes.</td>
</tr>
<tr>
<td>Other notes</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
<td>Hmm… arguments on Facebook, they’re making my mind race.</td>
</tr>
</tbody>
</table>
socially defined. In modern times, sleep is often seen as unproductive (Martin 2003, Lewis 2013). Sometimes the inference is that sleep involves laziness, that it betokens a less-than-productive attitude on the part of the individual. A lack of sleep is often associated with tiredness and shortfalls in an ‘individual’ level of alertness. However, it is less clear what sleep does or why it exists.

Our work-life balance has shifted, as compared with a pre-industrial age, placing a premium on how time is spent, while innovations such as the electric light bulb have extended the length of the productive day. Before the industrial revolution, people typically slept for ten hours each night (Lockley and Foster 2012). If individuals were allowed to sleep naturally, without alarm clocks, today’s young people would sleep for 8.5 hours and older adults would sleep for 7.5 hours (Lockley and Foster 2012). Martin (2003) characterised modern society as one that is chronically sleep-deprived.

Three physiological theories have been identified regarding why humans sleep. The first theory is that sleep is crucial for restoration of cells. Cellular activity is influenced by circadian rhythms, a cycle of activity and inactivity that recurs regularly over a period of about 24 hours. During sleep, cellular repair and regeneration activity takes place. The maintenance of human gene strands is associated with sleep (Cedernaes et al 2015). Cellular reproduction is associated with the ability to replicate deoxyribonucleic acid (DNA) strands accurately and consistently, minimising the risk of abnormal cells being produced. Cellular function relies on a functioning nucleus and ribonucleic acid (RNA) instructions from the nucleus to the rest of the cell. Much of the repair and reproduction work of cells is associated with periods of sleep. Links have been made between sustained sleep deficit and reduced immunological capacity. Such impaired immunity facilitates tumour development (Noguti and Robeiro 2012). Individuals with a chronic sleep deficit – usually defined as consistently achieving less than six hours sleep per night – are believed to be at increased risk of developing some forms of cancer, notably breast cancer (Haus and Smolensky 2013).

The second theory is that sleep represents an energy conservation measure. This corresponds with colloquial ideas of sleep as rest (Lockley and Foster 2012). NREM sleep is associated particularly with energy replenishment, which mostly occurs during the first hours of a sleep period when tiredness (or sleep drive) is being addressed. This theory suggests that the body can only cycle so much energy production and that this must be recharged, in a similar way to a battery. However, in practice, energy conservation through sleep is relatively limited (Martin 2003). During REM sleep, the cerebral cortex is active, even if the muscles are paralysed (Martin 2003).

The third theory conceives sleep as facilitating memory and learning, processing experiences and thoughts in such a way that they can be used in future (Born and Wilhelm 2012, Lewis 2013). NREM sleep is associated with declarative learning (recalling facts about a situation), while REM sleep is associated with procedural learning (how something is done). REM sleep may have been one of the evolutionary tools that enabled humans to outcompete other species and to achieve a pre-eminent position today (Martin 2003).

This third theory is favoured because it is known that sleep deficit makes it difficult for people to reason in a coherent way (Killgore 2010). Dreaming, during which a range of personally relevant experiences are often bizarrely mixed together, may represent the brain processing memories to conceptualise the world afresh. This theory has implications for the timing of sleep. If NREM sleep – sleep that predominates in the first half of a sleep period – is displaced by going to sleep later, then REM sleep that is associated with learning of complex processes may be displaced further or lost altogether. The effect of loss or lack of REM sleep might be difficulty learning and coping with change (Born and Wilhelm 2012).

While individuals may sleep at different times, napping during the day for instance, the majority of sleep is achieved during the hours of darkness. Seasonal variations in hours of sleep occur in association with the reduced light availability in winter and with longer and lighter days during the summer. It is easier to sleep in darkness than when it is light. The period when it is relatively easy to fall asleep, the sleep gate, arises typically around 10pm. However, there are individual differences among people who influence this period using artificial light (Harvard Medical School (Division of Sleep Medicine) 2007).

Sleep progresses through a series of stages (Table 1). The length of time spent in each
Factors influencing sleep and wakefulness

It is important to consider factors that influence how sleep is regulated as part of a cycle of wakefulness in a circadian rhythm of around 24 hours.

Sleep drive

Sleep drive refers to an increasing level of tiredness and a growing propensity to sleep with every hour spent awake. Sleep drive starts low after the individual awakes after a normal period of sleep and increases incrementally during the course of waking hours. Sleep drive cannot be quantified. However, it is recognised as an increasing readiness to relax and then, if circumstances permit, to sleep (Harvard Medical School (Division of Sleep Medicine) 2007).

The mechanism by which sleep drive increases as wake time increases is not fully understood, but it has been linked to the increased production of adenosine, a by-product of cellular energy metabolism that increases incrementally while cells remain active (Jones 2009). Adenosine is linked to the drive for NREM sleep, alongside interleukin, tumour necrosis factors, growth hormone releasing hormone and prostaglandin D2.

Possible promoters of REM sleep drivers include prolactin, nitric oxide and vasoactive intestinal polypeptide (Lockley and Foster 2012). There is a correlation between levels of adenosine in the blood and people’s report of increasing sleepiness (Jones 2009). Adenosine progressively dampens neurotransmission in regions of the basal forebrain, which might account for feelings of tiredness and increased difficulty attending to reasoning demands as the day comes to an end. During a waking day, the effects of adenosine on neurones are partially limited by the use of stimulants, for example caffeine that is found in coffee, tea, energy drinks and other foodstuffs (Roehrs and Roth 2008, Owens et al 2014). Caffeine may be used to improve attention levels into the evening. However, even regular use of stimulants such as caffeine cannot indefinitely delay the onset of sleep.

Where an individual starts the day with a sleep deficit, the sleep drive typically accelerates during the waking day and becomes progressively stronger as waking hours pass. A series of sleep deficits, for instance associated with anxiety and periods of extended or intense work activity, can lead quickly to an overpowering sleep drive that of your future sleep?

As you complete your sleep diary, pay attention to the extent to which you recall that you dreamt and what you can remember of your dreams.

Did you notice any recurring themes that relate to your experiences during the day, or plans and anxieties regarding the future?

Does this signal what you might attend to as a priority to enhance the quality of your future sleep?
leaves the individual feeling exhausted and depressed. The individual may counter such experiences with stimulants. However, these accumulate in the body and may compromise the subsequent sleep gate, especially if they are taken in the later waking hours. This makes it difficult to fall asleep, even though the individual feels tired (Roehrs and Roth 2008). A negative cycle of poor sleep and difficulty waking may then ensue, with an increased risk of accidents and mistakes. Eanes (2015) noted increased errors in performance and judgement in medical residents with five or fewer hours of sleep per night.

**Wakefulness**

The second factor influencing sleep, the circadian rhythm, is related to light and the biological clock that encourages individuals to sleep during periods of darkness. The eye is both an organ of sight and an important contributor to the circadian rhythm. A wide variety of cells in the body are thought to have their own circadian rhythm responding to the 24-hour cycle. However, the eye connects to the suprachiasmatic nucleus in the frontal hypothalamus, which is thought to orchestrate all other cell feedback with regard to the sleep-wake cycle (Moore 2007). In addition to possessing cones and rod cells associated with sight transmission, the eye includes optic nerve blind spot cells connecting to the retinohypothalamic tract that informs the suprachiasmatic nucleus about changing light levels. Partially sighted individuals who retain some sense of light and dark are able to sustain a reasonable sleep-wake cycle, while those who have no sight struggle to retain a night versus day rhythm.

Increasing amounts of light from the environment prompt arousal in the brainstem, hypothalamus and basal forebrain, which in turn stimulate the cerebral cortex. This mechanism can be thought of as an arousal system that increases as light increases and decreases as darkness ensues. Variations in the level of arousal are brought about by season (since in winter there is a shorter day) and ambient light levels associated with the environment. Consider the scenario in Box 1. The residents of the care home may have their levels of alertness significantly affected by low levels of light, by remaining indoors and having limited light through windows because of surrounding woodlands. If the lighting in the care home is poor, the residents may experience a degree of sensory deprivation, and may also experience difficulties with their circadian rhythms. The use of blue lights (mimicking daylight) during the morning and early afternoon can help to re-establish a normal circadian rhythm, improve levels of arousal when required and reduce confused behaviour (Ancoli-Israel et al 2002).

**Complete time out activity**

Nurses’ ability to manipulate factors influencing sleep to best effect is limited by the requirements of work and expectations at home. Shift patterns and the institutional nature of much care activity limit nurses’ ability to control light levels. Nurses manage sleep deficit on a regular basis and it is important to attend to this and maintain sleep-wake cycles.

**Importance of sleep**

The short-term consequence of sleep deficit is impaired mental health. The sleep-deprived individual is more likely to feel irritable and experience difficulties concentrating and is prone to accidents, including those associated with driving (Scott et al 2007).

Repeated exposure to sleep deficit is associated with increased musculoskeletal problems for nurses, for example back pain, and a growing sense of fatigue (Trinkoff et al 2006). There is an increasing demand for nurse shift patterns and levels of care responsibility to be re-evaluated, at a time when patient needs are increasing (Eanes 2015).

The experience of sleep deficit is most immediately felt in terms of tiredness, difficulty concentrating and an increased propensity for mistakes and accidents. However, there may be more profound longer term consequences in terms of metabolic risks (Cedernaes et al 2015). The authors noted that sleep deficit correlates with an increased risk of cardiovascular disease, stroke, obesity, type 2 diabetes mellitus and several cancers, notably breast, colorectal and prostate cancer.

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**TIME OUT**

1. Return to your sleep diary and identify how you use light to sustain levels of alertness.
   - To what extent are you able to control light levels during the day?
   - How do you manage light during the evening?
   - Do you try to sustain levels of alertness by using bright and especially blue lights and counter sleep drive using caffeine or other stimulants?
   - Alternatively, do you use subdued lighting and limit your exposure to other light sources such as the computer, tablet or television screens to better prepare for sleep?

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**BOX 1**

**Scenario**

Anne, a staff nurse, has been trying to understand why a group of confused older people in the care home have become increasingly disoriented and agitated this month – October. The residents’ shouting, walking about and aggression are proving a challenge. The care home is surrounded by woodlands. Someone suggests that the light levels may be the problem because it is much darker. Anne starts to wonder if this is true.
Laboratory studies demonstrated a correlation between sustained sleep deficit (less than an average of six hours per night) and metabolic risks (Cadernaes et al 2015). However, it should be recognised that other factors may have a role in this, such as the genetic makeup of individuals. Sleep has a pivotal role in repairing tissues, but the extent to which that repair is necessary and/or successful may depend on the genetic make-up of the individual (Archer et al 2014). Genetics also appears to influence predisposition to sleeping more or less, with norms ranging from 6.25 hours per night to 8.06 hours per night (He et al 2009). Age also appears to affect the body’s ability to complete cellular repair through sleep, with older individuals achieving significantly less restorative slow-wave sleep (Ohayan et al 2004).

Important links are being made with regard to the risks related to the timing of sleep, appetite and insulin use in the body, and disrupted or foreshortened sleep and a rise in nocturnal blood pressure and risk of myocardial infarction or stroke (Spiegel et al 2004).

Sleep deficit, obesity and type 2 diabetes
Wakefulness is associated with homeostatic mechanisms in the body including appetite. Appetite increases during daylight hours, fuelling the body with nutrients when they are most needed. Garaulet et al (2013) noted that people who eat late – those who consume the majority of their calorie intake after 3pm – are less successful at reducing weight than those who eat earlier. Eberly and Feldman (2010) found that those who work shifts, and eat later in the day or during the night, experience increased levels of obesity. Ghrelin is a hormone produced in the stomach that increases appetite and is usually produced during daylight hours. Leptin, an appetite suppressant hormone, is secreted by adipose tissues and reduces appetite (satiety hormone) (Knutson 2012).

When sleep patterns are altered, the usual balance between ghrelin and leptin is disrupted and control of body weight may be challenging. An individual awake during the night may consume more food than the body can use for energy. This may be exacerbated if those who eat late consume convenience foods high in saturated fats, sugars and salt. Spiegel et al (2004) suggested that several homeostatic hormone balances, including cortisol, appear to work together to regulate the use of carbohydrates in the body.

Cortisol is a stress hormone that facilitates the body’s ability to respond to physical and emotional demands associated with periods of wakefulness. When the individual produces this hormone in response to abnormal wakefulness during night-time hours, appetite is likely to increase (Spiegel et al 2004).

The body is ill-prepared to process glucose during the night. For glucose to be converted to energy sources in the cells, insulin is required. Studies have shown that those experiencing sleep deficit have difficulty converting glucose in this way. Buxton et al (2010) demonstrated how one week’s sleep restriction in young men reduces insulin sensitivity at the cellular level, limiting the body’s ability to use glucose as energy. Following sleep deficit, there is typically a 30% deficit in the body’s ability to process glucose (Spiegel et al 2004). Where glucose is underused for energy, it may instead be converted to fat stores in the body, with consequent risks of developing type 2 diabetes and cardiovascular problems linked to atherosclerosis (Spiegel et al 2004).

Sleep deficit and coronary risks
The cardiovascular system is at risk when associated with the development of obesity and type 2 diabetes, resulting in atheroma in coronary arteries. It may be compromised further by breathing difficulties linked to obesity. Obese individuals who experience obstructive sleep apnoea also experience repeated falls in their blood oxygen levels as a result of occlusion of the respiratory tract during sleep (Calhoun 2010). In response to blood-oxygen deficits, blood pressure increases over time, resulting in hypertension. Sustained sleep deprivation increases the production of cortisol, contributing to an abnormally sustained higher blood pressure, which is expected to fall during typical sleep (Chien et al 2010).

Sleep deficit and cancer risk
Lockley and Foster (2012) linked the increased risk of cancer in people experiencing sleep deficit to changes in the level of melatonin produced in the body. Melatonin is produced during the hours of darkness, and its levels in the blood increase quickly after the sleep gate has been reached. Melatonin has a free radical scavenging role and it is thought to be important in facilitating the body’s response to emergent tumour cells, triggering an immunological response to malignant cell production (Noguti and Robeiro 2012). The
number of free radicals is thought to increase with age and to be implicated in the increased development of tumours in later years. Where individuals disrupt or delay sleep on a regular basis, there is an increased risk that malignant cells may develop unabated by the usual immunological response.

**Complete time out activity**

### Adjusting sleep patterns

Several authors have made the case for changes in working life associated with the risks of sleep deficit. Abrams (2015) cautioned that failing to attend to sleep deficits in doctors working at night can result in an increase in malpractice. It is recommended that employers make rest provisions during night shifts to allow staff to take short naps. In a survey of working people in the United States, Luckhaupt et al (2010) found that 30% of people achieved less than six hours sleep per night and that risks were greatest where individuals had an additional or second job. Eanes (2015) encouraged nursing managers to reconsider shift patterns and arrangements made for staff travel to work. Nurses driving a long distance after a night shift may be prone to accidents.

Basner et al (2014) proposed a wide range of societal changes associated with work and social life, noting that until work is reconceived with adequate regard for the requirements of sleep, society will be ill-prepared to counter the health problems that arise as a result of sleep deficits. These concerns extend to those who are already unwell and dealing with additional sleep deficit risks. In their literature review of noise at night in care settings, Fillary et al (2014) emphasised the need to ensure continuity and quality of sleep for patients, as well as measures such as pain relief to enable individuals to sleep in the first place.

Fundamental changes to work and the balance of rest and work are being explored in Sweden, where a six-hour working day norm is being promoted (Rashid 2014). In the interim, however, there is much that nurses can do to re-examine their own sleep patterns, developing good sleep hygiene. Nurses are in a pivotal position to use the research relating to sleep to improve the quantity and quality of their sleep.

The first adjustment is associated with attitudes towards sleep. Sleep might seem to be a wasted resource, however there is evidence that time spent asleep is an excellent investment. Daytime napping, in the face of sleep deficit, is recommended, although napping when the individual already regularly achieves eight or nine hours sleep per night may warrant further investigation (Milner and Cote 2009). Nurses should link the psychology of sleep to the neurological and immunological functions that it serves (Irwin 2015), and ensure sufficient time asleep to enable them to function well as healthcare professionals. It is unrealistic to withdraw from a share of shift responsibilities since nursing is a round-the-clock practice. However, there is a case for opening discussions with managers regarding whether shift arrangements are health effective as well as cost effective. Individual nurses may prefer long shifts, compressing their work time into fewer days each week and reducing stress, but if the resultant rest time is not used to improve their sleep profile, little benefit may be gained.

An important link has been made between the timing of meals, dietary intake and sleep. Individuals who eat late, especially if they snack late in the evening or after awakening in the night, might consider whether mealtimes can be adjusted and moved forward in the day and their dietary intake reduced during the late evening. There is merit in consuming the main meal earlier in the day, wherever possible.

While stimulants such as caffeine have a role in sustaining levels of alertness, and their use is part of social custom, it is best to limit quantities of caffeine consumed during the late evening as the sleep gate approaches. Combining energy drinks with alcohol can make sleep much more difficult. Energy drinks are a stimulant – as is alcohol initially – before it becomes a neurodepressant. The combination of substances taken may disrupt sleep-wake cycles, making it difficult to sustain regular sleep gates and leading to problems with concentration in young people (Seifert et al 2011, Jones et al 2012).

Achieving a relaxed state of mind to ready the body for the sleep gate is important. In the late evening, reading a book and using soft lighting is better than playing electronic games on tablets and computers. An increase in television channels and services may seem appealing. However, their excessive use late into the evening might be detrimental. Blue light, especially with light bulbs that mimic daylight, is more likely to increase alertness levels and delay sleep than yellow light (van Bommel 2006). While it is difficult to adjust lighting in institutional settings, there remains scope to adjust it in the home.
It is unrealistic to insist that individuals should always be prompt in going to bed by 10pm. Nights out, parties and social dining in the evening are part of cultural activity. However, it is necessary to review more chaotic lifestyles, especially at weekends, when the individual repeatedly challenges the body clock and parties late. Where individuals stay up late on both a Friday and Saturday night, after sleep deficits have already accumulated earlier in the week, the body is ill-prepared to re-establish an adequate circadian rhythm.

It is helpful to create conditions in the bedroom that help to achieve and sustain sleep. Measures could include ensuring an appropriate temperature and allowing adequate air to circulate. The room must be dark enough to sleep, so heavier curtains that block out street lighting are valuable. A sleeping position should be chosen to aid breathing, and any problems such as obstructive sleep apnoea should be diagnosed and treated in a timely manner. Sleeping tablets may be used to initiate sleep in the short term, but their use is likely to be less effective in the long-term (NHS Choices 2014). Sedatives treat the symptoms of underlying problems and it is preferable to re-examine the sleep profile, making necessary corrections there to secure healthy sleep.

**Complete time out activity**

### Conclusion

It is important that nurses recognise what constitutes healthy sleep and how they can apply this to their sleep profile, before advising patients on the best ways to achieve and sustain sleep. Increasingly, research suggests that sleep deficits can have a negative effect on health and that attending to healthy sleep is important. Discovering what can be learned about normal sleep and what sustains it is a long-term health investment.

Sleep hygiene measures associated with preparing for bed should continue to be promoted. However, insights into the relationship between eating, sleep and long-term metabolic risks are of increasing significance. Homeostatic mechanisms work in unison; therefore, disrupting one mechanism is likely to have consequences for another. A better understanding of the relationship between metabolism and sleep may help counter significant health risks including cancer, diabetes and heart disease.

Complete time out activity

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Jones SC, Barrie L, Berry NJ (2012) Why (not) alcohol energy drinks? A qualitative study with experienced or new authors on a variety of subjects. Contact the Art & Science editor Gwen Clarke at gwen.clarke@rcni.com


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Sleep hygiene

TEST YOUR KNOWLEDGE BY COMPLETING SELF-ASSESSMENT QUESTIONNAIRE 834

1. How many hours of good quality sleep does an adult require every 24 hours?
   a) Between five and six ❏
   b) Between six and seven ❏
   c) Between seven and nine ❏
   d) More than nine ❏

2. The stage of sleep that involves slow-wave sleep is:
   a) N1 non-rapid eye movement (NREM) ❏
   b) N2 (NREM) ❏
   c) N3 (NREM) ❏
   d) Rapid eye movement (REM) ❏

3. Which is a feature of REM sleep?
   a) Muscles are paralysed ❏
   b) Muscles may twitch ❏
   c) Sleepwalking ❏
   d) Talking in one’s sleep ❏

4. Which statement is incorrect?
   a) Ghrelin: ❏
      - Increases appetite
      - Is secreted by adipose tissues
      - Facilitates the body’s ability to respond to physical and emotional demands associated with wakefulness
      - Increases appetite
   b) Leptin ❏
   c) Cortisol ❏
   d) Melatonin ❏

5. How many cycles of the four stages of sleep occur in a typical seven or eight-hour sleep period?
   a) Two ❏
   b) Three ❏
   c) Four or five ❏
   d) Six or more ❏

6. Which statement regarding sleep drive is true?
   a) Sleep drive decreases incrementally during the course of waking hours ❏
   b) The brain addresses sleep drive requirements during REM sleep ❏
   c) Sleep drive is linked to decreased production of adenosine ❏
   d) A series of sleep deficits may quickly lead to an overpowering sleep drive that leaves the individual feeling exhausted and depressed ❏

7. Sleep deficit may result in:
   a) Impaired mental health ❏
   b) An increased propensity for mistakes and accidents ❏
   c) An increased risk of obesity, type 2 diabetes and cardiovascular disease ❏
   d) All of the above ❏

8. Which hormone reduces appetite?
   a) Ghrelin ❏
   b) Leptin ❏
   c) Cortisol ❏
   d) Melatonin ❏

9. Ghrelin:
   a) Is usually produced during night-time hours ❏
   b) Is secreted by adipose tissues ❏
   c) Facilitates the body’s ability to respond to physical and emotional demands associated with wakefulness ❏
   d) Increases appetite ❏

10. To improve the quantity and quality of sleep:
    a) Daytime napping is always recommended ❏
    b) Consume the main meal later in the day ❏
    c) Adjust lighting and avoid use of computers in the late evening ❏
    d) Limit quantities of caffeine consumed early in the day ❏

This self-assessment questionnaire was compiled by Noreen Begley

The answers to this questionnaire will be published on March 23

The answers to SAQ 832 on nursing care plans, which appeared in the February 24 issue, are:
   1. d  2. c  3. a  4. b  5. c
   6. b  7. a  8. b  9. b  10. a

How to use this assessment

This self-assessment questionnaire (SAQ) will help you to test your knowledge. Each week you will find ten multiple-choice questions that are broadly linked to the CPD article. Note: there is only one correct answer for each question.

- You could test your subject knowledge by attempting the questions before reading the article, and then go back over them to see if you would answer any differently.
- You might like to read the article to update yourself before attempting the questions.

When you have completed your self-assessment, add it to your professional portfolio. You can record the amount of time it has taken, Space has been provided for comments.

You might like to consider writing a reflective account, see page 62.

Report back

This activity has taken me _____ hours to complete.
Other comments:

Now that I have read this article and completed this assessment, I think my knowledge is:
Excellent ❏
Good ❏
Satisfactory ❏
Unsatisfactory ❏
Poor ❏

As a result of this I intend to: