

# While you were **sleeping**

Sleep deprivation and disturbed sleep are common complaints and can be detrimental to our physical health.

**S**leep deprivation not only compromises our physical health. It also affects memory, attention, cognitive function and everyday living, with an even greater impact on people with health conditions such as epilepsy<sup>1</sup>. As such, reports that sleep disturbance is common among people with epilepsy are serious.

This article explores factors behind the phenomenon – including the effect on sleep of seizures, antiepileptic medications, poor sleep hygiene and sleep disorders – with a view to increasing awareness so the issue can be addressed more effectively by patients and healthcare professionals.

## What is sleep?

Sleep is a dynamic function driven by the 24-hour circadian rhythm – our ‘body clock’ –

regulating the sleep-wake cycle, temperature control and the secretion of hormones such as melatonin, cortisol and growth hormone.

Sleep is cyclic, typically progressing from light to deeper sleep (Stages 1 to 4 of Non-REM sleep) over 90-110 minutes. REM sleep – which ends the sleep cycle – differs from the preceding Non-REM sleep as the muscles relax and there is a period of rapid eye movements. Nights begin with proportionally more deep sleep and short periods of REM sleep. Later, deep sleep periods decrease and REM sleeps increase until the early hours when sleep is mostly light (Stage 1 and 2) and REM sleep.

About 50% of adult sleep is light (Stage 2) and 20% is REM. By contrast, half of infants’ sleep-time is active REM-like sleep and the other half is passive or non-REM-

like sleep. During the first few months of life, their sleep architecture (pattern) consolidates, becoming increasingly similar to adult patterns<sup>2</sup>.

## Quantity of sleep

People need different amounts of sleep for peak function. Generally, adults need 7-8 hours – although some function on just five hours, while others want up to 10. Teenagers need nine hours on average and infants around 16 daily.

If a person is sleep deprived for several nights, this ‘sleep debt’ eventually has to be repaid. Unfortunately sleep deprivation has become the norm in many cultures and people become accustomed to their sleep-deprived schedules. However it can reduce individual reaction times and hamper their

ability to concentrate, think clearly and make sound judgments.

Daytime drowsiness, excessive yawning, difficulty focusing eyes and nodding off as soon as seated or lying down are all signs of severe sleep deprivation. Often people are unaware they experience 'micro-sleeps' – brief sleep episodes occurring while awake.

Stress, foods, smoking, alcohol and medicines (including antiepileptic medications) can also significantly impact quality of sleep.

Worry and stress can make it difficult to fall asleep or go back to sleep after an early morning awakening. Nicotine withdrawal may wake smokers 3-4 hours after going to sleep, while stimulants like decongestants and diet pills make getting to sleep harder. Caffeine may increase alertness in the short term, but it will not fully reverse the effects of sleep deprivation; moreover it stimulates particular areas of the brain leading to insomnia. Although alcohol can help people fall asleep, it deprives them of REM and the deeper, more restorative stages of sleep.

Environmental factors can also impact sleep quality such as excessive noise, light, heat and cold. In order for us to fall to sleep, it is important that the body temperature drops. During REM sleep the body loses some of its ability to control body temperature and excessive cold or overheating will disrupt the sleep cycle.

## Sleep disorders

Almost 90% of Australians experience a transient sleep disorder at some stage, with 30% experiencing a severe sleep disorder<sup>3</sup>.

Over 70 diagnosable sleep disorders can impact quantity and quality of sleep, contributing to the community's overall rate of sleep deprivation. It is estimated that sleep disorders and deprivation from all causes contribute to 9.1% of work-related injuries, 8.3% of depression and 7.6% of non-work-related motor vehicle accidents<sup>4</sup>.

The prevalence of sleep disorders in people with epilepsy is unknown. However a 2004 study indicated sleep disturbance was reported more than twice as often in 492 people with partial epilepsy (39%) than in the control group of 486 people without epilepsy (18%)<sup>5</sup>.

Sleep disturbances in epilepsy are associated with the greatest impairment of

## STAGES OF SLEEP

- ✓ **STAGE 1 Transitional stage** Eye movements and muscle activity slows. Sleepers can experience a sudden jerk or sensation of falling and if woken, often remember fragmented visual images.
- ✓ **STAGE 2 Light sleep** Brain waves slow significantly with occasional bursts of rapid wave activity called sleep spindles. All eye movement stops.
- ✓ **STAGE 3 Moderately deep 'slow wave sleep'** Brain waves become extremely slow interspersed with smaller, faster brain waves.
- ✓ **STAGE 4 Deep 'slow wave sleep'** Eye movement and muscle activity cease. It is difficult to wake someone during Stage 3 and 4 sleep, and momentary confusion or disorientation may occur on waking. Some people experience parasomnias such as night terrors or sleepwalking.
- ✓ **Rapid Eye Movement or REM sleep** This first occurs 50-90 minutes after falling asleep, initially lasting about 5-10 minutes and gradually lengthening with successive sleep cycles. During REM sleep, the brain areas used for learning are stimulated and the eyes rapidly dart in all directions under closed lids. The limbs are temporarily paralysed although muscle twitching can occur. If people awake during REM sleep they may recall dreams.

“Sleep disturbances in epilepsy are associated with the greatest impairment of quality of life.”

quality of life<sup>5,6</sup>. Seizures interfere with sleep architecture, reducing REM sleep and increasing stage 1 'transition' sleep<sup>7</sup>. Even brief seizures can extensively affect sleep architecture, quality of sleep and cause increased daytime drowsiness.

## Types of sleep disorders

**Insomnia** is characterised by difficulty falling asleep or going back to sleep after waking at night. Approximately 5% of the population<sup>3,8,9</sup> will experience nocturnal awakenings lasting longer than 30 minutes.

Insomnia diminishes memory, concentration, energy levels, performance at school or work, and has been shown to increase the risk of car accidents. Causes of insomnia are varied and can include pain, chronic respiratory problems and other sleep disorders. Other triggers include caffeine, alcohol, nicotine, blood pressure and asthma medication.

Depression can perpetuate insomnia, as can anxiety, grief, and concerns over

relationships and work or financial difficulties. Even after causes are identified, reduced or eliminated, 'worry about not sleeping' can trigger continuing insomnia.

Treatment aims to break this vicious cycle. By learning about sleep, identifying and eliminating contributing factors, improving 'sleep hygiene' and training yourself not to worry about insomnia, the condition is often treated successfully.

**Narcolepsy** is a relatively rare neurological disorder experienced by 0.05% of the population<sup>9</sup>. It results from malfunction in the brain area regulating the maintenance of sleep and wakefulness, characterised by sudden episodes of daytime sleep lasting seconds to 30 minutes. Episodes occur regardless of the amount or quality of night-time sleep, but the night-time sleep period itself is often interrupted.

They occur more during periods of monotonous activity or inactivity but can happen anytime – even when driving, eating or during conversation.



## NON-REM PARASOMNIAS

- **Confusional Arousals** occur when a person woken during deep sleep – early in the nightly sleep cycle – appears confused, moving and reacting slowly.
- **Nightmares** are vivid dreams causing sufficient fear or anxiety to wake the person from REM sleep. Once calmed, they often struggle to fall asleep again.
- **Bed-wetting** or nocturnal enuresis usually occurs in sleep's deeper stages.
- **Sleep Paralysis** can occur if a person wakes as a REM cycle ends when their muscles are still paralysed. Lasting seconds, this can be broken by a sound or touch.
- **Sleep Talking** usually occurs during the sleep-wake transition of the cycle. The person cannot recall uttering sounds or sentences during sleep.
- **Night Terrors** occur when a person suddenly wakes feeling confused, with a terror that is difficult to soothe. Episodes last about 15 minutes before the person returns to sleep. In the morning, they will not remember the event.
- **Sleepwalking** usually occurs in Stage 4 or deep sleep. The person moves around while sleeping, unaware of their actual surroundings. Tending to run in families, sleepwalking can be dangerous.

“Parasomnias can occur in adults and often are confused with seizures. An accurate description or video of the events is useful for investigating doctors.”



**Parasomnias** are a group of sleep disorders that involve a partial waking. They include night-time behaviours and activity more common in children<sup>9</sup> and causing concern to parents, including night terrors and sleepwalking. Many of these parasomnias resolve themselves after a period of time. Parasomnias can also occur in adults, and often are confused with seizures. An accurate description or video of the events is useful for investigating doctors.

**Sleep Apnoea** is a disorder interrupting breathing during sleep. This causes multiple awakenings each night, leaving the person continually sleepy. One type is central sleep apnoea (CSA). It is relatively rare and little is known about its prevalence with epilepsy. The other, most common form, is obstructive sleep apnoea (OSA), affecting an estimated 4% of the population – males twice as frequently as females<sup>9</sup>.

During sleep, virtually all the body's muscles relax including those around the throat. OSA may occlude or 'collapse' the airway due to negative pressure when the person inhales. It is characterised by loud snoring or the sound of occluded breathing. While the person struggles to inhale, their oxygen blood levels fall, signalling the brain to arouse the person from deep sleep. As they rouse the throat muscles tighten, opening the airway. The person will then gasp or snort and the cycle resumes.

If untreated, the disrupted sleep cycle and frequent awakenings often result in severe daytime drowsiness and other health

disorders. Lack of oxygen to the brain can cause morning headaches, loss of libido and a decline in mental functioning. People with severe, untreated sleep apnoea are two to three times more likely to have motor vehicle accidents than the general population, and two to three times more likely to die from heart attack or stroke<sup>10,11</sup>.

### How common is sleep apnoea in epilepsy?

People are often unaware of the symptoms or they are attributed to medication, nocturnal seizures or remain unexplored.

However small studies indicate sleep apnoea is prevalent in people with epilepsy. One published in 2000 by Professor Beth Malow examined 39 epilepsy surgery candidates who underwent sleep studies during pre-surgical evaluation. One third had untreated OSA<sup>12</sup>. Other studies associate OSA treatment with improvement in seizure control – even when medications don't change.

### Impact of AEDs on sleep

Antiepileptic medications (AEDs) affect sleep architecture. Short-term studies on volunteers without epilepsy demonstrate AEDs can independently disrupt or enhance sleep.

The choice of an AED is not purely based upon seizure type or syndrome – but also age, gender, lifestyle factors and other conditions. Some beneficial 'side-effects'

can be used to the patient's advantage, while others may need to be avoided in certain individuals or circumstances<sup>12</sup>.

A number of small studies on AEDs showed impacts on sleep. Barbiturates, benzodiazepines and phenytoin were found to shorten the time it takes to fall asleep. Phenytoin, Carbamazepine, barbiturates and benzodiazepines decrease REM sleep while gabapentin, lamotrigine and levetiracetam increased REM sleep in some studies. Benzodiazepines and lamotrigine were found to decrease Stage 3 & 4 deep or 'restorative' sleep while gabapentin enhanced this sleep stage.

Little is known about the drugs' long-term effects on sleep and the daytime consequence of drug-induced sleep loss. Importantly, many AEDs did not affect particular stages of the sleep cycle or their effects remain unknown<sup>12,13</sup>.

Overall, the primary aim of AEDs is controlling seizure activity with the fewest possible adverse effects. Both the healthcare provider and person with epilepsy need to understand sleep architecture and appreciate the potential impact poor sleep hygiene, sleep disorders, epilepsy and antiepileptic medications have upon sleep debt, daily functioning and quality of life.

The interplay of epilepsy, antiepileptic medications and sleep is complex and much remains to be discovered. But if sleep disturbances continue after addressing sleep hygiene, maintaining good AED compliance and seizure control, it is worth raising any concerns with your treating doctor.

## REFERENCES

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## Tips to improve your sleep habits

- 30 minutes exercise** 5 -6 hours before bedtime can help.
- Set a bedtime ritual** or routine you associate with sleep.
- Go to bed when sleepy** and, importantly, get up at the same time each day.
- Exposure to bright light** in the morning (eg sunlight) helps reset the body's internal biological clock each day.
- Improve your sleeping environment.** Is your bed comfortable? Is the room a comfortable temperature with noises and light blocked out?
- If you can't sleep,** get up, leave the room and do quiet activities for about 20 minutes. Keep lights low, take a warm bath, listen to soothing music, have a warm non-caffeinated drink. Write down any worries so you can deal with them in the morning.

## Avoid

- All caffeine 4-6 hours before bedtime** as it is a stimulant and can lead to insomnia.
- Heavy, spicy, sugary foods** 4-6 hours before bed. They can affect your ability to stay asleep.
- Alcohol** which despite its immediate sleep-inducing effect, interferes with deep and REM sleep. This results from a stimulant or wake-up effect occurring as the blood-alcohol level falls.
- Nicotine** as smokers tend to sleep very lightly and often wake early due to nicotine withdrawal.
- Weekend sleep-ins** which push back (delay) your body clock, making it harder to wake at the usual time on Monday.

## Tell your doctor if

- You continually struggle to fall asleep, always feel tired or have daytime drowsiness.
- You wake many times at night and have difficulty returning to sleep.
- Your sleep is disturbed by reflux or indigestion, aches and pains, hot flushes, breathing difficulties or stress and anxiety.

- (8) Lack L et al. *A survey of sleep difficulties in an Australian population* Community Health Stud 1988;12(2):200-7
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## For further information visit

Harvard Medical School "Healthy Sleep"  
<http://healthysleep.med.harvard.edu/>

Brain Foundation  
<http://www.brainaustralia.org.au>

Australian Sleep Association  
<http://www.sleepaus.on.net>

University of Maryland Medical Center  
<http://www.umm.edu/sleep>