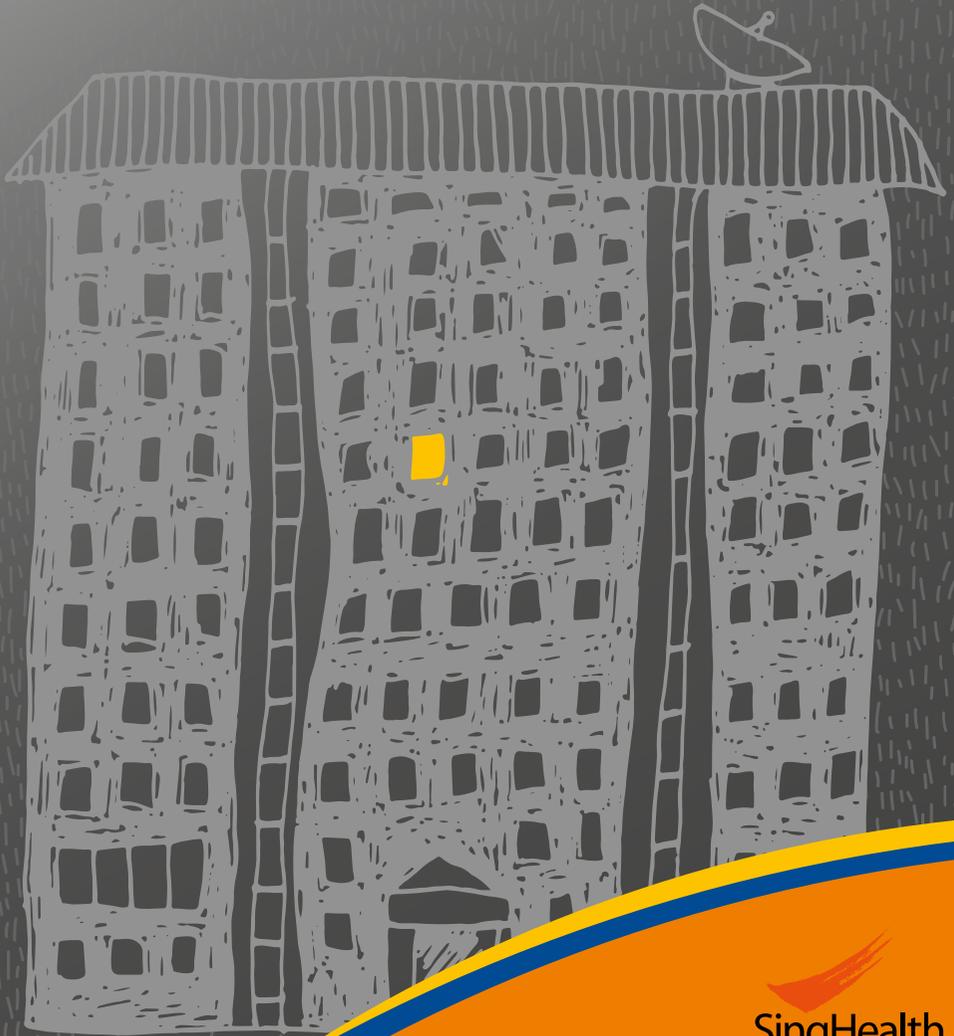


Sleep Matters

Get The Answers To Common Sleep Conditions



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Sleep Centre

The **SingHealth Duke-NUS Sleep Centre** is a centre that treats the full spectrum of sleep conditions, with a comprehensive range of holistic treatment options specially customised for paediatrics and adults.

Expertise from 6 SingHealth Institutions

It is a unique platform that hosts specialists from a broad spectrum of SingHealth hospitals and national specialty centres, serving patients at six key SingHealth institutions, namely, Singapore General Hospital, Changi General Hospital, Sengkang General Hospital, KK Women's and Children's Hospital, National Dental Centre Singapore and National Neuroscience Institute.

Accredited Sleep Laboratories

Hosting the only internationally-accredited sleep laboratories in Asia, we have the largest pool of globally trained qualified sleep specialists in Singapore, with a complete range of inpatient and outpatient services for the evaluation, treatment and education of sleep disorders.

Our patients enjoy full access to warm, supportive care from our team of multidisciplinary sleep medicine experts throughout the duration of their treatment; working together to offer a seamless and optimal level of care for you.

For enquiries, please contact the SingHealth Duke-NUS Sleep Centre at:

Singapore General Hospital Sleep Centre	Tel: 6321 4377
Changi General Hospital Integrated Sleep Service	Tel: 6850 3333
Sengkang General Hospital Sleep Service	Tel: 6930 6000
KK Women's and Children's Hospital Sleep Disorders Centre	Tel: 6294 4050
National Dental Centre Singapore	Tel: 6324 8802
National Neuroscience Institute	Tel: 6321 4377

Find out more about our specialists at SingHealth Duke-NUS Sleep Centre at www.singhealth.com.sg/sleepcentre

Our Services

Our dedicated sleep specialists work closely in a multidisciplinary team to provide a complete range of integrated services for the assessment and management of sleep conditions in a caring and friendly environment.

Multidisciplinary Team

The diagnosis and management of sleep issues involve many different medical and surgical disciplines, and it is our belief that this is best accomplished in an expert, multidisciplinary sleep centre. Our specialists encompass multidisciplinary backgrounds, with sleep clinicians, respiratory physicians, Ear, Nose and Throat (ENT) surgeons, neurologists, orthodontists, sleep study technologists, psychiatrists, psychologists and specially-trained support staff.

Individualised Treatment

Each individual case of sleep disorder is different, and will be reviewed in detail by our multidisciplinary team to come up with an optimal treatment plan for you.

We provide evaluation and treatment of all sleep disorders, including:

1. Snoring and Obstructive Sleep Apnoea (OSA)
2. Obesity Hypoventilation Syndrome
3. Central Apnoea
4. Cheyne Stoke's Breathing
5. Complex Sleep Apnoea
6. Overlap Syndrome
7. Insomnia
8. Circadian Rhythm Sleep Disorders
 - Jet Lag
 - Advanced and Delayed Sleep Phase Syndromes
 - Shift Work-related Sleep Disorders
9. Parasomnias
10. Narcolepsy
11. REM-Behavioural Disorders
12. Periodic Limb Movements and Restless Legs Syndrome (RLS)

Education

We aim to further the development of sleep medicine in Singapore via activities at several different levels:

1. General Public

Across the different sleep centres, we organise regular public outreach and sleep symposia to improve public awareness of various sleep disorders.

2. Other Medical Professionals

We also hold regular forums for General Practitioners, and sleep medicine courses to update our colleagues, educate other specialties and professionals about the impact of sleep disorders and the need for a high index of suspicion in looking out for comorbid sleep conditions.

3. Specialist Training

Sleep medicine is a very special sub-specialty as the pathway to sleep training originates in several primary specialties. Our sleep fellowship training programme accepts trainees who have completed their primary specialist training in the following specialties:

- Ear, Nose and Throat (ENT)
- Respiratory medicine
- Neurology
- Dentistry
- Psychiatry

The training programme for each of these entails common core modules as well as specialty-specific training requirements. Fellows will have the opportunity to work with experienced sleep specialists from Respiratory, ENT, Psychiatry, Dental and Psychiatry specialists across all SingHealth Duke-NUS cluster hospitals and medical centres. Fellows will also be expected to participate in research projects mentored and supervised by their primary fellowship director.

We also organise sleep medicine courses and symposiums regularly to cater to the growing needs of specialists and sleep technologists wanting to manage sleep patients and improve their knowledge through continuing medical education.

FOREWORD

The SingHealth Duke-NUS Sleep Centre consisting of sleep centres and services in Singapore General Hospital, Changi General Hospital, Sengkang General Hospital, KK Women's and Children's Hospital, National Dental Centre Singapore and National Neuroscience Institute was set up to coordinate the proactive management of patients with sleep disorders within SingHealth cluster, from primary care setting to hospitals, and back to the community.

Regardless of the hospital the patients go, we have a team of sleep specialists that can help them with their sleep. Through patient education, physician education and research, we hope to improve our understanding of sleep and sleep disorders to promote healthy living amongst Singaporeans. Healthy sleep is without a doubt one of the pillars for healthy active living.

This issue of Sleep Matters published by SingHealth received contributions from sleep specialists within the SingHealth Duke-NUS Sleep Centre. With its enhanced content, I am sure the readers will gain much by paying attention to tips to getting a good night sleep and be on the lookout for sleep disorders that can possibly affect themselves or their family members.

Adjunct Associate Professor Toh Song Tar

Head, SingHealth Duke-NUS Sleep Centre

Head and Senior Consultant, Department of Otolaryngology
Singapore General Hospital

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National University of Singapore and Duke-NUS Medical School

INTRODUCTION

Sleep medicine is a rapidly evolving field and advances in diagnostics and therapeutics are being made through active clinical and basic science research. The increased recognition of the importance of sleep health has led to an exponential rise in patients diagnosed with sleep disorders in recent years. While it is rewarding to see that ongoing educational efforts has raised public awareness, many sleep patients remain undiagnosed or lack understanding of their sleep disorders. It is this motivation that led us to our first published work on Sleep Matters, under the SingHealth Healthy Living Series.

The Sleep Matters booklet was well received by the public since its inception. Here, we are pleased to present to you the 3rd edition of Sleep Matters, which has been revised to improve its reader friendliness, while still preserving the breath of topics covered. This new edition also has a focus on Obstructive Sleep Apnoea (OSA) and Insomnia, as these are the two most common sleep disorders. The two chapters have been expanded significantly to provide the reader greater depth in understanding of these conditions.

Our mission is to improve the sleep health of Singapore's population, and public education is essential. We believe this new edition of Sleep Matters will benefit all readers including patients, families of patients and the general public. With its enhanced content, presentation and graphics, we hope you will find great pleasure in reading and learning about sleep.

Wishing everyone many nights of good sleep ahead.

Dr Mok Yingjuan

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ACKNOWLEDGEMENTS

Disclaimer: All information provided within this publication is intended for general information and is provided on the understanding that no surgical and medical advice or recommendation is being rendered. Please do not disregard the professional advice of your physician.

NORMAL SLEEP PHYSIOLOGY (ADULTS AND SENIORS)

Sleep is something that we all do as naturally as breathing and eating, from the time you formed in utero till the time you die. Yet scientists and doctors understand the physiology of breathing and eating far better than we understand the mysteries of the mind and body during sleep.

In the last 20 years however, we are beginning to understand far more about sleep, both the physiology of what happens as we fall asleep, and the pathologies that underlie conditions such as obstructive sleep apnoea and its contribution to morbidity and mortality.

Sleep is a period of time when the body rests. As you fall asleep, the brain begins to filter out sounds, sights and other sensory input from the surroundings. The muscle tone gradually relaxes, allowing the body to rest. Scientists divide normal sleep into several stages, using differences in the brain wave patterns and muscle tone to differentiate the stages.

Scientists divide normal sleep into several stages.



Stages of Sleep

Stage N1



This is a 'light' stage of sleep, where the brain's sensory input is shutting down, but you may still be able to hear and remember sounds and other sensory inputs from the surroundings.

It is common to drift in and out of stage N1 sleep before falling deeper into more consolidated stages of sleep. A sleep-deprived person may have episodes or microsleep where brief periods (a few seconds) of N1 sleep are interspersed during wake periods without the person being aware of this.

These brief periods of microsleep can be dangerous, for instance in a driver who 'switches off' without realising it while driving. Many people who have trouble sleeping are actually drifting in and out of stage N1 sleep without realising it.

Stage N2



As you fall deeper into sleep, the filtering of sensory inputs intensifies. For instance, it will require a louder sound to wake you up from N2 sleep than N1 sleep. The muscle tone in the body drops and the body starts to become more relaxed .

When a person's brain wave activity is tracked as he falls asleep, certain characteristic patterns during this stage of sleep called spindles and K-complexes can be seen.

Stage N3



In this stage, you are deeply asleep. It takes more effort to wake you up from N3 sleep. On awakening at this stage you may report that you were having a dream, although the images and memories of dreams in N3 sleep are usually more indistinct.

REM Sleep**REM (RAPID EYE MOVEMENT) SLEEP**

This is a very interesting stage of sleep, and usually occurs sequentially after you have gone through the first three stages of sleep. In this stage, your muscle tone is very flaccid, and the voluntary muscles e.g. arms and legs are essentially paralysed. However, there are bursts of eye movements during REM sleep, hence this is called rapid eye movement sleep. In this stage of sleep, both breathing and heart rate become less regular.

In people with underlying heart and lung disease, the oxygen levels in the body can fall to very low levels. Despite the inactivity seen in the muscles, there is actually increased brain wave activity, and when you wake from REM sleep, you may report very vivid dreams.



It is recommended that adults sleep for seven to nine hours a night, although the norm can vary.

HOW MUCH SLEEP DO YOU NEED?

It is recommended that adults sleep seven to nine hours a night. However, there is a wide range of normality with some people needing less than seven hours of sleep while others may need up to 10 hours.

Some epidemiological studies suggest that people who sleep too little or too much may have more medical problems or a higher mortality rate, although whether this is a cause or effect is debatable.

For most people, a clue to if you are getting enough sleep is whether you find yourself sleeping a lot more over weekends or on holiday, when you have less restrictions on when you need to get up. If you are sleeping a lot more whenever you have the chance, and you have a lot of lethargy or daytime sleepiness, chances are you are not sleeping enough to meet your body's requirements.

The quality of sleep also matters – in certain medical conditions and in certain sleep conditions, such as obstructive sleep apnoea, there is disruption in the sleep cycle, resulting in poor quality, unrefreshed sleep.

Over the course of a night, most people go through four to five complete cycles of sleep. **They drift from stage N1 to N2, to N3 sleep, into REM sleep, and then go back to N1 sleep again.** As the night wears on, the length of the REM sleep periods increases, with the longest REM sleep period often occurring just before they wake up.

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National Neuroscience Institute Tel: 6321 4377

SLEEP DEPRIVATION

Sleep deprivation is a condition where someone is not getting enough sleep; it can be either chronic or acute.

The absolute number of hours of sleep necessary for someone to function properly is variable. Some people can function with full effectiveness with only three to five hours of sleep per night, while others need at least eight hours or more of sleep per night. However, it is recommended that adults sleep seven to nine hours a night.

A chronically sleep-deprived state can cause tiredness, excessive daytime sleepiness, clumsiness and weight gain. It impairs the normal functioning of the brain. It is impossible for humans to go completely without sleep for long periods of time – brief microsleeps cannot be avoided. Total sleep deprivation has been shown to cause death in lab animals.

WHAT ARE MICROSLEEPS?

Microsleeps occur when someone is significantly sleep-deprived. The brain can automatically shut down, falling into a sleep state that can last from a second to half a minute.

You can fall asleep no matter what you are doing. Microsleeps are similar to blackouts and you will not be aware that they are occurring when you are experiencing them.

EFFECTS OF SLEEP DEPRIVATION

Individuals who are sleep-deprived may not recognise the effects of being so. Small amounts of sleep loss over many nights may result in subtle cognitive loss, which appears to go unrecognised by the individual.

More severe sleep deprivation for a week can lead to profound cognitive dysfunction similar to that seen in some stroke patients, which may also appear to go unrecognised by the individual.

Sleep Deprivation Can Cause:

- 1 Confusion, memory lapses
- 2 Depression, irritability, headaches
- 3 Eye bags and bloodshot eyes
- 4 Increased blood pressure, increased stress hormone level
- 5 Increased risk of diabetes, obesity
- 6 Decreased immunity
- 7 Decreased growth hormones
- 8 Increased risk of road traffic accidents
- 9 Poor work productivity
- 10 Poor quality of life
- 11 Sleeping less than four hours a night is associated with higher risk of premature death

PREVENTION

Maintain proper sleep hygiene. Seek medical help if you feel that you are not sleeping well.

CAUSES

1. Lifestyle

You may choose not to sleep to watch a midnight show, talk to friends, play computer or video games.

Heavy work commitment and stress may hinder sleep and lead to sleep deprivation.

Shift workers may be affected by sleep deprivation.

2. Medical Disorders

Many medical conditions can lead to sleeplessness, and hence sleep deprivation.

Chronic pains and aches can lead to disturbed sleep and sleep deprivation.

Sleep disorders like obstructive sleep apnoea, narcolepsy and restless leg syndrome can lead to disruption of normal sleeping pattern and sleep deprivation.

Nasal obstruction can result in someone not being able to sleep, therefore being sleep-deprived.

The effects of sleep loss are often unrecognised.

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EXCESSIVE DAYTIME SLEEPINESS

Excessive daytime sleepiness refers to the inability to stay alert during the major awake period of the day, resulting in you falling asleep at inappropriate times.

When sleepiness interferes with daily routines and activities, or reduces your ability to function, it is considered excessive.

This is a prevalent condition. In Singapore, the prevalence of excessive daytime sleepiness has been reported to be nine percent (*Ng TP et al, Sleep Medicine 2005*).



A 'sleep debt' builds until enough sleep is obtained.

Causes of Excessive Daytime Sleepiness

Causes of excessive daytime sleepiness include the following. It is commonly caused by more than one of these causes.

1 Inadequate sleep

The amount of sleep needed each night varies amongst different people.

Most need seven to eight hours of uninterrupted sleep to maintain alertness the following day. A habitual sleep period of less than four to five hours daily is generally insufficient to maintain normal



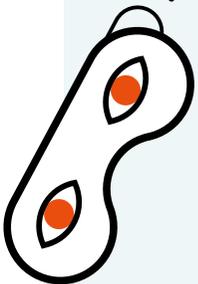
daytime alertness and is likely to cause excessive daytime sleepiness.

If you do not get enough sleep even on a single night, a 'sleep debt' begins to build and increases until sufficient sleep is obtained. Excessive daytime sleepiness occurs as the debt accumulates. If you do not get enough sleep during the work week, you may tend to sleep longer on the weekends or days off to reduce your sleep debt.

2 Sleep disorders

Sleep disorders such as obstructive sleep apnoea, narcolepsy, restless legs syndrome and insomnia may cause excessive daytime sleepiness.

- *Obstructive sleep apnoea* is a potentially serious disorder in which your breathing is interrupted during sleep. This causes you to awaken many times during the night and experience excessive daytime sleepiness.
- *Restless legs syndrome* causes a person to experience unpleasant sensations in the legs. These sensations occur frequently in the evening, making it difficult for you to fall asleep and leading to excessive daytime sleepiness.
- *Insomnia* is the perception of poor quality sleep due to difficulty falling asleep, waking up during the night with difficulty in returning to sleep or waking up too early in the morning.
- *Narcolepsy* will cause excessive daytime sleepiness during the day, even after getting sufficient sleep at night. You may fall asleep at inappropriate times and places.



3

Medications

Some medications may disrupt sleep and cause sleepiness. Examples include sedating antihistamines, sedatives, antidepressants and seizure medications.



4

Alcohol

Alcohol is sedating and can, even in small amounts, make a person more sleepy and at greater risk of car crashes and performance problems.



5

Caffeine

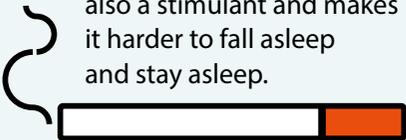
Caffeine in coffee, tea, soft drinks or medications makes it harder for many people to fall asleep and stay asleep. Caffeine stays in the body for about three to seven hours, so even when taken earlier in the day, it may cause problems in falling asleep at night.



6

Nicotine

Nicotine from cigarettes is also a stimulant and makes it harder to fall asleep and stay asleep.



7

Medical conditions

Chronic medical conditions such as asthma, heart failure, depression, rheumatoid arthritis or any other chronically painful disorder may also disrupt sleep and lead to excessive daytime sleepiness. Excessive daytime sleepiness may also occur following head injury and rarely, due to brain tumour.



8

Sleep-wake cycle disturbance (such as shift work)

Most shift workers get less sleep over 24 hours as compared to day workers. The human sleep-wake system is designed to facilitate the body and mind for sleep at night and wakefulness during the day. These natural rhythms make it difficult to sleep during daylight hours and to stay awake during the night hours, even in well-rested individuals.



Sleep loss is greatest for night shift workers, those who work early morning shifts and for female shift workers with children at home. Shift workers who try to sleep during the day are frequently interrupted by noise, light, the telephone, family members and other distractions.

SYMPTOMS

Signs of excessive daytime sleepiness may include:

- Difficulty paying attention or concentrating at work, school or home
- Poor performance at work or school
- Difficulty in staying awake when inactive, such as when watching television or reading
- Difficulty remembering things
- Need to take naps on most days
- Sleepiness that is noticed by others
- Falling asleep while driving

DIAGNOSIS

If you feel sleepy during the day despite getting enough sleep, consult your physician who will evaluate the possible causes and advise on the appropriate management. It is important to get proper diagnosis and treatment of the underlying cause of the sleepiness. Your physician may refer you to a sleep disorders clinic for a comprehensive evaluation of your problem.

MANAGEMENT

Identifying the cause(s) of excessive daytime sleepiness is the key to its management. Treatment is directed towards the specific underlying cause.



Get help if you feel sleepy despite getting enough sleep.

Self/Home Care

★ Get enough sleep

Many people do not set aside enough time for sleep on a regular basis. A first step may be to evaluate your daily activities and sleep-wake patterns to determine how much sleep is obtained. If you are getting less than eight hours of sleep, more sleep may be needed.

A good approach is to gradually move to an earlier bedtime. For example, if an extra hour of sleep is needed, try going to bed 15 minutes earlier each night for four nights, then keep to the last bedtime. This method will increase the amount of time in bed without causing a sudden change in schedule.

★ Avoid caffeine

Avoid beverages containing caffeine (coffee, tea and some soft drinks). Caffeine may help to reduce sleepiness and increase alertness but the effect is temporary. Caffeine can cause sleep interruptions and exacerbate sleepiness.

★ Avoid alcohol

While alcohol may shorten the time it takes to fall asleep, it can disrupt sleep later in the night, leading to poor quality sleep and worsened daytime sleepiness. Chronic use of larger quantities of alcohol can also lead to alcohol dependency.

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OBSTRUCTIVE SLEEP APNOEA

What is Obstructive Sleep Apnoea (OSA)?

Obstructive Sleep Apnoea (OSA) is a condition in which the upper airway collapses repeatedly during sleep. This creates an effect similar to that of being repeatedly choked throughout the night.

During these episodes, sleep is interrupted and there are recurrent dips in the blood oxygen levels, putting stress on the heart. As a result, sleep is unrefreshing and you would typically feel sleepy and irritable throughout the day.

Even a short sleep arousal can lead to unrefreshing sleep.

OSA IS COMMON

OSA is common and a worsening global health problem. Recent data from the Singapore Health Study estimated that 30.5 percent of Singapore's population has moderate to severe OSA.

As obesity is a risk factor for OSA, the prevalence of OSA is likely to rise further in the face of the worsening obesity epidemic.



What are the Symptoms of OSA?

- Excessive daytime sleepiness
- Loud, frequent snoring
- Choking or gasping episodes during sleep
- Observed to stop breathing during sleep
- Abrupt and frequent awakenings at night
- Unrefreshing sleep
- Waking up with a headache or a dry mouth
- Frequent urination at night
- Difficulties with concentration at work or studies
- Reduced libido

WHY OSA IS A CONCERN

OSA is strongly associated with cardiovascular health risks. People with OSA are at increased risk of high blood pressure, coronary artery disease, heart attacks, abnormal heart rhythms, stroke and sudden death.

In particular, OSA has been associated with difficult-to-treat high blood pressure. In addition, OSA also increases the risk of other serious health complications, such as depression, diabetes and cognitive impairment.

Many people with OSA suffer marked daytime sleepiness which impairs their executive function at work.

Their sleepiness also puts them at risk of motor vehicle accidents. All the above factors contribute to the significant impairment in the quality of life observed in people with OSA.

WHAT ARE THE RISK FACTORS FOR OSA?

- Obesity (*However, OSA may also occur in non-obese patients, especially in Asians*)
- Male gender (*For women, the risk is increased after menopause*)
- Smoking
- A narrowed upper airway
- A family history of sleep apnoea

HOW IS OSA DIAGNOSED?

Consult your physician if you have loud snoring or excessive daytime sleepiness despite getting enough sleep. Your physician will evaluate the possible causes and advise on the appropriate management.

Your physician may refer you to a sleep disorders clinic for a comprehensive evaluation of your problem. The evaluation usually involves an overnight sleep study. A sleep study is required for the diagnosis of OSA.



Snoring and obstructive sleep apnoea are more common in males.

WHAT IS A SLEEP STUDY?

A sleep study or polysomnogram (PSG) is an overnight non-invasive diagnostic test performed in a sleep laboratory.

The PSG monitors the different stages of sleep, breathing effort, oxygen levels, heart rhythm and muscle activity during sleep. The severity of OSA can also be determined.

WHAT ARE THE TREATMENTS FOR OSA?

A medical device called Continuous Positive Airway Pressure (CPAP) is considered the gold standard treatment for OSA. CPAP is safe, generally well-tolerated and highly effective.

This device must be worn nightly and long-term CPAP compliance is essential for its effectiveness.

If you are unable to tolerate CPAP therapy, other treatment options include mandibular advancement splints and surgery. These treatment options are described in detail under the following sections.

How Does CPAP Therapy Work?

CPAP therapy works by quietly delivering pressurised air to the nose and back of the throat to prevent the airway from collapsing during sleep.

There are two important parts of the CPAP machine that need to be decided on in careful consultation with your sleep physician, prior to using CPAP.

They are:

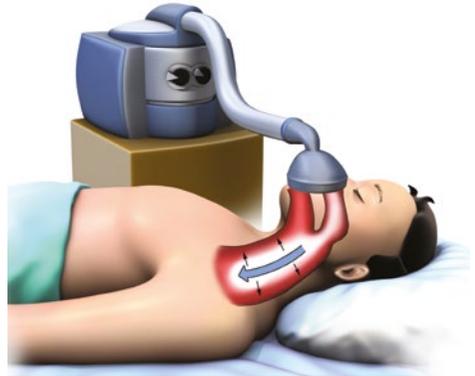
1. The Mask

CPAP is administered through a mask that seals either the nose, the mouth or both.

There are a variety of masks that can be used. Most of these are made from soft silicone or gel to maximise comfort. The mask chosen for you will be fitted by a sleep technician to suit your facial structure and breathing habits.

There are different types of masks to suit different needs, such as:

- Nasal masks
- Oral-nasal masks
- Nasal pillows
- Full face masks
- Oral masks



Continuous Positive Airway Pressure (CPAP)

2. The Machine

Most CPAP machines today are small, quiet and relatively portable. Modern CPAP devices can deliver a fixed pressure, or may have a sophisticated software that can detect obstruction and self-adjust the delivered pressure (auto-titrating machines).

The type and setting of each device will need to be individualised for you after consultation with a sleep specialist. An overnight CPAP titration sleep study may be required to determine the settings that are most suitable for you.

Weight Management

Weight reduction is important if you are overweight and have OSA. This can be achieved through dietary and lifestyle modifications and for some patients, bariatric surgery.

What Happens After OSA is Treated with a CPAP?

OSA sufferers who start using CPAP report sleeping better and feeling more energetic and less sleepy during the day.

Some report feeling better after the first day of treatment while for others, the improvement may only become apparent after a few weeks of sustained use.

The benefits of CPAP include:

- Improved sleep quality
- Improved daytime sleepiness
- Improved memory and cognition
- Improved blood pressure control
- Improvement in bed partner's sleep with the elimination of your snoring

Advice for People with OSA on CPAP treatment

It may take a while to get used to CPAP treatment, but it is important to persevere to reap the benefits of your treatment. Minor troubleshooting may be required, and it may take time to find the right device settings for you.

Some common problems encountered, and troubleshooting tips are as follows:

1. Dryness of the upper airway

This may occur due to low levels of humidity in the environment or as a result of a mask air leak.

The use of a humidifier will help in increasing air moisture, reduce dryness of the airways and increase comfort. It is also important to ensure that your mask fits well to reduce air leak.

2. Mask air leak

Re-adjust the mask if you experience mask air leak during the night. If it persists, work with your doctor and the sleep technologist/CPAP vendor to find an alternative mask that is more suitable for you.



People with OSA who use the CPAP report feeling more energetic during the day.

3. Difficulties in getting used to wearing a CPAP mask

You may wish to try using the CPAP while you are awake for short periods of time in the day, for example, while watching TV. When you are used to how it feels, you may start using the CPAP every time you sleep.

4. Difficulties in falling asleep

If you find the CPAP pressure too high as you are trying to fall asleep, a 'ramp' function on the CPAP machine may be used.

When this 'ramp' function is switched on, the CPAP machine will begin with a low pressure setting, and gradually increase to the targeted level of CPAP pressure as you fall asleep.

5. CPAP pressure is too high

If you feel uncomfortable with the pressures delivered by the CPAP machine during sleep, please highlight this to your doctor.

An overnight CPAP titration sleep study may be required to determine the settings that are most suitable for you.

With time, patience and support, CPAP can significantly benefit your overall health and quality of life.

Dental Splint

What is a Dental Splint or an Oral Appliance (OA)?

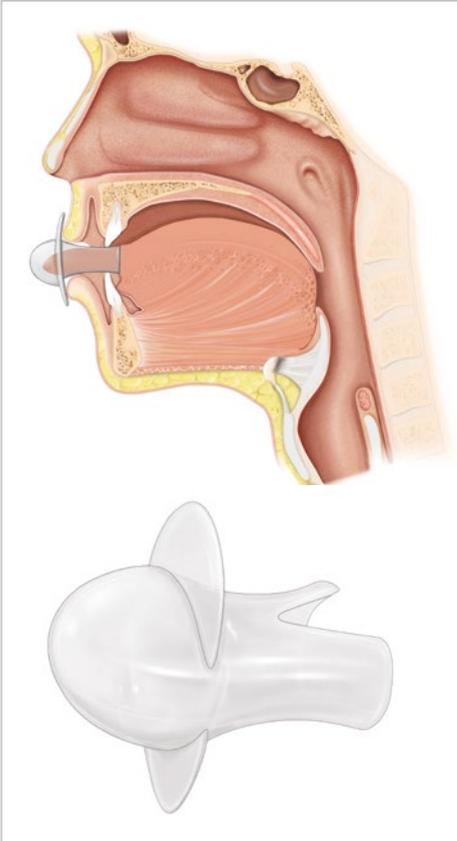
A dental splint or an Oral Appliance (OA) is an alternative to the CPAP in managing snoring and mild to moderate Obstructive Sleep Apnoea (OSA). OA looks like the removable functional braces worn by children, or mouth guards that protect the teeth during sports.

There are many names for an OA:

- Mandibular advancement device
- Mandibular advancement splint
- Sleep apnoea mouth guard
- Sleep apnoea dental appliance
- Sleep apnoea oral appliance

An OA is different from a dental splint, that is used to protect the teeth in bruxism (tooth grinding).

Proper examination and diagnosis are needed to determine the jaw structure and nature of airway obstruction, before prescribing an OA. Those who mouth breathe will not be able to use an OA as it fills the oral cavity and obstructs mouth breathing.



A tongue stabilising device clips onto the front of the tongue and pulls it forward to open the airway.

Another form of an OA, is the Tongue Stabilising Device (TSD). It also goes by many names: *tongue retaining device, sleep apnoea tongue device or tongue guard.*

It is a silicone suction cup that clips over the front of the tongue. Lip shields protrude from the device to keep the tongue positioned outside the mouth.

How Do Oral Appliances (OA) Work?

The tongue guard or TSD holds onto the tongue and prevents it from falling backwards into the airway during sleep. A customised OA is made of acrylic-like dental splints and is anchored on all teeth in both the jaws.

There are built-in mechanisms in the OA, such as screws, connectors or bite blocks, to thrust the mandible (lower jaw) forward. The tongue, soft palate, other muscles and soft tissues in the mouth and throat become stretched and taut as the mandible is re-positioned anteriorly.

With the tongue and soft palate shifted forward and away from the airway, the calibre of the airway increases.

Sometimes an OA may be used together with a CPAP machine to reduce the air pressure for easier breathing. There is an OA adjustment (titration) period of four to six months, when the mandible is gradually advanced into an optimum position, before a second sleep study is done to determine the effectiveness of the OA.

What Can Oral Appliance (OA) Wearers Expect?

The common side effects in using an OA are an open mouth posture and drooling during sleep. The jaw muscles and teeth, especially the incisors, may be sore or painful at the start of OA use.

The pain and discomfort will reduce, after a wearing-in period of up to six months. The way the teeth fit together may change, and the lower teeth will bite in a more forward position in the morning. The change in bite is transient and lasts for an hour or so after the removal of the OA.

However, after many years of long-term use, there may be a small permanent change to the lower jaw position which becomes a couple more millimetres forward; it does not make a big visible change to the physical appearance.



There may be changes to the bite after wearing an oral appliance for a few years.

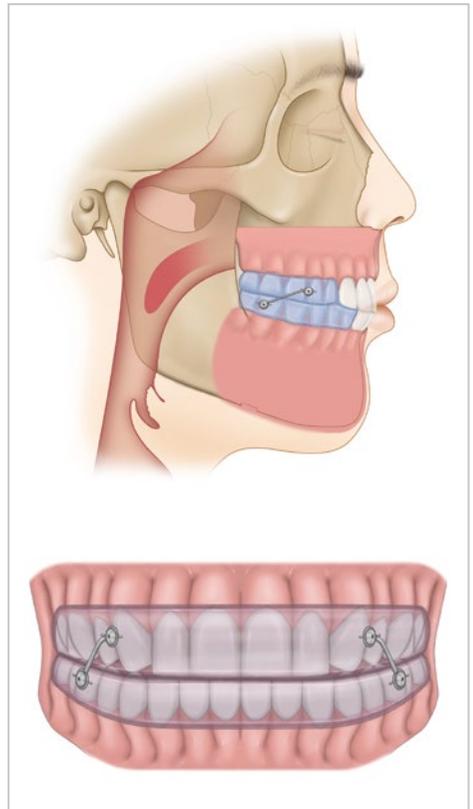
The horizontal gap between the upper and lower incisors may be reduced, and the lower incisors will shift to an edge-to-edge bite with the upper incisors. The bite of the molars will also change after a couple of years.

If oral hygiene practice is poor during OA use, tooth cavities and tooth loosening may occur. Dental fillings, crowns, bridges, implants and gum treatment should be done first before the OA is made.

An OA does not last forever. It may be necessary to replace an OA every three to five years depending on the maintenance of the OA and whether it still fits.

Advice to Oral Appliance Wearers

An OA cannot be worn if there is poor oral health maintenance. Teeth are anchors for the OA, and OSA management is not effective when teeth are loose or lost through a lack of oral healthcare.



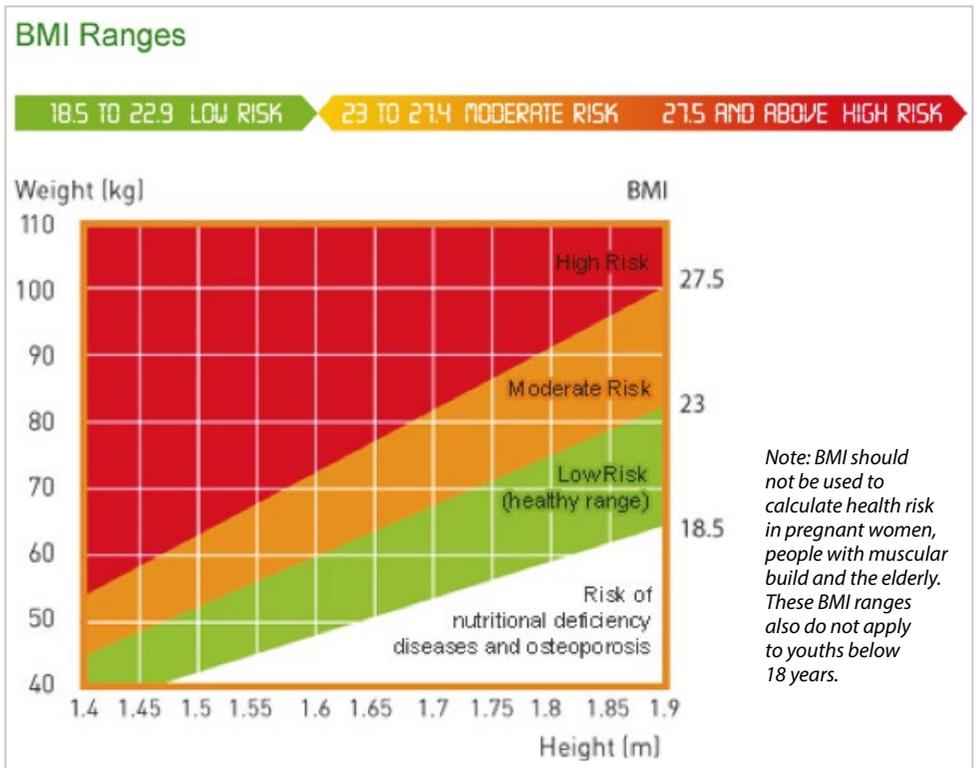
An oral appliance reduces snoring and OSA by posturing the lower jaw forward to open the airway.

Sleep studies are necessary every few years to determine if the OA is still effective. OA treatment becomes less effective with weight gain and increased severity of OSA.

The following are advised in OSA treatment using an OA:

- Maintain good oral health and have a dental check-up every six months.

- Make sure the nasal passage is patent for breathing through the nose.
- Exercise regularly and keep to a healthy weight in the BMI range below 23.



Healthy BMI Chart (extracted from www.healthhub.sg)

Jaw Surgery in Managing Adults with OSA

In severe OSA cases, after all alternative forms of treatment have been tried and are not effective, there is an option for Maxillomandibular Advancement (MMA) surgery or jaw surgery.

It is a major surgical procedure, whereby both the upper and lower jaws are surgically advanced using orthognathic surgery techniques. It is done in conjunction with fixed orthodontic braces to shift the upper and lower teeth into a good bite after the surgery.

The duration of treatment may take as long as one to three years. All soft tissues and muscles attached to the jaws are brought forward. This pulls on the lax soft tissues to tighten them up.

The airway and larynx open up and become much bigger when the soft palate and tongue are relocated anteriorly after surgery. Long-term studies show a high success rate in managing OSA with this procedure, which also achieves good quality of life outcomes.

Surgery

Surgery is indicated for OSA when first-line treatment, such as behavioural and lifestyle modifications, CPAP therapy as well as dental appliances, have failed. Surgery is also recommended, when you have easily correctible abnormalities of the upper airway, such as enlarged tonsils and adenoids.

Patients may also need nasal surgery if they have nasal congestion affecting CPAP usage.

Planning for the Surgical Treatment of OSA

When surgery is being considered for a patient, the upper airway should be examined with a flexible nasoendoscope performed by an Ear, Nose and Throat (ENT) specialist to identify the sites of upper airway obstruction during sleep.

Obstruction can occur at one or several locations: nose, soft palate in the oral cavity, tonsils, base of the tongue and epiglottis.

A combination of surgeries may be performed when the obstructions occur at multiple sites. It is therefore crucial to identify the obstructing areas in order for the surgery to be tailored for each individual, and to avoid unnecessary surgery.

Other investigations to evaluate the upper airway may be performed, including:

- Lateral cephalometry
- Computed tomography (CT) or magnetic resonance imaging (MRI) scans of the upper airway, awake or asleep
- Drug-induced sleep endoscopy
- Computer-assisted airway measurements (CAM)

Types of Surgery for OSA

The purpose of surgery is to reduce, remove or reposition tissues of the upper airway, in order to increase the upper airway dimensions and reduce obstructions.



Normal airway



OSA airway

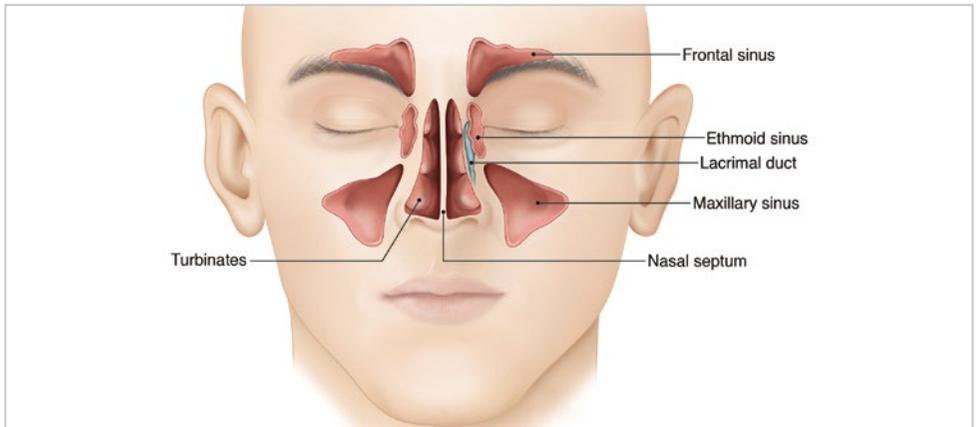
1. Nasal Surgery

In the nose, normal structures like the turbinate may be enlarged due to allergic rhinitis. The nasal septum that divides the nose into the left and right sides may also be deviated to one side.

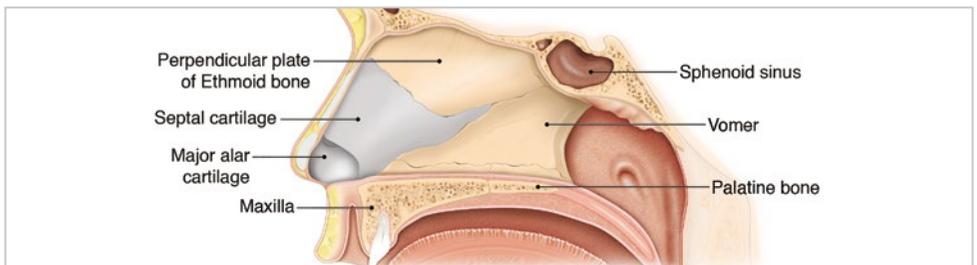
Sinusitis, nasal polyps and enlarged adenoids can also contribute to nasal obstruction which results in mouth breathing.

This causes the tongue to fall backwards, contributing to upper airway obstruction. Nasal obstruction also reduces CPAP compliance due to nasal discomfort.

Treatment of nasal obstruction begins with allergen avoidance, medications like antihistamines, intranasal steroids, nasal decongestants and antibiotics when required. Nasal surgery is indicated when medical therapy fails.



Nasal passage with sinuses



Nasal septum and upper airway

Surgical options to relieve nasal airway obstruction include:

- Reducing the size of the turbinates
- Straightening the deviated nasal septum
- Removing enlarged adenoids
- Endoscopic sinus surgery to treat nasal polyps and sinusitis

2. Palatal Surgery

The area behind the soft palate is the most common site of obstruction, contributing to snoring and OSA.

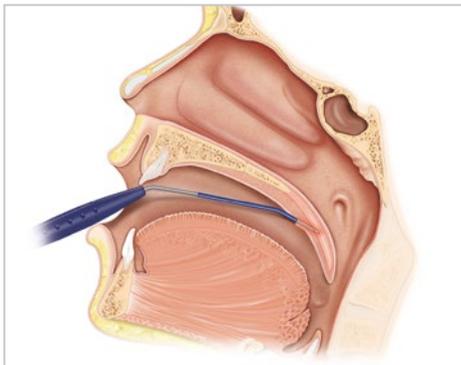
This is usually a result of bulky, floppy, low-lying soft palate, enlarged tonsils, excessive posterior tonsillar pillar muscles or mucosa, elongated uvula and redundant lateral pharyngeal mucosa.

For those with snoring and mild or moderate OSA, radiofrequency ablation of the soft palate may be performed under local anaesthesia, to reduce the floppiness and bulkiness of the soft palate.

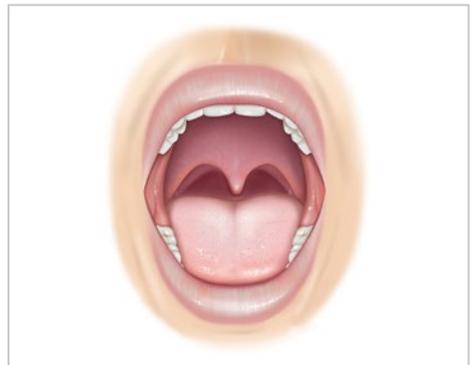
Alternatively, tonsillectomy and Uvulopalatopharyngoplasty (UPPP) or one of its many variations can be performed under general anaesthesia to increase the airway dimensions behind the soft palate.



Narrowed oropharyngeal airway with long soft palate



Radiofrequency of the soft palate



Enlarged oropharyngeal airway

Some of the variations of UPPP include:

- **Uvulopalatal flap**
- **Relocation pharyngoplasty**
- **Lateral pharyngoplasty**
- **Barbed reposition pharyngoplasty**

3. Hypopharyngeal and Base of Tongue Surgery

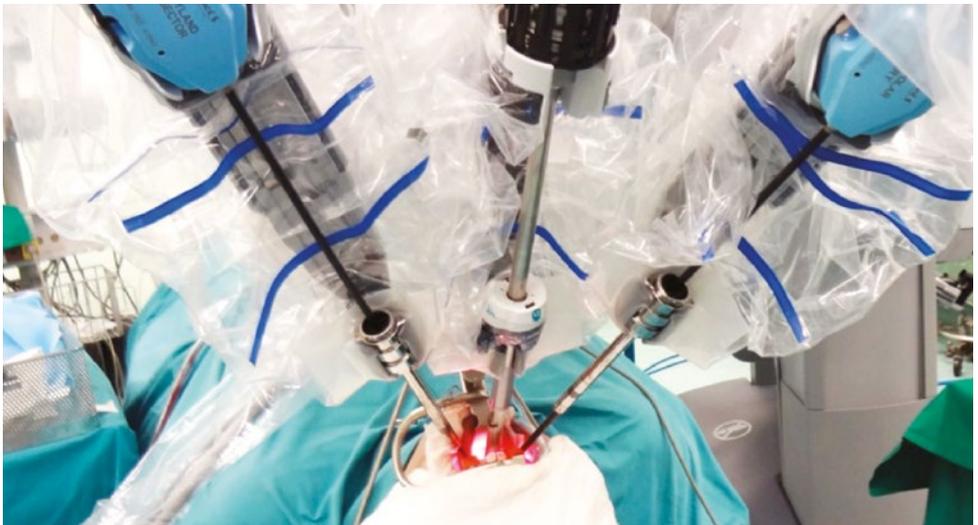
The base of the tongue and lingual tonsils (lymphoid tissue at the base of tongue) may be enlarged, contributing to upper airway obstruction during sleep.

The epiglottis (cartilage situated behind and below the base of the

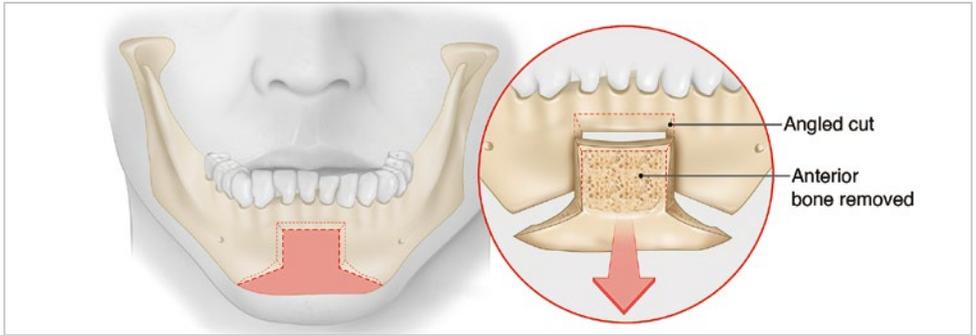
tongue) can also cause airway obstruction during sleep. Some people may have a small lower jaw that leaves less room for the tongue, resulting in posterior displacement of the tongue, reducing the size of the upper airway.

Options to treat obstruction, include both soft tissue surgery as well as bony skeletal surgery. **Soft tissue surgery** involves radio frequency ablation to reduce the size of the tongue, or **median glossectomy** to remove the middle portion of the back of the tongue.

Transoral Robotic Surgery (TORS) can be used to access the back of the tongue, allowing for superior access and view of the tongue base and hypopharyngeal area.



The da Vinci Transoral Robotic Surgery (TORS) for OSA



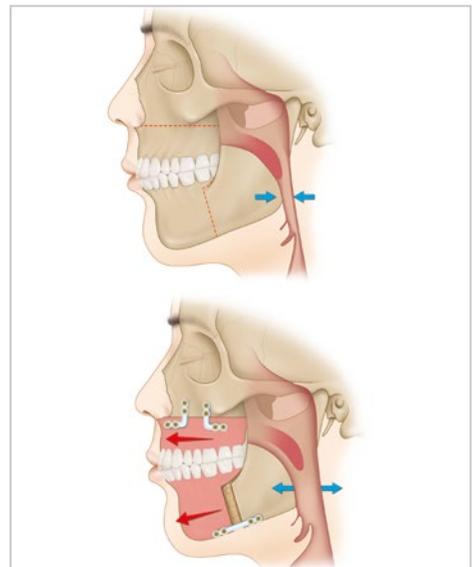
Genioglossus advancement – tongue muscle is pulled forward to increase the airway space at the back, and to increase the tension of the tongue, to reduce obstruction during sleep.

Bony skeletal surgery to the lower jaw can also be performed to increase the airway size behind the tongue, and increase tension on the tongue to prevent it from falling backwards and causing obstruction during sleep. Examples of such surgeries include:

- **Sliding genioplasty**
Surgery to cut and reposition a part of the chin bone towards the front.
- **Genioglossus advancement**
Surgery where the tongue is pulled forward.
- **Hyoid suspension**
Surgery where the hyoid bone (U-shaped bone in the front midline of the neck) and its muscle attachments to the tongue and airway are pulled forward.

4. Maxillomandibular Advancement Surgery

Maxillomandibular advancement (MMA) is a more invasive but effective surgery, with up to a 90 percent success rate.



In maxillomandibular advancement surgery, the upper and lower jaws are surgically advanced to open the airway.

This procedure is performed when nasal, palate and tongue base surgeries are not effective enough. It involves breaking the mid-face and lower jaw bones to move them forward, increasing the space behind both the palate as well as the tongue base.

5. Hypoglossal Nerve Stimulation

Hypoglossal nerve stimulation is a novel form of therapy in treating OSA by increasing upper airway muscle tone during sleep.

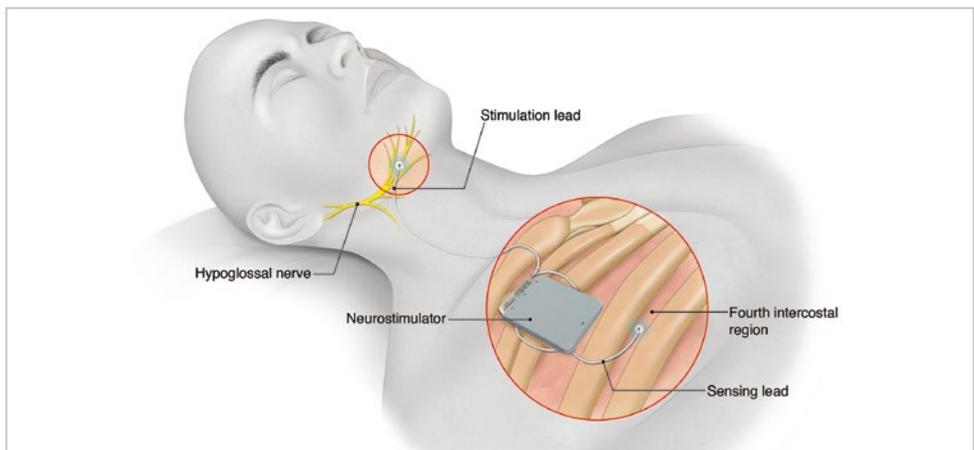
This is achieved by implanting a device beneath the skin in the chest. This device is switched on by the patient just before sleep, and it applies mild stimulation to the hypoglossal nerve that supplies the tongue. This achieves optimal tongue protrusion required to prevent tongue base obstruction during sleep.

6. Tracheostomy

Tracheostomy involves creating a hole in the windpipe (trachea) in the lower part of the neck to bypass the upper airway obstruction. The patient, thereafter, will be breathing through the hole in the lower neck during sleep.

A tracheostomy tube may be placed through this hole to help with the breathing. It is used in people with refractory airway obstruction, and in the morbidly obese with medical conditions that contraindicate surgeries that are more extensive.

Although this is a simple procedure with a success rate of almost 100 percent, this option is poorly accepted by patients, due to the stigma and problems that comes with breathing through a hole in the lower part of the neck.



Hypoglossal nerve stimulation

CONCLUSION

There are numerous surgical options for the treatment of OSA for patients who have failed CPAP therapy. Everyone has a different upper airway and a different cause of OSA. A single surgical treatment protocol will not work for all.

Surgery needs to be individualised to each and every single patient to ensure that unnecessary surgery is not performed. The most conservative surgical option is also the most effective.

ADVICE ON RISK REDUCTION FOR OSA

- Reduce weight if you are obese
- Exercise regularly
- Quit smoking
- Avoid consuming alcohol at night. Alcohol causes relaxation of the upper airway muscles.
- Avoid sleeping pills/sedatives as these may cause relaxation of the upper airway muscles.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Singapore General Hospital Tel: 6321 4377

Changi General Hospital Tel: 6850 3333

Sengkang General Hospital Tel: 6930 6000

KK Women's and Children's Hospital Tel: 6294 4050

National Dental Centre Singapore Tel: 6324 8802

National Neuroscience Institute Tel: 6321 4377

INSOMNIA

What is Insomnia?

Insomnia is the complaint of inadequate or poor quality sleep that interferes with normal daytime functioning.

For some people, insomnia means difficulty in falling asleep or waking up frequently during the night with problems getting back to sleep. For others, it is waking up too early in the morning and/or experiencing unrefreshing sleep. It can be transient or chronic.

Everyone has a rough night or two, or short-term (transient) insomnia. Chronic insomnia, though, lasts for more than a month.

You should consider seeking medical advice if your sleep has been disturbed at least several times over the past month, has gone on for weeks and months, or if it interferes with the way you feel or function during the day.

INTRODUCTION

Sleep is essential for health providing rest and restoration for the mind and body. It is the regular period in every 24 hours when we are unconscious and unaware of our surroundings. There are two main types of sleep:

- **Non-REM sleep**
The brain is quiet, but the body may move around. Hormones are released into the bloodstream and our body repairs itself after the wear and tear of the day.
- **Rapid Eye Movement (REM) sleep**
It comes and goes throughout the night and makes up about one-fifth of our sleep time. During REM sleep, our brain is very active, our muscles are very relaxed, our eyes move quickly from side to side and we dream.

“ There is no ‘normal’ amount of sleep; more importantly is how well you sleep, not how long your sleep is. ”

We move between REM and non-REM sleep about five times throughout the night, dreaming more as we get towards the morning.

During a normal night, we will also have short periods of waking. These last one or two minutes and happen every two hours or so. We are not usually aware of them. We are more likely to remember them if we feel anxious or if there is something else going on - noises outside, our partner snoring etc.

HOW MUCH SLEEP DO WE NEED?

There is no 'normal' amount of sleep; more importantly, it is how well you sleep, not how long your sleep is. Sleep requirements change during the course of a lifetime.

- Babies sleep for about 17 hours a day.



Sleep requirements change during the course of a lifetime.

- Older children require nine or 10 hours per day.
- Most middle-aged people function best on seven to nine hours of sleep, though some do well with as little as four hours, while others need up to 11 hours.

Older people need the same amount of sleep, but will often only have one period of deep sleep during the night - usually in the first three or four hours, after which they wake more easily.

We also tend to dream less as we get older. Older people also often find that their sleep at night is broken, particularly if they take naps during the daytime.

WHAT IF I DO NOT SLEEP?

The occasional night without sleep will make you feel tired the next day, but it will not harm your physical or mental health.

However, after several sleepless nights, you will start to find that:

- You are tired all the time
- You drop off to sleep during the day
- You find it difficult to concentrate
- You find it hard to make decisions
- You start to feel depressed

This can be very dangerous if you are driving or operating heavy machinery. A lack of sleep may also make us more vulnerable to high blood pressure, obesity and diabetes.

CAUSES

Insomnia is a symptom of another problem. It can be caused by any of a number of factors.



Psychological Factors

Tendency to insomnia

Some people seem more likely than others to have insomnia during times of stress.

Other people respond to stress by getting a headache or stomach ache. Knowing that you are likely to get insomnia, and that it will not last too long can be helpful in dealing with it when it happens.

Persistent stress

Relationship problems, a child with a serious illness or an unrewarding job may contribute to sleep problems. Learning to deal with stress may help treat your insomnia.

Psychophysiological (learned) insomnia

If you sleep poorly during times of stress, you may worry about not being able to function well during the day. You may decide to try harder to sleep at night. This usually makes things worse.

After a few nights, some of the things you do to get ready for bed may remind you of your trouble sleeping. Changing into your night clothes and turning off the lights will suddenly make you wide awake.

Some people with psychophysiological insomnia may fall asleep quickly when they are *not* in bed. They may drift off on the couch, while reading the newspaper, watching television or driving.

Even a few nights of poor sleep during a month can trigger psychophysiological insomnia.



Lifestyle

Stimulants

Caffeine keeps people awake. If you have coffee in the evening, your sleep will be less restful, even if it does not keep you from falling asleep.

Nicotine also keeps people awake, and smokers may take longer to fall asleep than non-smokers. Many medications have stimulants in them. These include weight-loss, anti-allergy and asthma medications. Some cold remedies also have stimulants in them.

Alcohol

You may think having a glass of wine at bedtime will help you sleep. But alcohol, while it may help you fall asleep quickly, is likely to make you wake up briefly throughout the night.

Work hours

If you are a shift worker, you are more likely to experience sleep problems. This includes workers who have changing shifts. It also includes people who work nights or early mornings.

Keeping the same schedule, even on weekends, is important. It can help to programme your body to sleep at certain times and to stay awake at others.

Waking up at the same time every morning is one way to establish a stable sleep pattern. Having a routine is important.

Exercise

You may think that resting and having a quiet lifestyle helps to prevent insomnia. In fact, people who get little or no exercise may find it hard to sleep at night.

Regular exercise helps people to sleep better. The best time to exercise is in the afternoon. Do not exercise close to bedtime. Leave at least two hours before your bedtime for your heart rate to slow down after the exercise.

Sleeping pills

Sleeping pills should be used as directed by your doctor. Some sleeping pills stop working after a few weeks if they are used every night.

If you stop using them suddenly however, your sleep may be worse for a time. This problem can be reduced, by cutting back slowly on the use of sleeping pills. Your doctor will help you with this.



Regular exercise helps you to sleep better.



Environmental Factors

Noise

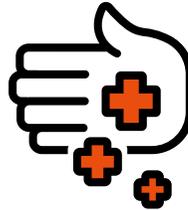
Keep the bedroom as quiet as possible. Passing traffic, airplanes, the television and other noises can disturb your sleep even when they do not cause you to wake up.

Light

Use shades or heavy curtains to keep your bedroom dark. Light comes through your eyelids even when your eyes are closed. Light can disrupt your sleep.

Physical and Psychiatric Illness

Many medical problems can disrupt sleep and lead people to complain that they have insomnia.



Psychiatric problems, other sleep disorders and physical illnesses may change your sleep in ways that can be easily mistaken for insomnia. Treating the medical disorder may treat the insomnia.

Medical illnesses

These include gastric reflux with heartburn, chronic obstructive lung disease, asthma, congestive heart failure, menopausal hot flashes, arthritis and other causes of chronic pain, and overactive thyroid.

Psychiatric problems

One kind of insomnia – waking up very early – is one of the most common complaints of people with depression.

If you have a psychiatric disorder, you may sleep poorly. Treatment of the underlying disorder can help to improve your sleep.

Sleep disorders

These include obstructive sleep apnoea, periodic limb movement disorder and a restless leg syndrome.

“ Waking up at the same time every morning, is one way to establish a stable sleep pattern. ”

“ *Everyone can benefit from improved sleep hygiene.* ”

DIAGNOSIS

People with insomnia are evaluated by a psychiatrist for a thorough medical and sleep history. An overnight sleep study may be recommended if there is a suspicion that there may be a primary sleep disorder, such as sleep apnoea.

Your doctor can make sure that your sleeplessness is not the result of a physical illness, a prescribed medicine, or emotional problems and make appropriate recommendations and treatment. You may be asked to keep a sleep diary showing sleeping and waking patterns for a week or two.

TREATMENT

Treatment will depend on the cause of the insomnia. A combination of behavioural approaches and medications are usually offered.

Nearly everyone can benefit from an improved sleep hygiene. People with sleep disorders should work with their doctors to diagnose the problem and treat conditions that may be responsible.

If your doctor diagnoses primary insomnia, consider behavioural therapy first, then discuss the proper use of prescription sleeping pills.



If you are not sleepy at bedtime, do something relaxing to take your mind off worries about sleep.

GOOD SLEEP HYGIENE

These simple tips can help you get a good night's sleep:

1. Do not go to bed unless you are sleepy.

If you are not sleepy at bedtime, then do something else. Read a book, listen to soft music or browse through a magazine.

Find something relaxing but not stimulating to take your mind off of worries about sleep. This will relax your body and distract your mind.

2. Use your bed only for sleeping and sex and never for reading or watching TV.

If you are not asleep after 15 - 20 minutes, get out of bed. Find something else to do that will make you feel relaxed.

If you can, do this in another room. Read quietly with a dim light, but do not watch the TV since the full-spectrum light emitted by the TV has an arousing effect.

Similarly, using your phone just before your bedtime is not recommended due to the arousing effect from the light emitted. When you feel sleepy, get back into bed.

3. Do not nap during the day unless it is absolutely necessary.

Even then, restrict your nap to 15 - 20 minutes in the early afternoon.

4. Begin rituals that help you to relax each night before bed.

Establish a regular bedtime and a relaxing bedtime routine, such as taking a warm bath or listening to soothing music.

Whenever possible, wind down late in the day, such as by scheduling stressful or demanding tasks early, and the less challenging activities at a later time.

5. Get up at the same time every morning.

Do this even on weekends and on holidays.

6. Eat properly and practise healthy habits.

- Do not go to bed hungry, but do not eat a big meal near bedtime either.
- Avoid caffeine, especially after mid-afternoon.
- Avoid alcohol after dinner time; although many people think of it as a sedative, alcohol can actually impair the quality of your sleep.

- Try to avoid all beverages after dinner if you find yourself getting up at night to urinate.
- Do not have a cigarette or any other source of nicotine before bedtime.
- Get plenty of exercise early in the day. Avoid any tough exercise within three hours of your bedtime.

7. Make your bedroom quiet, dark and a little bit cool.

Your bedroom should be well-ventilated and kept at a constant, comfortable temperature.

Try using a sleep mask or ear plugs to compensate for any problems in your sleeping environment.

8. Above all, do not worry about sleep.

Watching the clock never helps. Except when keeping a sleep diary, do not keep track of the amount of time you spend trying to sleep. Instead, rest quietly and peacefully.

Try not to lie in bed reviewing your problems and plans. If you are overloaded, get out of bed and make a list. Then return to bed and think of something relaxing and pleasant.

COMMON (PSYCHOLOGICAL) BEHAVIOURAL APPROACHES

Relaxation therapy

Learn deep breathing, progressive muscle relaxation or meditation. These techniques help to reduce or eliminate anxiety and body tension.

Relaxing your mind at bedtime will help you drift off to sleep. It takes much practice to learn the techniques and to achieve effective relaxation.

Stimulus control therapy

Go to bed only when you are sleepy. Do not read, watch the TV or snack in bed. Get up at the same time every day, no matter how little sleep you have had.

Avoid daytime napping. This technique helps to recondition you such that you associate the bed and bedtime, with sleep only.

Sleep restriction therapy

Some people suffering from insomnia spend too much time in bed unsuccessfully trying to sleep. If this is the case for you, reduce your time in bed to the estimated total time you sleep in an average night (minimum five hours) by going to bed at a later time.

Get up at the same time every day. Maintain the same bedtime every night for a week, and then move it 15 minutes earlier every week until you get a satisfying, relaxing amount of sleep. Then maintain the same schedule every day.

Cognitive therapy

Learn to replace negative thoughts about sleep ('I will never get to sleep tonight', 'I will not be able to function tomorrow', or 'I will fall sick unless I sleep eight hours a night') with positive thoughts ('If I relax peacefully in bed, my body will take care of itself').

MEDICATION

People have used sleeping tablets for many years, but we now know that:

- They do not work for very long.
- They leave you tired and irritable the next day.
- They lose their effect quite quickly, so you have to take more and more to get the same effect.

- Some people become addicted to them. The longer you take sleeping tablets, the more likely you are to become physically or psychologically dependent on them.
- There are some newer sleeping tablets (Zolpidem and Zopiclone), but these seem to have many of the same drawbacks as the older drugs, such as Valium and Ativan.

Sleeping tablets should only be used for short periods (less than two weeks) - for instance, if you are so distressed that you cannot sleep at all.

If you have been on sleeping tablets for a long time, it is best to slowly cut down the dose after discussing it with your doctor. In some cases, antidepressant tablets may be helpful.

Over-the-counter medications *are not usually recommended, for the treatment of insomnia.*

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Singapore General Hospital Tel: 6321 4377

Changi General Hospital Tel: 6850 3333

Sengkang General Hospital Tel: 6930 6000

KK Women's and Children's Hospital Tel: 6294 4050

National Dental Centre Singapore Tel: 6324 8802

National Neuroscience Institute Tel: 6321 4377

JET LAG, SHIFT WORK AND CIRCADIAN RHYTHM DISORDERS

Commonly known as the 'body clock', the circadian rhythm is an innate cyclical rhythm that regulates many bodily functions automatically throughout the day and does not require conscious control.

Keep to a regular sleep schedule to help avoid sleep difficulties.



There are those that are apparent to us, such as the sleep-wake cycle and the digestive cycle, for which we feel sleepy or hungry when we reach a certain time of the day. There are also those that are not so obvious, such as core body temperature and the release of hormones into the bloodstream.

In human beings, this innate rhythm cycles between the duration of 24.2 to 24.9 hours, just slightly longer than a day. This could potentially create a messy situation where we could fall asleep or need to eat at very inconvenient timings, over a period of time.

Fortunately, this 'clock' is synchronised to the 24-hour day by environmental inputs, most importantly by sunlight, as well as by social rhythm, such as common meal times, work schedules and physical exercises.

Genetics largely influence the variations between individuals, hence there are people whom we recognise as 'larks' (preferring to sleep early in the night) and 'night owls' (ability to stay up late into the night).

Genetics also determines the ability of individuals to adapt to time cues in the daily cycle, and hence the ability to 'tune their clocks'.

With age, this innate rhythm can also change in its cycle length, commonly reflected through changes in sleep pattern as one grows older.

PROBLEMS WITH CIRCADIAN RHYTHM

It is important that you keep to a regular sleep schedule, as this maintains synchrony of the 'body clock' with the demands of social activities and duties. Any situation that desynchronises the circadian rhythm and the social rhythm will result in sleep difficulties, as well as problems in maintaining alertness.

The most common causes of disruption to circadian rhythm are jet lag, shift work and circadian rhythm disorders.

1. Jet Lag

This is a transient condition in which the circadian rhythm is temporarily out of synchronisation with the external environment when a person travels across several time zones rapidly.

Symptoms

The symptoms are usually daytime fatigue and sleepiness, insomnia, stomach upsets, moodiness and feeling of unsteadiness. Some may also experience chills, and others have episodes of feeling hot and sweaty.

As our body clock runs slightly longer than 24 hours, **jet lag is worse when we travel eastwards than when we travel westwards**. It is easier to lengthen the day (delaying going to bed) than to shorten it (trying to fall asleep earlier). After travelling from east to west, early waking is the main problem, as opposed to difficulty falling asleep when travelling from west to east.



Flying westwards can cause less jet lag.

Our circadian rhythm will eventually synchronise with the local time at the destination, at a rate of roughly one day per hour of time difference.

Tips for managing jet lag:

1. If you are able to, choose a destination that involves flying westwards.
2. Choose daytime flights to avoid losing sleep.
3. Use sleeping aids such as blindfolds, ear plugs, and neck rests to help you sleep during the flight.
4. Adjust to local time by keeping to local routines at your destination, such as taking meals and staying awake when the locals do.
5. Try to keep awake during daytime. Staying in a brightly lit environment will facilitate the adjustment of the body clock.
6. If necessary, naps should be short, and planned so as not to affect night time sleep.
7. Melatonin supplement may be helpful for jet lag symptoms and improving sleep when taken near bedtime.
8. Exercise during the day.
9. Caffeine may help in maintaining alertness.
10. Plan ahead for your journey and make allowances for adjustments where possible.

2. Shift Work

Shift workers are people who work non-traditional hours, which may be exclusively at night, or on rotating shifts. They often face problems similar to jet lag, even without crossing time zones. The differences between their 'day' during which they are working, and the natural day-night cycle have resulted in a desynchronised circadian rhythm. While some may have no problems adapting to this demand, many suffer from sleep problems.

They may experience insomnia, and may not get enough sleep during the day as the brain remains active, culminating in sleep deprivation. This eventually leads to wake time sleepiness and impaired work performance. They may have sleep problems even on their days off.

The main objective of managing shift work sleep problems is to try to resynchronise the circadian rhythm to the work schedule as



Adjust your body clock to manage shift work sleep problems.

quickly as possible. In addition, we try to improve on the quality and duration of sleep at bedtime to reduce effects of sleep deprivation.

This is typically easier to achieve for people who work regular shifts, and treatment is similar to that for jet lag, which is to adjust the body clock to a new 'daytime'.

What if I work rotating shifts?

The day before night shift: Get up at your usual time and have meals as usual. Take a two to three hour nap in the late afternoon or early

evening to reduce your sleep debt before the start of your duties.

During the shift: Take a power nap for 30 minutes if possible to reduce the sleep debt. Avoid too long a nap as you may have more difficulty getting into an alert state.

Day after the night shift: If you have to work another night shift, get six to eight hours of sleep when you get home. If you cannot get a long enough sleep, nap in the late afternoon or early evening as described earlier. If you do not have to work nights again, catch a short two to three hour nap after you get home and stay awake till your normal bedtime.

Tips to cope with rotating night shifts:

1. Maintain a regular sleep routine on normal work days and on rest days.
2. Plan naps to reduce sleep debt during night shift periods, and catch up on sleep on rest days.
3. Eat properly and maintain sufficient exercises to provide cues for maintenance of circadian synchronisation.

Tips to sleep better during the day:

1. Maintain general sleep hygiene principles. Avoid strenuous exercises, caffeine and nicotine four hours before bedtime.
2. On your way home from night shift, use dark sunglasses to reduce the effects from the bright morning sunlight which may influence the circadian rhythm.
3. Keep a conducive sleep environment: Use dark curtains and ear plugs, if necessary.
4. Learn some relaxation skills and avoid trying too hard to get to sleep.
5. Avoid the temptation to defer sleep to attend to personal administrative or social tasks – plan to do these after your rest period.
6. If necessary, see your General Practitioner (GP) for short-term prescription of sleeping aids. Use these medications on an as needed basis only.

Scheduling enough time to sleep is important and should be actively prioritised and planned for. Good sleep is essential to well-being, and allows one to function efficiently and safely.

3. Circadian Rhythm Disorders

These include the delayed sleep phase syndrome ('night owl') or the advanced sleep phase syndrome ('morning lark').

Delayed sleep phase syndrome is more commonly seen in teenagers and may be related to a combination of physiologic and environmental factors.

Developmental changes in the brain's circadian centres during adolescence – poor sleep hygiene associated with increasing amounts of school work, and the widespread use of computer devices and smartphones late into the night (which activate special receptors in the eye), combine to delay the body's intrinsic sleep cycle. This results in the affected patients being only able to fall asleep in the early morning hours and waking up in the late morning or early afternoon, regardless of whether they are trying to fall asleep or not.

This can cause significant disruptions to their schooling or work performance.

Advanced sleep phase syndrome is more commonly seen in the middle-aged and elderly. This may be due to the natural shortening of our internal sleep cycle with increasing age but it may also be contributed by poor sleep hygiene and changing sleep habits that elderly people commonly experience.

Sufferers go to sleep very early in the evening and wake up in the wee hours of the morning and are unable to go back to sleep again.

Apart from the inconvenience and the inability to partake in evening social events, insomnia in the early mornings, poor quality sleep, daytime fatigue and sleepiness as well as depression are common associated complaints.

TREATMENT OF ADVANCED OR DELAYED SLEEP PHASE SYNDROME

Consultation with a sleep specialist is essential for accurate diagnosis and to exclude other common sleep conditions. An individualised treatment plan can then be tailored accordingly and this may include the following:

1. Optimise sleep hygiene and maintain regular sleep-wake cycles, even on weekends
2. Timed bright light exposure with a special phototherapy device at specific and individualised timings
3. Timed melatonin administration

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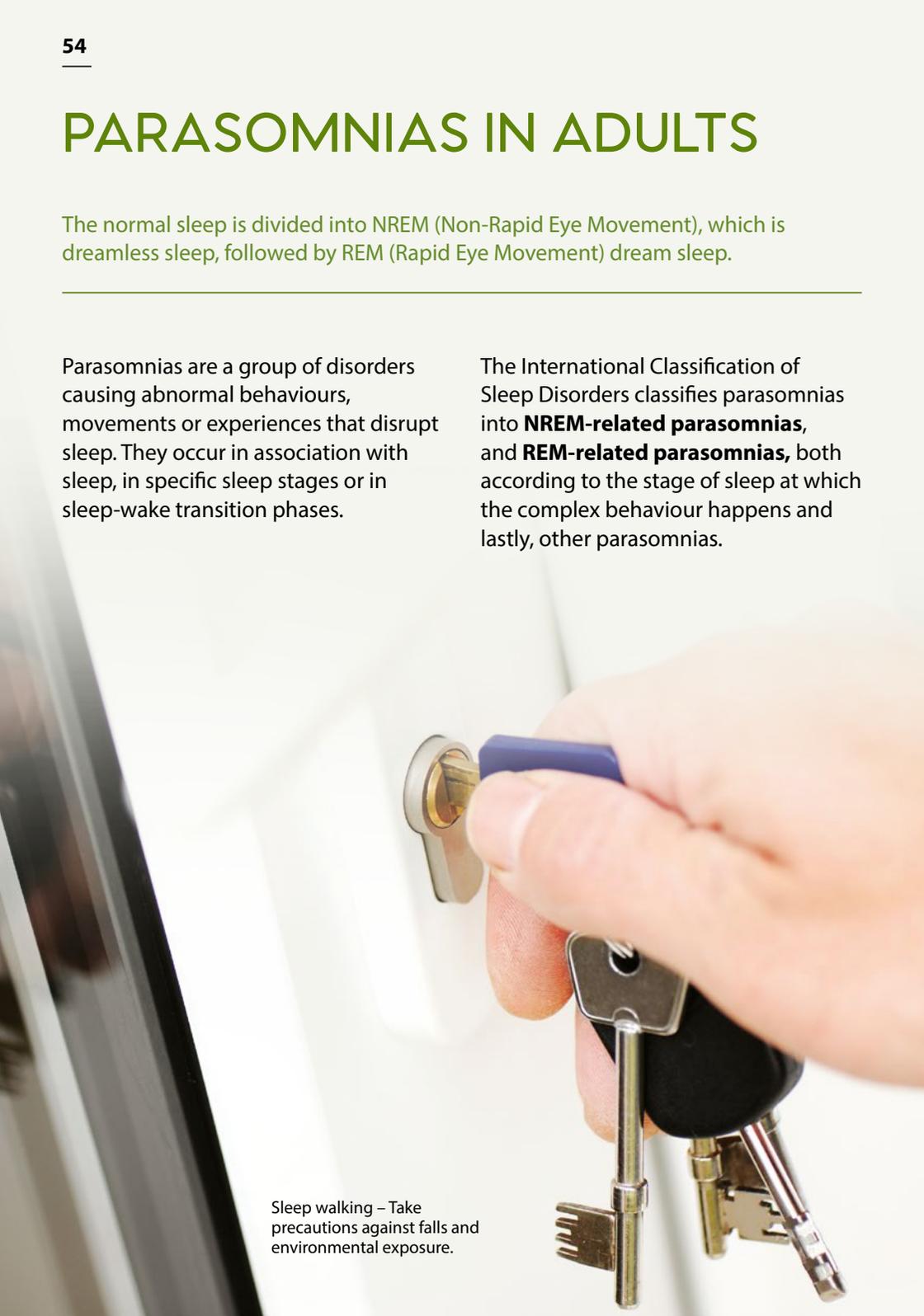
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PARASOMNIAS IN ADULTS

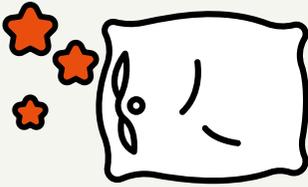
The normal sleep is divided into NREM (Non-Rapid Eye Movement), which is dreamless sleep, followed by REM (Rapid Eye Movement) dream sleep.

Parasomnias are a group of disorders causing abnormal behaviours, movements or experiences that disrupt sleep. They occur in association with sleep, in specific sleep stages or in sleep-wake transition phases.

The International Classification of Sleep Disorders classifies parasomnias into **NREM-related parasomnias**, and **REM-related parasomnias**, both according to the stage of sleep at which the complex behaviour happens and lastly, other parasomnias.



Sleep walking – Take precautions against falls and environmental exposure.



NREM-RELATED PARASOMNIAS

NREM parasomnias are disorders of arousal that usually happens during deep sleep Stage 3 NREM but can also occur in light sleep Stage 2 NREM.

NREM parasomnias are disorders of arousal from sleep and consists of the following types:

- Confusional arousals
- Sleepwalking
- Sleep terrors
- Sleep-related eating disorders

NREM parasomnias are more common in children than adults, and the estimated prevalence in the adult population is around four percent.

Confusional arousals, otherwise called 'sleep drunkenness', are a type of parasomnia where the person suddenly wakes up from sleep, and is associated with a confused state of mind and appears bewildered. It mostly lasts for a few minutes to 15 minutes.

Sleepwalking, or Somnambulism, usually starts abruptly within the first one-third of sleep and generally lasts for less than 10 minutes.

Sleepwalking is characterised by complex behaviours in sleep, mostly walking. The sleepwalking is usually slow and quiet with the eyes open. Occasionally, the sleepwalkers can do goal-directed tasks, such as cleaning, rearranging furniture, driving, and sometimes life-threatening actions, like jumping out of windows.

The episodes of sleepwalking terminate spontaneously, with the person waking up in a different location or returning to bed without incident. Sometimes, the person may become confused and agitated when others try to fully wake them up from the sleepwalking episodes.

Safety is the main concern during sleepwalking, as injury may occur during walking, from falls and environmental exposure.

Sleep-related eating disorders is a condition similar to sleepwalking, where the person wakes up from sleep with a partial arousal and does involuntary eating of both edible and inedible things, such as pet food etc.

Sleep terror or night terror manifests as a sudden arousal from sleep, with intense fear and screaming associated with a flushed face, sweating of the whole body and palpitations.

The person suffering from NREM parasomnias has no recollection of those events when asked about them.

Management

If you suspect that you are suffering from NREM parasomnias, seek appropriate medical attention to rule out other medical conditions or medications which can cause parasomnias.



The person suffering from NREM parasomnias will not remember the event.

You may need further investigations, such as a polysomnogram, to confirm the diagnosis by ruling out other sleep disorders. NREM parasomnias in adults are often treated with good sleep hygiene, avoidance of precipitating drugs, avoidance of sleep deprivation and discontinuation of stimulants, such as caffeine.

General safety measures should be put in place when a person has been diagnosed with parasomnias. The environment has to be made safe, i.e. to lock doors and windows, remove dangerous items and other hazards.

Family members should be aware of this condition, and educated on how to tackle gently when the person is having an episode of parasomnia without confronting the person.

Treatment with medicines, particularly a low dose of clonazepam, is useful in selected cases where the parasomnias are not responding to non-pharmacological treatment and the episodes are frequent and injurious to the person.



REM-RELATED PARASOMNIAS

REM sleep is the stage of sleep where we dream but are prevented from acting out our dreams by the accompanying relaxation of the whole body muscles (atonia).

There are three types of REM-related parasomnias - REM Sleep Behaviour Disorder (RBD), Recurrent Isolated Sleep Paralysis and Nightmare Disorder.

RBD is an important REM-related parasomnia commonly seen in the elderly, with a prevalence of two percent.

The classic characteristic feature is the presence of REM sleep without muscle relaxation (atonia) leading to violent and dream-enacting behaviours. There is also the appearance of various abnormal motor activities, like simple hand gestures, kicking and violent thrashing during REM sleep. This can cause self-injury or injury to the bed partner.

RBD is seen more in male than females, with a ratio of 9:1. RBD has been linked to dopamine dysfunction, and the incidence of RBD increases with neurodegenerative conditions, such as Parkinson Disease, Lewy Body Dementia and Multiple System Atrophy.

Antidepressant medications acutely precipitate or exacerbate dream-enactment behaviour in up to six percent of those affected, and medication-induced RBD is the most prevalent form of RBD among the young (< 40 years old). This should be kept in consideration.



Violent and dream-enacting behaviours can happen in REM-related parasomnias.



REM sleep behaviour disorder (RBD) can be effectively treated with medications.

Management

Patients suspected of suffering from REM-related parasomnias need to be thoroughly evaluated by a physician and undergo a polysomnogram for diagnostic purposes.

Once diagnosed with this type of parasomnia, particularly RBD, safety precautions in the sleeping

environment has to be properly followed. RBD can be effectively treated with medications, such as Melatonin and Clonazepam.

The patient has to avoid certain type of antidepressants which can precipitate RBD, followed by consulting the physician to look out for neurodegenerative conditions, as previously mentioned.

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RESTLESS LEGS SYNDROME AND PERIODIC LIMB MOVEMENTS IN SLEEP

What are RLS and PLMS?

Restless Legs Syndrome (RLS) is a sensory-motor neurological disorder that causes an irresistible urge to move the legs. It often begins at a very young age but is mostly diagnosed in the middle or later years.

When an involuntary twitching or jerking of the legs occurs during sleep, it is known as Periodic Limb Movements in Sleep (PLMS).

A young woman with long, dark hair is smiling and looking upwards. She is wearing a white, ribbed, off-the-shoulder top and holding a white coffee cup with a black lid. The background is a bright, out-of-focus outdoor setting.

The prevalence of RLS in the U.S and Europe is quoted to be around seven to 10 percent, whereas in Asia, it is reported to be around one to four percent. A local study done in Singapore showed a RLS prevalence of less than one percent. It is more common in women.

80 percent of RLS patients have PLMS. PLMS is usually picked up incidentally on overnight sleep studies. It is only clinically significant if it causes symptoms.

Restless legs syndrome begins at a very young age but is mostly diagnosed in middle or later years.

COMPLICATIONS

RLS can affect your quality of life.

Both RLS and PLMS can disturb sleep by causing sleep initiation insomnia and sleep maintenance insomnia respectively.

CAUSES

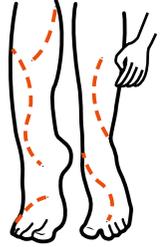
In the majority of cases, the underlying cause is unknown. Iron metabolism and dopamine, a neurochemical in the brain, are believed to play a role in causing RLS/PLMS.

RLS are often seen in patients with low iron levels, kidney failure, diabetes mellitus and low thyroid hormone.

About one in five pregnant women suffer from RLS in the last three months of pregnancy. The symptoms usually disappear after delivery. Some medications, for example, antidepressants, can trigger and worsen RLS/PLMS.

SIGNS AND SYMPTOMS

1 The patients often describe an unpleasant crawling or creeping sensation in the feet, calves and thighs. Occasionally, the arms can be affected.



2 The symptoms are worse in the evening or at night.

3 The symptoms are relieved by moving the legs.



4 The symptoms are worse at rest.



The symptoms of Restless Legs Syndrome (RLS) are worse in the evening or at night.

DIAGNOSIS

The diagnosis of RLS lies entirely on clinical features. An overnight sleep study is occasionally used to diagnose PLMS.

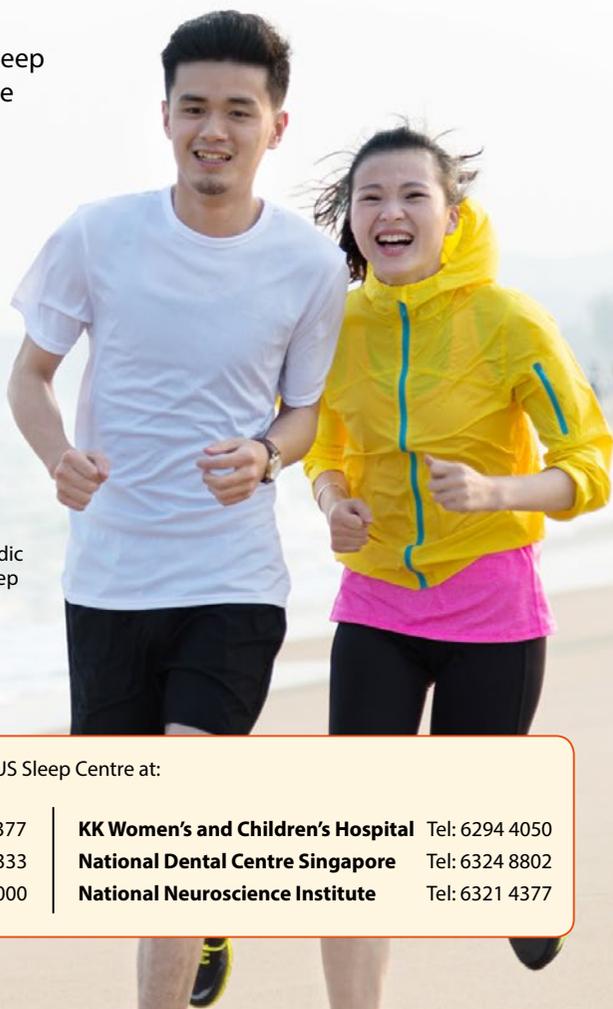
TREATMENT

First, to treat the underlying cause, if any. This includes stopping any medications that can trigger RLS/PLMS, if possible.

It is important to maintain good sleep hygiene, quit smoking and exercise regularly during the day.

The drug treatment includes: dopamine agonists, alfa-2 delta ligands (gabapentin, pregabalin) and opioids.

To manage restless legs syndrome and periodic limb movements in sleep, maintain good sleep hygiene, quit smoking and exercise regularly during the day.



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SLEEPY DRIVING

Sleepy driving is a serious problem that can lead to car crashes. Sleepiness causes motor vehicle accidents because it impairs concentration and can lead to the driver falling asleep at the wheel.

Important aspects of driving impairment associated with sleepiness are reaction time, vigilance, attention and information processing. The exact prevalence is not known in Singapore. Sleepiness-related crashes are an under-recognised problem and may be categorised as fatigue and inattention.

Although society today gives sleep less priority than other activities, sleepiness and performance impairment are responses of the human brain to sleep loss/deprivation. There is currently nothing that can reduce the human need for sleep. Microsleeps, or involuntary intrusions of sleep or near-sleep, can overcome even the best intentions to remain awake.

Microsleeps can overcome your best efforts to stay awake.



ACCIDENT CHARACTERISTICS

A typical crash related to sleepiness has the following characteristics:

- It occurs during late night/early morning or mid-afternoon.
- The crash is likely to be serious.
- A single vehicle leaves the roadway.
- The driver does not attempt to avoid a crash.
- The driver is usually alone in the vehicle.

RISKS FOR SLEEPY DRIVING CRASHES

- **Sleep loss**
The need for sleep varies among people - sleeping eight hours per 24-hour period is common, and seven to nine hours is needed to optimise performance. Sleeping less than four consolidated hours per night impairs performance on vigilance tasks. Acute sleep loss, even the loss of one night of sleep, results in extreme sleepiness.

The effects of sleep loss are cumulative. Regularly losing one to two hours of sleep a night can create a 'sleep debt' and lead to chronic sleepiness over time. Only sleep can reduce sleep debt. Sleep loss can be work-related or a lifestyle choice.

- **Sleep quality**

The quality of sleep is also important. Sleep disruption and fragmentation lead to inadequate sleep and can negatively affect functioning. Sleep fragmentation can be caused by illness, including untreated sleep disorders.

Disturbances such as noise, young babies, children, activity and lights, a restless/snoring spouse or job-related duties (e.g. workers who are on call) can interrupt and reduce the quality and quantity of sleep.

- **Driving patterns**

Late-night driving between midnight and 6 am, driving in the mid-afternoon hours and driving for longer periods without taking a break.

- **Use of sedating medications,** especially prescribed anxiolytic hypnotics, tricyclic antidepressants, and some antihistamines.

- **Untreated or unrecognised sleep disorders**, especially sleep-related breathing disorders, obstructive sleep apnoea syndrome and narcolepsy.
- **Consumption of alcohol**, which interacts with and adds to drowsiness.

A combination of these factors increases crash risk substantially.

WHY SLEEPY DRIVING ACCIDENTS HAPPEN

Sleepiness leads to accidents because it impairs human performances that are critical to safe driving.

People can use physical activity and dietary stimulants to cope with sleep loss and mask their level of sleepiness. However, when they sit still to perform repetitive tasks like driving, sleep comes quickly.

Sleepiness leads to:

- Slower reaction time: At high speeds, delay in reaction time can have a profound effect on crash risk.
- Reduced vigilance.
- It takes longer for information on the roads to be integrated and processed.



Sleepiness leads to slower reaction time.

PEOPLE AT HIGHEST RISK

- Young people (ages 16 to 29), especially males
- Shift workers whose sleep is disrupted by working at night or working long or irregular hours
- People with untreated sleep apnoea syndrome (SAS) and narcolepsy

ASSESSMENT FOR CHRONIC SLEEPINESS

The Epworth Sleepiness Scale (ESS) is an eight-item, self-report measure that quantifies individuals' sleepiness by their tendency to fall asleep 'in your usual way of life in recent times' in situations like sitting and reading, watching TV, and sitting in a car that is stopped for traffic.

People with a score between 10 to 14 are considered moderately sleepy, whereas a score of 15 or greater indicates severe sleepiness.

PREVENTIVE MEASURES

To prevent sleepy driving and its consequences, you need to know the benefits of behaviours that help you avoid becoming sleepy while driving.

These include:

1. Getting sufficient sleep and taking a short nap (15 to 20 minutes) when sleepy
2. Not drinking alcohol when sleepy
3. Limiting driving between midnight and 6 am
4. Taking caffeinated drinks/food e.g. coffee
5. Detection and treatment of illnesses that can cause excessive sleepiness like sleep-related breathing disorders, obstructive sleep apnoea syndrome and narcolepsy

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COMMON SLEEP CONDITIONS IN INFANTS, CHILDREN AND ADOLESCENTS

SLEEP IS IMPORTANT

Sleep is an important part of healthy growth and development in children, just like nutrition and physical activity.

Contrary to the common perception that sleep is only a passive state during which the bodily processes slow down and the body rests itself at the end of the day, many active physiological processes take place in the body during sleep.

Amongst these are memory consolidation and growth hormone secretion which are important physiological processes in children.

The paediatric sleep specialist is concerned with both the quality and quantity of sleep in children.

What can affect sleep?

Sleep-related disorders such as obstructive sleep apnoea can disrupt a child's sleep.

Medical conditions in children, such as uncontrolled asthma, allergic rhinitis and eczema, can affect the quality and duration of a child's sleep.

School and social pressures and the **increased usage of electronic devices** in this day and age can also impact the bedtime and the duration of sleep in children and adolescents.



Children need sleep for growth and memory consolidation.

Why get a good night's sleep?

Effects of Poor Sleep

Poor sleep can have various adverse effects on a child's health:

- Sleep deprivation can affect daytime alertness, judgement, memory, reaction time and motor performance.
- The lack of sleep is associated with behavioural problems and emotional disturbances which may reduce the ability of the child to perform optimally at school.
- Decreased slow wave sleep (one of the stages of sleep) is associated with decreased growth hormone secretion during sleep.
- Sleep deprivation is related to type 2 diabetes, obesity, hypertension, metabolic syndrome, reduced immunity and cardiovascular problems.

SLEEP REQUIREMENTS IN INFANTS AND CHILDREN

Sleep architecture (the pattern and proportion of the different sleep stages during sleep) and sleep requirements evolve with the development and maturation of the central nervous system, as a child progresses from infancy through childhood and adolescence to adulthood.

Newborns spend an average of 14 to 17 hours in a 24-hour period asleep. They may sleep for three to five hours at a stretch (two to three hours in breastfed babies), and then wake for one to three hours in between.

Infants between four to 11 months old sleep for an average of 12 to 15 hours in a 24-hour period. This includes sleep in the night, with usually two to four daytime naps.

In toddlers, their sleep needs averages between 11 to 14 hours in a 24-hour period (including daytime naps). The sleep duration decreases further in pre-schoolers, to between 10 to 13 hours. By five years of age, most children stop taking daytime naps.

School-going children should be highly active and alert during waking hours, and the majority require between nine to 11 hours of sleep at night.

At the onset of puberty, **adolescents** may develop a two-hour phase delay in their circadian rhythm ('body clock') leading to a natural tendency to fall asleep at later times. The majority of adolescents require an average of about eight to 10 hours of sleep.

There is no 'golden rule' to the exact amount of sleep needed at different ages, and there are often individual variations in sleep requirements, sleep patterns as well as tolerance to sleep deprivation. In general, the duration of sleep is sufficient if the child feels well-rested on waking spontaneously and is able to function normally throughout the day.

Some of the signs of insufficient sleep include:

- Excessive daytime sleepiness
- Mood disturbances
- Behavioural problems such as inattention, hyperactivity, oppositional behaviour and poor impulse control
- Impaired cognitive functioning, such as poor concentration, impaired vigilance, delayed reaction time and learning problems

GOOD SLEEP HYGIENE AND PRACTICES

The following advice can help children achieve better sleep:

- Maintain a consistent sleep and wake time daily, including school days and non-school days.

- Avoid using the bed for any other activity (e.g. reading, watching television, playing games on personal electronic devices, eating) other than sleeping.
- Avoid using the bedroom for time-out or punishment.
- Ensure that the bedroom is conducive for sleeping. Keep it dim, cool and quiet.
- Establish a regular relaxing routine before bedtime (e.g. brushing teeth, changing into pyjamas, reading of a story).
- Go to bed only when tired or sleepy, rather than spending too much time awake on the bed. If your child is unable to fall asleep after 20 minutes, consider letting him get out of bed to do some low stimulation activity (e.g. quiet reading) and then returning to bed later.



Do not use the bed for other activities other than sleeping.

- Avoid caffeine (e.g. coffee, tea, chocolate, cola and soda drinks) and nicotine (exposure to environmental tobacco smoke) at least four to six hours before bedtime.
- Avoid going to bed with a full stomach or when too hungry.
- Avoid stimulating activities before sleep (for e.g. watching of exciting/frightening television programmes, playing of games on personal electronic devices).
- Regular exercise is encouraged, but avoid exercise or strenuous activities at least four hours before bedtime.
- Every baby is different; your baby may have different sleep patterns from other babies and still be normal and healthy.
- Your baby will begin to sleep for longer periods of time at night as he/she grows and develops over time.
- All babies wake up spontaneously at least a few times during the night. They may require soothing and intervention from caregivers to fall back to sleep in the first couple of months. From the age of three to six months onwards, most will have the ability to self-soothe themselves back to sleep.

SLEEP ADVICE FOR PARENTS OF NEWBORNS AND INFANTS

The sleep and wake times of newborns and infants are often influenced by their need to be fed or changed.

It is important that parents understand how newborns and infants sleep so that they can set realistic expectations.

- Babies do not understand what is 'sleeping through the night', and many do not do so until they are more than three to six months old.



Babies, before three to six months old, do not sleep through the night.

Parents with newborns and infants may consider the following advice to help their babies develop the ability to self-soothe (*It is never too early to start!*):

- **Put your baby to the crib/bed drowsy but still awake** so that he/she can learn to fall asleep on his/her own. Babies/children who are accustomed to parental assistance at bedtime often require help again to fall back to sleep when they wake in the night.
 - **Avoid breastfeeding or bottle feeding your baby to sleep** so that he/she does not require this to fall asleep. Some parents find gentle rhythmic patting of their babies helpful in settling them to sleep, but it is best to stop the patting when the baby is quiet and about to fall asleep.
 - **Learn to identify signs of sleepiness in your baby.** Babies may express their need to sleep in different ways. Some babies fuss or cry, some rub their eyes or pull their ears, others lose focus in ongoing play or activity.
 - **Avoid picking your baby up immediately each time** he/she cries or fusses in the night. As long as safety is not a concern, allow your baby to try to fall back to sleep on his/her own first. If you need to check on your baby in the night, keep it brief and avoid turning
- on bright lights and engaging/stimulating activities. When feeding or changing your baby during the night, do so in a quiet and calm manner.
- **Wrapping newborns snugly** with a thin baby blanket may help them feel more secure and reduce 'startles' during sleep. Always check that the wrapping is not too tight and that the baby's breathing is not obstructed.
 - **Engage in play and stimulating activities during your baby's wake period**, but keep the environment dimmer and quieter with less activity as the evening approaches to help your baby sleep better and longer during the night.
 - **Avoid night feedings after the age of six months.** Night feedings are not necessary for growth after the age of six months and may potentially disrupt sleep.



Wrap newborns snugly to help them sleep better.

BEHAVIOURAL INSOMNIA IN CHILDHOOD (BIC)

Insomnia, which is the inability to initiate and/or maintain sleep, may not only affect children but also their parents and the whole household.

There are many possible causes of insomnia in children, including behavioural insomnia of childhood (which is discussed below), delayed sleep phase disorder (common in adolescents due to a 'shift in their body clock' at puberty), medical conditions (causing pain, itching or coughing in the night), psychological conditions (e.g. anxiety, depression, stress) and medications.

This section will discuss behavioural insomnia of childhood, which can be further classified into sleep-onset association type, limit-setting type, or combined. If you suspect that your child has insomnia, consult a doctor who may refer your child to a paediatric sleep specialist.

1. Sleep-Onset Association Type BIC

A child with sleep-onset association type BIC relies on a specific stimulation (object or setting) for the initiation of sleep at bedtime or to fall back to sleep following an awakening in the night.

Associations that are highly demanding or disruptive to the caregivers are considered negative sleep-onset associations (e.g. prolonged rocking, night feedings inappropriate for age).

How common is it?

This is common and estimated to affect between 25 to 50 percent of infants at the age of six to 12 months of age, and 15 to 20 percent of toddlers.

What to look out for?

The child with sleep-onset associations often presents with frequent night awakenings as he/she is unable to self-soothe back to sleep after a spontaneous night awakening.

The child may continue to cry and stay awake for prolonged periods, until the caregiver intervenes to provide the association required for him/her to fall back to sleep.

Risk factors

Factors that may increase the likelihood of night awakenings include breastfeeding, co-sleeping, colic, acute illness, changes in the sleep environment, a difficult temperament, parental anxiety, and when the child has just achieved a certain motor or cognitive developmental milestone (for e.g. pulling to stand, separation anxiety).



Have a good sleep routine with positive sleep associations.

Management

The management of sleep-onset association type BIC, includes establishing a good sleep routine, and the use of positive sleep associations: e.g. a comforting object (stuffed toy or used mother's shirt) that the child can bring to bed with him/her each night.

There is no 'best' method to help a child fall asleep independently, but the key is to be 'consistent and persistent' every night, especially if more than one caregiver is involved.

Often, once the child is able to fall asleep independently at bedtime, he/she is more likely to be able to self-soothe to sleep during spontaneous night awakenings.

Some methods that have been used include:

1. Extinction – Putting the child to bed at a fixed time and ignoring his/her cries until a specific 'wake' time. This method is not recommended for infants below the age of six months, and may be emotionally draining. Parents should be prepared for a 'post-extinction burst' (a period of worsening before improvement) in some children.
2. Graduated extinction – This is a 'gentler' method, where you can respond to your child briefly each time he/she calls (after being put to bed), but only after progressively longer periods of time e.g. five minutes, then 10 minutes, and then 15 minutes until he/she falls asleep. This method is likely to take longer to work but is less emotionally taxing.

3. Fading of adult intervention
 - Establish a bedtime routine before sleep, and gradually increase the physical distance between you and your child while he/she is falling asleep (sit by the crib or bed, and move the chair slightly further away each night, until out of sight of the child). This method is also likely to take longer, but is less emotionally taxing.

2. Limit-Setting Type BIC

In limit-setting type BIC, the inadequate enforcement of bedtime limits by parents results in the child delaying bedtime or refusing to go to bed.

How common is it?

Bedtime resistance is estimated to be present in 10 to 30 percent of pre-schoolers. About 15 percent of children aged four to 10 years old may still have significant limit-setting sleep issues.

What to look out for?

Bedtime stalling behaviours are attempts by the child to delay bedtime (e.g. requests for another book, another hug, another drink of milk).

Some children may also exhibit bedtime refusal behaviour, such as refusal to get ready for bed, or refusal to stay in bed. Some

children may indicate night-time fears in order to stall bedtime.

In some situations, parents do not set appropriate limits or are inconsistent in their limit-setting (e.g. allowing the child to fall asleep while watching television, or to fall asleep on the parent's bed). Other daytime behavioural problems and limit-setting difficulties may also be present in these children.

Risk factors

Factors that increase the risk of limit-setting disorders include the child sharing the parent's bedroom, conflicting parental disciplinary styles and family tension.

Management

Management includes the good sleep practices mentioned earlier, specifically setting a fixed bedtime, reviewing sleep schedules (e.g. avoid late afternoon naps) and consistent parental limit-setting.

Parents should aim to establish a set bedtime that coincides with the child's natural sleep time.

The method of 'bedtime fading' may be practised where the bedtime is initially set at the current bedtime, and brought forward gradually to the desired bedtime to reduce struggles between bedtime and sleep-onset.

Clear bedtime rules need to be set with the child (e.g. staying in bed, not calling out for parents), and ignoring complaints about bedtime (e.g. 'I am not tired yet').

Check on the child briefly if needed, provide reassurance and return the child to bed if he/she gets out of bed. A transient worsening of behaviour may occur in some children at the beginning. Caregivers are encouraged to be consistent and firm each time.

Positive reinforcement (e.g. sticker charts and small rewards) may help motivate the child.

PARASOMNIAS IN CHILDREN

Parasomnias are unpleasant or undesirable events that intrude into sleep. The common parasomnias in children are nightmares, confusional arousals, sleep terrors and sleepwalking.

With the exception of nightmares, parasomnias usually occur in slow wave sleep (within the first few hours of the night after the child falls asleep), and there is often no recollection of the event the next morning.



Set clear and consistent bedtime rules for your child.

These events can occur in otherwise healthy children, but may occur more frequently during episodes of acute illness and/or fever, stress, sleep deprivation or in association with any disorder that disrupts sleep.

This section will focus on some of these parasomnias in more detail:

1. Confusional Arousals

Confusional arousals consist of confused behaviour during and following arousals from sleep in the night, and/or upon attempted awakening from deep sleep in the morning.

How common is it?

Confusional arousals are present in five to 15 percent of children and are usually benign in nature. They usually start before five years of age and peak in frequency during mid-childhood before spontaneous remission. There may be a family history of confusional arousals or sleepwalking.

What to look out for?

Episodes of confusional arousals are usually sudden and may be startling. The child may appear to be awake but is disorientated and will be slow in speech and mentation, responding poorly to commands.

The child may sit up in bed, moan or whimper inconsolably, and say words like 'Go away!', 'No!' or may be even more bizarre, such as talking to a lamp. The episode usually lasts for a few minutes to half an hour, and sometimes longer.

2. Sleepwalking (Somnambulism)

Sleepwalking consists of a series of complex behaviours. It is usually initiated during arousal from sleep, and culminates in walking around with an altered state of consciousness and impaired judgement.

How common is it?

The onset of sleepwalking is usually between four to six years of age. About 15 to 40 percent of children have sleepwalked on at least one occasion, with three to four percent having frequent (weekly or monthly) episodes.

Episodes usually decrease during adolescence. In children who sleepwalk, a third of them continue to sleepwalk for five years, while 12 percent continue to do so for 10 years. There may be a family history of sleepwalking.

What to look out for?

Episodes of sleepwalking usually begin with the child sitting up in bed and looking around confused, before walking. It can involve routine behaviours (e.g. unlocking the door, walking out of the room) or more inappropriate behaviour (e.g. urinating into a waste paper basket). The child may sometimes speak but the speech is usually meaningless. The child usually appears to be awake with the eyes open with a confused 'glassy' stare.

The child may then return to sleep on his/her bed, or lie down at an inappropriate site to sleep. The child is usually very difficult to arouse during an episode of sleepwalking and will appear confused and disorientated if awoken.

3. Sleep Terrors (Night Terrors)

Sleep terrors are characterised by sudden arousals from sleep with behavioural manifestations of intense fear.

How common is it?

The typical onset of sleep terrors is between two to four years of age, and tends to decrease in frequency as the child grows older. It rarely persists beyond puberty.

Usually more males than females are affected, and a history of sleep terrors in family members may be present. It is estimated to affect three percent of prepubertal children, and one percent of adults.

What to look out for?

The event is often of sudden onset. The child sits up in bed and screams in fear, looking tensed with symptoms of flushing, sweating, fast breathing and an increased heart rate. The child is often inconsolable and attempts to pacify him/her may worsen the reaction.

If awoken, the child will appear disorientated and confused.

Episodes usually last for a few to five minutes, with the child returning to sleep on his/her own thereafter.

Sleep terrors may be confused with another more common parasomnia – nightmares. In contrast to night terrors, nightmares tend to occur

in the last one-third of the night (during a sleep stage known as ‘rapid eye movement sleep’ or ‘dream sleep’), and if awoken, the child is orientated and able to recall events vividly.

Management of Parasomnias

In the majority of cases, a reassurance and education of the child and parents will suffice.

Parents should be encouraged to maintain good sleep hygiene and practices, specifically a consistent bedtime routine and schedule for the child.

The prevention of physical injuries is important in sleepwalking (e.g. installing gates at the top of the stairway, locking of windows and the main door). Parents should be advised to guide the child slowly and calmly back to the bed during a sleepwalking episode, without waking him/her. In children where these episodes are recurrent, a scheduled awakening just before the usual time of the first episode, on a nightly basis for a few weeks, may be effective.

Causes of fragmented sleep (e.g. obstructive sleep apnoea, periodic leg movement disorder) may worsen parasomnias, and if suspected, should be identified and treated. Medications are rarely needed.



Maintain good sleep hygiene and practices to help manage parasomnias.

OBSTRUCTIVE SLEEP APNOEA (OSA) IN CHILDREN

Obstructive sleep apnoea is a condition where there is recurrent 'blockage' of the upper airway during sleep, leading to a reduced airflow to the lungs and sleep disruption.

Snoring is an important symptom of obstructive sleep apnoea, but not all children with snoring will have obstructive sleep apnoea. Children with habitual snoring but no evidence of compromised breathing and sleep disruption have 'primary snoring'.

How common is it?

It is estimated that overall, three to 12 percent of children have habitual snoring, and one to three percent of children have snoring with obstructive sleep apnoea. Boys and girls are equally

affected. The peak age is between four to seven years of age, usually in children with enlarged tonsils and/or adenoids. There is a second peak seen in older children above eight years old who tend to be obese.

Causes

The two most important causes of obstructive sleep apnoea in children, are enlarged tonsils and/or adenoids, and obesity.

Risk factors

Other children at risk for obstructive sleep apnoea, include children with neuromuscular (central nervous system and muscle) disorders, abnormalities in the jaw and/or face, Trisomy 21 (Down syndrome), and those with a family history of sleep and breathing disorders.

What to look out for?

Some of the symptoms suggestive of obstructive sleep apnoea, include:

- Snoring
- Apnoea (pauses in breathing during sleep)
- Snorting, gasping noises during sleep
- Laboured breathing during sleep, with a 'sucking in' of the chest
- Unusual sleeping positions, such as hyperextending the neck to breathe better, sitting up, or propped up with many pillows
- Restlessness and frequent awakenings during sleep
- Sweating during sleep
- Mouth breathing in the day or during sleep
- Cyanosis (blue discolouration of the lips/face)
- Difficulty waking in the morning
- Feeling unrefreshed after an overnight sleep
- Morning headaches
- Irritability or aggressive behaviour during the day

- Learning difficulty
- Excessive sleepiness during the day

Complications

Some of the complications of untreated obstructive sleep apnoea, include:

- Learning and/or behavioural problems
- Poor growth
- Diabetes, obesity, hypertension, heart failure, stroke
- Death (in very severe, untreated cases – rare)

DIAGNOSIS

A clinical history and physical examination are not sufficiently reliable to differentiate primary snoring from obstructive sleep apnoea. If the doctor suspects that your child has obstructive sleep apnoea, he will refer your child to a paediatric sleep specialist for review, and for an overnight polysomnography (sleep study).

Your child will be admitted overnight to a single room in a sleep laboratory, where his/her sleep and breathing will be monitored and recorded continuously during sleep.

There will be sensors placed on your child's head and body, and elastic bands placed around his/her chest

and abdomen, connected by wires to a computer system that records the data.

This is not a painful procedure, and most children will be able to fall asleep, after they get used to the set-up. A caregiver is allowed to stay overnight with the child during the study.

TREATMENT

The treatment of obstructive sleep apnoea in children depends on the underlying cause.

In children with enlarged tonsils and/or adenoids, surgery would be recommended.

For more information, please refer to our booklet: 'Up Close: Get the answers to common Ear, Nose and Throat Conditions'. For more details on surgical treatment, including adenotonsillectomy, please refer to the sections: Common ENT conditions among Children – "Snoring in children", and "Tonsils and adenoids".

In children who are obese, weight loss measures such as healthy eating and regular exercise are encouraged.

They may also be referred to paediatric specialists for weight management programmes and to screen for conditions such as diabetes, hypertension and hyperlipidaemia.

In some children where surgery is not an option, or if they continue to have significant residual obstructive sleep apnoea after surgery, they may be recommended the use of Continuous Positive Airway Pressure (CPAP) during sleep.

The CPAP set-up consists of a face mask connected by a tubing to a machine that generates and delivers a positive pressure.

This pressure helps to keep the upper airway of your child open during sleep. Children who are treated with CPAP will need to be managed by a paediatric sleep specialist, who will recommend regular follow-up checks and sleep studies.

Besides the treatments mentioned above, a small group of children may benefit from an orthodontic assessment and other procedures or surgeries for their sleep apnoea.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Singapore General Hospital Tel: 6321 4377

Changi General Hospital Tel: 6850 3333

Sengkang General Hospital Tel: 6930 6000

KK Women's and Children's Hospital Tel: 6294 4050

National Dental Centre Singapore Tel: 6324 8802

National Neuroscience Institute Tel: 6321 4377

SERVICES AVAILABLE AT SINGHEALTH INSTITUTIONS

Singapore General Hospital



The SGH Sleep Centre is the first and the largest multidisciplinary sleep service in Singapore, with a comprehensive range of inpatient and outpatient services for the evaluation, treatment and education of patients with various sleep conditions.

The range of sleep disorders managed include snoring, obstructive sleep apnoea, and other forms of sleep disordered breathing, obesity hypoventilation syndrome, chronic respiratory failure, parasomnias, circadian rhythm disorders, nocturnal epilepsy, REM sleep disorders, leg movements disorders and insomnia.

TYPES OF TREATMENT

- Surgical treatment for snoring and Obstructive Sleep Apnoea (OSA)
- CPAP therapy
- Noninvasive ventilation
- OSA – Dental and Maxillo management
- Phototherapy
- Mandibular Advancement Splints
- Cognitive Behaviour Therapy for insomnia

Periodic Limb Movement Disorder (PLMD), sleepwalking/sleep talking, sleep terrors, Excessive Daytime Sleepiness (EDS), narcolepsy

3. ENT (Ear, Nose and Throat) sleep: Excessive snoring, sleep apnoea

4. Psychiatry and Psychology sleep: Insomnia, circadian rhythm disorders

Positive Airway Pressure (PAP) therapy and services

We offer education and counselling services to individuals who have been diagnosed with Obstructive Sleep Apnoea (OSA), on the initiation and use of PAP therapy:

1. Education services include the various mask interfaces, types of PAP therapy, benefits of PAP therapy, costing and availability of PAP equipment
2. Acclimatisation to PAP therapy and PAP troubleshooting techniques
3. Mask-fitting techniques
4. Education on the use and care of PAP machines and accessories, such as chin straps and heated humidifiers
5. Sale of mask interfaces
6. Rental for the trial of PAP equipment

SERVICES

OUTPATIENT SERVICES

Consultation clinics

Our specialist sleep physicians from different disciplines conduct dedicated weekly clinics for the diagnosis, evaluation and management of various types of sleep disorders including:

- 1. Respiratory sleep:** Sleep-Related Breathing Disorders (SRBD) including Obstructive Sleep Apnoea (OSA), Obesity Hypoventilation Syndrome (OHS), chronic respiratory failure and circadian rhythm disorder
- 2. Neurology sleep:** Sleep-related movement disorders, which include REM Behaviour Disorder (RBD),

7. Downloading and interpretation of compliance data from PAP devices

Cognitive Behavioural Therapy (CBT)

CBT is a type of counselling aimed at changing behaviour. It is an effective tool for the treatment of insomnia and other psychiatric conditions.

INPATIENT SERVICES

Types of sleep studies

1. Overnight Diagnostic

Polysomnography (PSG)

PSG, also known as an Inpatient Sleep Study, is the most common type of sleep study conducted to record and analyse your night-time sleep patterns and to identify any underlying sleep disorder. Sensors are attached by stickers, tape, or belts and no needles are involved.

Recordings captured during a sleep study may include:

- **Electroencephalography (EEG):** Measurement of brain wave activity, which help to define your sleep stages
- **Electrooculogram (EOG):** Measurement of eye movements

- **Electromyography:** Measurement of muscle activity, for e.g., leg movements, chin muscle activity

- **Electrocardiogram:** Measurement of electrical heart activity and heart rate

- **Other recordings:** Breathing patterns, oxygen saturation, snoring sounds and video monitoring

2. CPAP titration study

For patients with OSA or other sleep-related breathing disorders, Positive Airway Pressure (PAP) therapy is sometimes required. Optimal pressure requirements are different for each patient. A CPAP titration study is one way to determine the optimal pressure requirement, to ensure the efficacy of PAP therapy and to manage any adverse effects that may arise.

3. BIPAP titration study

This is an in-laboratory PAP titration sleep study that utilises a different kind of ventilator – a bilevel ventilator. It is indicated when respiratory failure is more severe and CPAP therapy is insufficient.

4. Multiple Sleep Latency Test (MSLT)

MSLT is used to aid in the diagnosis of narcolepsy and idiopathic hypersomnia, by measuring the severity of daytime sleepiness. It is a full-day test consisting of five scheduled 20-minute naps, separated by two-hour breaks, and is usually performed in the day following an overnight diagnostic PSG.

5. Maintenance Wakefulness Test (MWT)

This is a full-day test that measures your ability to remain awake during the day. It is indicated when there is a need to assess the objective response to treatment in those with excessive daytime sleepiness, for e.g., pilots or truck drivers with OSA.

Test subjects are sat down in a dark, quiet room and instructed to stay awake for 20 minutes at a time. Sensor and electrodes are used to record the time taken to fall asleep. This is repeated four times during the day and being able to resist any sleep is an indication of a satisfactory level of daytime alertness.

6. Full EEG sleep study

A Full EEG sleep study is indicated when sleep seizures are suspected. This is similar to a PSG, except that more EEG electrodes are applied to capture more brain wave activity during the sleep study.

7. Transcutaneous carbon dioxide monitoring

Transcutaneous carbon dioxide monitoring is a non-invasive way of continuously measuring blood carbon dioxide levels during a sleep study, using a heated electrode sensor applied to the skin with a sticker. It is usually performed in those with sleep-disordered breathing, such as obesity hypoventilation syndrome, when nocturnal hypoventilation is suspected.

Ambulatory

1. Overnight pulse oximetry

The overnight pulse oximetry device monitors and records the blood oxygen saturation levels throughout the night. It is usually performed to look for evidence of nocturnal OSA or hypoventilation, or to confirm the efficacy of the prescribed PAP therapy.

It can be conducted at home, or as part of your stay in the hospital. It is a painless procedure using a very simple device, a probe-like sensor clipped onto a finger for continuous monitoring overnight.

A report of the trending oxygen levels will be generated upon the return of the device and will be given to the sleep physician for interpretation.

2. Actigraphy monitoring

Actigraphy is a test used to record and continuously monitor human rest/activity levels over an extended period of time via the Actiwatch.

This is a lightweight medical device worn on the wrist like a watch. It records motion and light which can then be used to analyse sleep and wake cycles and help in the diagnosis of circadian rhythms disorders, irregular sleep wake patterns, advanced/delayed sleep phase syndrome or shift work-related sleep disorders.

3. Home-based sleep study – WatchPAT study

The WatchPAT is a type of portable home sleep study device, which can help in the diagnosis of sleep-related breathing disorders. It records the Peripheral Arterial Tonometry (PAT), oxygen saturation, actigraphy, snoring, and body position of the patient.

WatchPAT is a less costly alternative to an inpatient sleep study, with the added benefit of being able to be conducted in the comfort of your own bedroom.

However, this device should only be used in those with a higher likelihood of OSA and without any other complicating medical conditions. Hence, it is mandatory for a sleep physician to first conduct a careful screening before proceeding with the test.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Singapore General Hospital Tel: 6321 4377

www.sgh.com.sg

Changi General Hospital



CHANGI GENERAL HOSPITAL (CGH) INTEGRATED SLEEP SERVICE

CGH Integrated Sleep Service (ISS) saves you crucial inter-referral time by combining the expertise of a diverse group of specialists at one centre to provide diagnostic, intervention, and treatment services for numerous common and complex sleep conditions. The CGH Sleep Laboratory is accredited by the Australasian Sleep Association and National Association of Testing Authorities.

The integrated model of care at CGH ISS is provided by a comprehensive field of healthcare professionals. This includes Ear, Nose and Throat (Otolaryngology), to Respiratory Medicine, Dental, Neurology, and Psychological Medicine, to lifestyle modification and weight management programmes involving Sport Medicine, Endocrine and Bariatric surgery. In the management of sleep disorders, CGH ISS delivers positive clinical outcomes and a high quality of service by utilising proven technologies and therapies.

TYPES OF SLEEP DISORDERS

- Sleep-related breathing disorders such as Obstructive Sleep Apnoea (OSA), and Obesity Hypoventilation Syndrome (OHS)
- Neurological sleep disorders such as narcolepsy, restless legs syndrome and periodic limb movement disorder
- Insomnia
- Parasomnias such as REM Behaviour Disorder (RBD) and sleepwalking
- Circadian rhythm disorders

CGH SLEEP LABORATORY

The CGH Sleep Laboratory is equipped with diagnostic capabilities that can conduct about 1,000 sleep studies a year. Designed to simulate a restful home environment, infra-red synchronised cameras and monitors work in the dark to monitor your sleep and measure the body's physiological changes. The sleep studies are performed by our professional team of RPSGT (USA)-certified sleep technologists.

TYPES OF SLEEP STUDIES WE OFFER

- Overnight Diagnostic Polysomnography (PSG)
- Continuous Positive Airway Pressure (CPAP) titration sleep study
- Bilevel Positive Airway Pressure (BiPAP) titration sleep study
- Multiple Sleep Latency Test (MSLT)
- Multiple Wakefulness Test (MWT)
- Actigraphy

TREATMENT AND SERVICES

Examples of treatment and services we provide include:

1. **Positive Airway Pressure (PAP) Therapy, mandibular advancement splints and sleep apnoea surgery**

A medical device called Positive Airway Pressure (PAP) is commonly used for the treatment of OSA. PAP therapy works by quietly delivering pressurised air via a mask to the upper airway to prevent it from collapsing during sleep. PAP is safe, generally well tolerated and highly effective. To support patients in their PAP treatment, we have a dedicated PAP clinic that provides patient education, PAP mask fitting, PAP therapy acclimatisation and troubleshooting.

Second line OSA therapies such as mandibular advancement splints, nasal surgery, upper airway and reconstruction surgery are also available. Upper airway surgery includes radiofrequency ablation to nasal turbinates, soft palate and tongue base as well as reconstructive surgery to the soft palate, tongue base reduction surgery, maxillary and mandibular advancement surgery.

2. Weight management

- a. Sport Medicine
Since 2003, Singapore Sport and Exercise Medicine Centre at CGH has helped many obese patients lose weight successfully through the evidence-based weight loss programme. This programme combines diet, physical activity/exercise, and behaviour modification to help patients safely achieve significant and sustainable weight loss. It includes consultations with our sports physicians, endocrinologists, dietitians, and supervised gym sessions with our physiotherapists and/or sports trainers, using the latest exercise equipment.

- b. Bariatric Surgery
Bariatric surgery has been found to be effective in helping obese patients lose weight. After surgery, we have seen an improvement in patients' various associated medical illnesses and a complete or partial resolution of OSA.

3. Cognitive Behavioural Therapy (CBT)

CBT is an intervention method that can help manage problems by changing behaviours and thoughts through counselling. It is used to treat a range of issues including insomnia and other psychiatric conditions.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Changi General Hospital

Tel: 6850 3333

www.cgh.com.sg

Sengkang General Hospital



Our Sleep Medicine unit is an integrated unit that combines expertise from various specialties to provide comprehensive treatment for various sleep conditions. We specialise in the diagnosis and management of snoring, obstructive sleep apnoea (OSA), sleep disordered breathing, insomnias, sleep related movement disorders, parasomnias and circadian rhythm sleep problems. Our services are helmed by a multidisciplinary team of specialists including respiratory physicians, ENT (Ear, Nose and Throat) surgeons, neurologists, orthodontics dentists, sleep psychiatrists, psychologists and sleep technologists.

We provide specialist outpatient consultations, diagnostic sleep studies, positive airway pressure therapy and other therapeutic interventions for sleep disorders. Our aim is to provide a wide spectrum of advanced, evidenced-based and patient-centred care treatment and we are dedicated to ensure high value care and great patient journey in the management of patients' sleep conditions.

The list of services we provide include:

1) Diagnostic Sleep Studies

- Ambulatory home sleep study
- Diagnostic Polysomnography (PSG)
- CPAP (Continuous Positive Airway Pressure) titration study
- BiPAP (Bilevel Positive Airway Pressure) titration study
- Multiple Sleep Latency Test (MSLT)
- Maintenance of Wakefulness Test (MWT)
- Transcutaneous Carbon Dioxide monitoring
- Full EEG Sleep Study
- Actigraphy
- Overnight pulse oximetry

2) Therapeutic strategies

- Positive Airway Pressure therapy (CPAP and BIPAP)
- Surgical treatment for snoring and OSA
- SWITCH (Sengkang Weight Improvement Therapy and Complete Health) Centre integrated weight management programmes - include dietary modification, exercise and physical activity, behavioural modification, medical therapy and bariatric metabolic surgery.
- Cognitive Behaviour Therapy (CBT)
- Medical therapy

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

Sengkang General Hospital Tel: 6930 6000

www.skh.com.sg

KK Women's and Children's Hospital



A key referral centre in Singapore for breathing and sleep-related disorders in children, KK Women's and Children's Hospital's multidisciplinary services care for a wide range of sleep conditions affecting newborns to 16-year-olds.

Our Sleep Disorders Centre located within the hospital performs 10 sleep studies a week. These studies are attended by a RPSGT-certified sleep technologist and enable the evaluation of a wide range of sleep disorders including Obstructive Sleep Apnoea (OSA), parasomnias, hypersomnias and periodic limb movement disorders.

SERVICES

Outpatient

1. **Sleep Clinic:** Evaluation and management of general sleep disorders and sleep-related breathing disorders e.g. OSA
2. **ENT Clinic:** Evaluation and surgical management of sleep-related breathing disorders e.g. OSA
3. **Dental/Orthodontic Clinic:** Orthodontic evaluation and management of OSA related to malocclusion and maxillary/mandibular craniofacial structural imbalances
4. **Psychological Medicine Service:** Evaluation and management of behavioural sleep disorders
5. **Weight Management Clinic:** Comprehensive weight management for OSA patients with obesity, with dietitian and exercise physiologist/specialist care included
6. **Combined Neuromuscular Clinic:** One-stop multidisciplinary clinic for patients with neuromuscular disorders and sleep-related breathing disorders, managed by a team comprising doctors from Respiratory Medicine, Neurology,

Orthopaedics, and allied health professionals from Physiotherapy, Occupational Therapy and Speech Therapy

7. **Complex/Home Care Clinic:** One-stop multidisciplinary clinic for long-term management of technologically-dependent complex patients requiring non-invasive ventilation or tracheostomy, supported by a team comprising of relevant doctors, nurses and allied health professionals required for the care of each patient
8. **Multidisciplinary OSA Service:** Outpatient service for patients with complex sleep-related breathing disorders requiring multidisciplinary care from Respiratory, Ear, Nose and Throat (ENT) and Dental/Orthodontic services

Inpatient

1. Overnight diagnostic polysomnography (PSG)
2. CPAP (Continuous Positive Airway Pressure)/BiLevel titration study
3. Multiple Sleep Latency Test (MSLT)
4. 1-Night/3-Night pulse oximetry monitoring

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

KK Women's and Children's Hospital Tel: 6294 4050

www.kkh.com.sg

National Dental Centre Singapore



Since 1997, the multidisciplinary management of patients with complex oral needs has been the core of our clinical practice. The aim of these multidisciplinary programmes is to provide coordinated care for patients by streamlining clinical processes.

Team care is optimised and delivered at a one-stop clinic with multiple specialists for the convenience of patients and allowing for informed inter-professional decision-making during treatment:

CORRECTIVE JAW SURGERY

We have a comprehensive and experienced team to manage patients with dentofacial deformities and malocclusions who require

jaw surgery. The team, comprising surgeons, orthodontists, pedodontists, periodontists and prosthodontists, manage about 200 cases every year, the highest volume in Singapore.

This one-stop facility with state-of-the-art diagnostic and imaging technology benefits patients with complex conditions, using interdisciplinary collaboration with the Sleep Clinic to manage patients with Obstructive Sleep Apnoea (OSA).

Orthognathic Surgery Clinic

Since the 1980s, orthognathic surgery has been offered as part of the Centre's comprehensive range of oral healthcare services. Combined clinical conferences identify potential treatment issues, to achieve multidisciplinary solutions before surgery.

The Orthognathic Surgery Clinic within the Centre for Corrective Jaw Surgery attends to groups of conditions which may benefit from orthognathic surgery, including:

- Maxillary and/or mandibular facial skeletal deformities associated with masticatory malocclusion
- Facial skeletal discrepancies associated with Obstructive Sleep Apnoea (OSA), airway defects and soft tissue discrepancies
- Temporomandibular joint pathology

Maxillofacial Rehabilitation - Oral and Craniofacial Implant Clinic

The Oral and Craniofacial Implant Clinic (OCIC) brings together specialists from various dental and medical disciplines for the joint management of complex oral implant cases, as well as cases that require implant-supported craniofacial prostheses for congenital deformities or after tumour resection/trauma.

We collaborate with the National Cancer Centre of Singapore, the Singapore National Eye Centre and private practitioners as partners.

Obstructive Sleep Apnoea (OSA) and Snoring Clinic

Our orthodontists, oral and maxillofacial surgeons and prosthodontists are partners of the multidisciplinary Sleep teams of the Singapore General Hospital, Changi General Hospital, Sengkang General Hospital and KK Women's and Children's Hospital working together to evaluate, educate and treat those with snoring and OSA. Multidisciplinary appointments and referrals are coordinated through our OSA clinic coordinators.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

National Dental Centre Singapore

Tel: 6324 8802

www.ndcs.com.sg

National Neuroscience Institute



The Sleep specialists of the National Neuroscience Institute (NNI) work together in a collaborative environment to optimise the evaluation and treatment of patients with sleep disorders.

TRAINING AND EDUCATION

The centre aims to further the development of sleep medicine in Singapore through regular outreach and educational programmes for the public, general practitioners and medical colleagues. It conducts the Singapore Sleep Symposium, Sleep Medicine courses and regular forums.

A Sleep Fellowship Training Programme offers participants the opportunity to work with experienced Sleep specialists from various departments, across all SingHealth Duke-NUS cluster hospitals and medical centres.

Our full range of integrated services include the evaluation and treatment of all sleep disorders in adults:

- Snoring and Obstructive Sleep Apnoea (OSA)
- Obesity Hypoventilation Syndrome (OHS)
- Central Sleep Apnoea
- Complex Sleep Apnoea
- Overlap Syndrome
- Insomnia

- Circadian Rhythm Sleep Disorders
- Parasomnias
- Narcolepsy
- REM-Behavioural Disorders
- Periodic Limb Movements and Restless Legs Syndrome

Besides outpatient consultation services, the centre offers in-laboratory sleep studies, as well as home-based studies.

For enquiries, contact SingHealth Duke-NUS Sleep Centre at:

National Neuroscience Institute

Tel: 6321 4377

| www.singhealth.com.sg/sleepcentre

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