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MEDICAL NEWS

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FOCUS: SLEEP DISORDERS

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An Update on Obstructive Sleep Apnoea

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Obstructive Sleep Apnoea (OSA) has long been known to be a common condition worldwide, but data from a recent study suggests that OSA may be even more prevalent in Singapore than previously suspected. A cross-sectional population study of adults from the Singapore Health Study 2012 cohort found that 30.5% of the sample population suffered from moderate to severe sleep disordered breathing, with 91% of these subjects remaining undiagnosed and untreated.

RISK FACTORS

With increasing rates of **obesity** and the **ageing of our population,** both major risk factors for OSA [1], the incidence of OSA is expected to rise in tandem. Thus, while it remains a major under-recognised problem, OSA may potentially become a healthcare problem of epidemic proportions in Singapore.

SYMPTOMS

Patients with OSA suffer from severe snoring, and repetitive collapse and obstruction of their upper airway during sleep. This results in recurrent reduction or termination of airflow to the lungs, 30 times per hour or more in severe cases. This causes recurrent hypoxemia with sympathetic activation and sleep disruption.

As a result, OSA patients typically present with excessive daytime sleepiness as they are unable to obtain good quality sleep no matter how long they sleep, and often wake feeling tired and unrefreshed.

OSA patients usually snore, often very loudly, and may be witnessed to have apnoeic episodes during sleep which are associated with choking or grunting noises. They often wake up with a very dry mouth and headaches.

Nocturia and erectile dysfunction (in males) are common, and some OSA patients (especially females) may paradoxically complain of **sleep onset or sleep maintenance insomnia** due to recurrent sleep disruption caused by apnoeic events.

THE PATIENT PROFILE

OSA sufferers are more likely to be male, overweight and in the middle to older age group. Certain craniofacial features commonly seen in the local Asian population, such as a small, receding mandible or maxillary hypoplasia may also contribute to the higher incidence of OSA locally.

Data from a large local sample of OSA patients also suggests that ethnicity may be important.

After accounting for the effects of body weight, the local Chinese population seems to be at an increased risk of OSA followed by the Malays and Indians respectively, possibly due to the higher prevalence of craniofacial restriction seen in the Chinese population [2].

Obtaining good quality sleep of sufficient duration is of paramount importance to our mental and physical well-being, as many of our body's metabolic and homeostatic functions are most effective and efficient while we are asleep.

Untreated OSA has been shown to be associated with poor mood, memory and concentration. OSA also increases the risk of industrial and driving accidents as well as a host of medical complications including ischaemic heart disease, heart failure, stroke, hypertension, diabetes as well as many cancers.

Indeed, the prevalence of OSA in certain medical conditions such as end-stage renal failure, heart failure, refractory hypertension and stroke exceeds 50% or more.

That is why many society guidelines, such as those for hypertension and stroke, now recommend maintaining a high index of suspicion for OSA and having a low threshold to refer a patient for a sleep study and possible OSA treatment if indicated [3].

WHEN TO REFER

If OSA is suspected, General Practitioners or other specialists may refer patients to a specialist centre such as the SingHealth Duke-NUS Sleep Centre for an assessment.

Where to refer

The SingHealth Duke-NUS Sleep Centre which sees patients across six clinical sites across SingHealth institutions, is the largest multidisciplinary sleep service in Singapore and is staffed by specialists from ENT Surgery, Respiratory Medicine, Neurology, Psychiatry, Psychology and Dentistry who have all undergone further specialised training in the field of Sleep Medicine locally and abroad.

The Singapore General Hospital and Changi General Hospital sites are also amongst the few sleep centres in Asia outside of Australia to have obtained the prestigious Australasian Sleep Association (ASA)/National Association of Testing Authorities, Australia (NATA) accreditation, which is a testament to its technical competence and commitment to quality care for its patients.

DIAGNOSIS

After an initial clinic assessment at the SingHealth Duke-NUS Sleep Centre, patients usually proceed to have a sleep study, which may be performed as an inpatient polysomnography over 1-2 nights utilising multiple channels of monitoring including video EEG, cardiorespiratory signals, abdominal and thoracic movement and EMG.

Alternatively, outpatient sleep studies can also be done in the patients' own homes albeit with a more limited range of monitoring (e.g. cardiorespiratory and oximetry only in the case of Apnealink device or oximetry with pulse waveform analysis with the WatchPAT device). However, these devices should only be used for selected patients.

Once the sleep study is analysed and reported, a personalised management plan for each OSA patient will then be made by the attending sleep specialist, who needs to take into consideration the type and severity of the sleep disordered breathing, patient's age, BMI, craniofacial morphology, comorbidities and symptom severity before deciding on the best modality of treatment, which may include CPAP, oral appliances, positional therapy or various surgical modalities.

Hence, having access to a multidisciplinary sleep clinic is crucial for obtaining the best personalised care for any patient with OSA.

TREATMENT

The CPAP Therapy

Generally, Continuous Positive Airway Pressure (CPAP) therapy remains the most effective treatment for OSA and should be offered to all symptomatic OSA patients.

CPAP has been shown in multiple studies to reduce AHI (Apnoea Hypopnoea Index, a marker of OSA severity), improve cognitive function, sleepiness and blood pressure.

Although observational studies have suggested a decreased risk of cardiovascular events in patients with severe OSA who are adherent to treatment, recent RCTs (Sleep Apnoea Cardiovascular Endpoints [SAVE] [4] and Randomised Intervention with CPAP in Coronary Artery Disease and Sleep Apnoea [RICCADSA] [5]) did not show any cardiovascular benefit of CPAP treatment in patients with OSA who had preexisting cardiovascular disease and minimal sleepiness.

An important limitation of both studies was that adherence to the use of continuous positive airway pressure was below accepted guidelines for adequate use (mean adherence of less than 4 hours per night) and patients with significant sleepiness or severe nocturnal hypoxemia were excluded from the studies.

Hence, CPAP should not be offered purely for secondary prevention of cardiovascular events in OSA patients who are asymptomatic.

Also, despite significant advances in CPAP machines and interfaces in the last few years, adherence to CPAP treatment remains problematic; a recent study of OSA patients from Singapore General Hospital showed a 1 year CPAP adherence rate of only 52.6% [6]. For patients who cannot tolerate CPAP therapy, it is very important that alternative treatment options be considered.

The Use of Oral Appliances

Oral appliances such as Mandibular Advancement Splints (MAS) are important alternatives for patients with mild to moderate OSA who are unable to tolerate CPAP therapy.

MAS have been shown to improve symptoms and reduce AHI, albeit with less efficacy compared to CPAP. However, adherence to this form of treatment is higher compared with CPAP (80%–90% v. 50%–70%); thus, in mild to moderate disease, overall treatment effectiveness may be similar to CPAP [7].

Not all oral appliances are equal. For e.g. 'boil and bite' devices available through retail pharmacies are generally poor fitting and ineffective for the treatment of OSA.

The 2015 update of the American Academy of Sleep Medicine and American Academy of Dental Sleep Medicine clinical practice guideline recommended that, for best effect, these **oral appliances should be custom fitted by a dentist with extensive experience or additional training in dental sleep medicine** [7], such as those from the National Dental Centre Singapore who are part of the SingHealth Duke-NUS Sleep Centre.

After the oral appliance has been custom fitted and jaw protrusion has been optimised, a repeat sleep test may be ordered to evaluate treatment efficacy.

Surgical Treatment
Surgical treatment may be effective for a selected minority of OSA patients.

Tonsillectomy and adenoidectomy may help when tonsillar enlargement encroaches on the upper airway, particularly in paediatric patients. Adult OSA patients with severe tonsillar hypertrophy and minimal palatal or tongue base obstruction may also benefit from adenotonsillectomy [8].

For OSA patients who have failed treatment with CPAP or MAS, **Maxillomandibular Advancement surgery** (MMA), with or without genial tubercle advancement, may be an option. MMA is an invasive surgical procedure that has shown good efficacy but carries a significant risk of morbidity [9].

Multi-level or stepwise surgery (MLS) to target narrowing of multiple sites in the upper airway has been associated with improved outcomes in the treatment of OSA, but this benefit is largely supported by Level 4 evidence.

Laser-assisted uvuloplasty or uvulopalatopharyngoplasty (UPPP) are unreliable for reducing the AHI or improving patient outcomes, and are not recommended as sole procedures for the treatment of OSA [10].

Bariatric surgery may also be a good surgical treatment option for severely obese OSA patients as it has been shown to result in dramatic improvements in AHI as well as other metabolic paramaters (e.g. glycaemic and blood pressure control) for those patients who manage to lose weight successfully [11]. For optimal outcomes, patients being considered for any type of upper airway or Bariatric surgery should be carefully assessed and managed at an expert surgical unit with high volumes, such as the ENT/Dental service of the SingHealth Duke-NUS Sleep Centre and the Bariatric Clinic at the LIFE Centre in SGH.

Finally, a prospective multicentre cohort study has proven the safety and efficacy of an **implantable hyperglossal nerve stimulator** for the treatment of patients with moderate to severe OSA who have failed CPAP therapy. Unlike traditional CPAP which functions as a pneumatic splint for the upper airway, upper airway stimulation maintains upper airway patency by augmenting the neural drive supplying the pharyngeal dilator muscles.

In this study, there was a 68% reduction in the AHI (29 to 9 events/h) at the 12-month follow-up interval. Similar improvements were seen in the Epworth Sleepiness Scale (ESS) and the Functional Outcomes of Sleep Questionnaire (FOSQ). Adverse events were few and usually minor [12]. This treatment is currently only approved for clinical use in the USA and certain European countries but not in Singapore.

In summary, OSA is surprisingly prevalent in Singapore and incidence rates are expected to rise due to increasing rates of obesity and the ageing population. Most patients with OSA remain undiagnosed and untreated, which contributes significantly to the burden of chronic disease in Singapore, especially due to the association between OSA and many other cardiovascular and metabolic diseases.

Healthcare practitioners need to be vigilant and refer patients with suspected OSA for further assessment and treatment preferably at a specialist multidisciplinary sleep service.

CPAP remains the current treatment of choice for most OSA patients as it has proven efficacy in reducing AHI and improving symptoms. Patients who fail CPAP therapy may benefit from alternative options such as MAS, adenotonsillectomy, multi-level surgery or Bariatric Surgery, but patient selection is key to treatment success.

TAKE HOME MESSAGES

- 1/3 of adult Singaporeans may suffer from moderate to severe OSA with the majority being undiagnosed and untreated.
- Screening for OSA may be indicated in patients with ischaemic stroke or TIA and difficult to control hypertension.
- CPAP remains the treatment of choice for most patients with OSA with proven efficacy, but compliance rates are low.
- For a minority of OSA patients, Oral appliances and various surgical modalities are also effective treatment options but patient selection and a multidisciplinary approach are key to success.

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Apart from his work in Respiratory Medicine, he has a special interest in Sleep Medicine and Chronic Non-Invasive Ventilation(NIV), and runs the Chronic NIV service in SGH, the largest such service in Singapore. He manages patients with a wide range of Respiratory conditions such as chronic cough, asthma, COPD and bronchiectasis, and Sleep Disorders ranging from obstructive sleep apnoea, circadian rhythm disorders to narcolepsy and chronic respiratory failure.

He has published research on Vitamin D and respiratory tract infections as well as cardiac biomarkers in obstructive sleep apnoea. He is currently involved in research on CPAP interfaces and the use of AutoPAP in selected CPAP populations.

GPs can call for appointments through the GP Appointment Hotline at **6321 4402** or scan the **QR code** for more information.

Approach to Persistent Sleepiness in Obstructive Sleep Apnoea (OSA) After Continuous Positive Airway Pressure (CPAP)

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Excessive Daytime Sleepiness (EDS) is one of the most common presentations of Obstructive Sleep Apnoea (OSA). The Epworth Sleepiness Score (ESS) is the most widely used subjective method to assess sleepiness.

Sleepiness can affect tasks requiring vigilance and has been associated with an increased risk of motor vehicle accidents [1].

One of the main goals of treatment for OSA is to control EDS. Tracheostomy was the first effective treatment for OSA. However, it is rather invasive. In 1981, the introduction of the Continuous Positive Airway Pressure (CPAP) treatment by Sullivan and his colleagues has marked an important milestone in the management of OSA.

CPAP has been proven in many clinical trials to be efficacious in normalising Apnoea-Hypopnoea Index (AHI) in OSA, as well as in controlling EDS [2]. CPAP is now the recommended first-line treatment for OSA. However, there are certain groups of OSA patients, who still have persistent sleepiness after a CPAP usage.

PREVALENCE

The prevalence of sleepiness after CPAP was reported as 12% and 6% after exclusion of all possible causes of sleepiness in a French study [3]. Another large French study also demonstrated a prevalence of 13% [4].

CAUSES

It is important to establish the underlying cause of persistent sleepiness in OSA patients while on CPAP.

1. INADEQUATELY TREATED OSA

Suboptimal CPAP treatment can lead to the inadequate control of OSA. This can be due to:

1. Suboptimal CPAP pressure being prescribed
2. CPAP intolerance, such as a mask leak, claustrophobia, a bloated abdomen, mouth dryness and a nasal congestion
3. Poor adherence to the CPAP

> Adherence to the CPAP is defined as a night use of at least 4 hours, on at least 70% of nights. CPAP adherence is quoted to be around 40% - 83% in many different studies.

The reasons for poor CPAP adherence are complex and often multifactorial, including a CPAP intolerance. Many studies have looked at various strategies to improve the CPAP adherence. Systematic education and supportive care, cognitive behavioural therapy and heated humidification are the few proven effective measures that improve the CPAP adherence.

2. OTHER CO-MORBID SLEEP DISORDERS

Periodic Limb Movement Disorder (PLMD)

The co-occurrence of PLMD and OSA varied from 47% to 61.5% in different studies. Periodic Limb Movements in Sleep (PLMS) can disrupt sleep by causing arousals in sleep which in turn result in daytime sleepiness.

Narcolepsy

Classical clinical presentations include cataplexy, excessive daytime sleepiness, hypnagogic hallucination and sleep paralysis. Narcolepsy is divided into Type I (with cataplexy/a CSF hypocretin deficiency) and Type II (without cataplexy/a CSF hypocretin deficiency).

The Multiple Sleep Latency Test (MSLT), a biological test, is used to help with the diagnosis of narcolepsy. In narcolepsy, the MSLT shows a short sleep latency (< 8 minutes) and ≥ 2/4 Sleep-Onset Rapid Eye Movements (SOREMs). OSA is not uncommon in narcolepsy, with a reported prevalence of up to 24.8% in one study [5].

Idiopathic Hypersomnia (IH)

Patients with IH present with excessive daytime sleepiness despite the long hours of sleep (> 11 hours/day) and unrefreshing naps.

IH is diagnosed by the exclusion of the other possible causes of EDS. The MSLT shows short sleep latency (< 8 minutes) and < 2/4 SOREMs.

Behaviourally Induced Insufficient Sleep Syndrome (BIISS)

Patients with BIISS have a shorter habitual sleep episode, than is expected from age-adjusted normative data. When the habitual sleep schedule is not maintained (for e.g., on weekends or during a vacation), they will sleep for longer than is usual. A diagnosis can be made by taking a good history, supported by a sleep diary and an actigraphy.

3. MOOD DISORDERS

Patients with depression can present with daytime sleepiness. Depression is common in OSA.

A study showed that 40% of untreated OSA patients had some depressive symptoms and 2% had moderate to severe depression [6]. The presence of depression has been shown to be one of the predictors of persistent sleepiness after a CPAP [4].

4. MEDICATIONS, DRUGS OR ALCOHOL

Many medications have sedative effects, e.g., antihistamines, analgesics, anticonvulsants and certain antidepressants. The use of recreational drugs or alcohol can be the cause of daytime sleepiness.

5. SLEEPINESS DUE TO THE PRETREATMENT OF OSA

Chronic intermittent hypoxia during sleep in untreated OSA may result in permanent damage to brain regions involved in wakefulness. This insult may not be completely reversed with CPAP treatment.

6. OBESITY

Obesity itself is an independent risk factor for hypersomnolence.

APPROACHES

Many patients may perceive fatigue as sleepiness. Fatigue is not associated with the higher propensity to sleep but with a feeling of exhaustion and lethargy and decreased activity.

It is important to take a good history, to differentiate between these two distinct symptoms. A good, detailed and thorough history will help to identify the possible underlying cause for the persistent sleepiness, after CPAP.

TO OPTIMISE THE CPAP TREATMENT

Apart from a detailed history, the CPAP downloads provide useful information on the residual AHI, a mask leak and the adherence.

In some cases, the CPAP downloads appear to be within the normal limits but if there is the clinical suspicion of inadequately treated OSA, attended Polysomnography (PSG) while on CPAP should be considered.

RULE OUT BIISS

BIISS is a common cause of daytime sleepiness. Therefore, it is important to rule out BIISS by taking a good history and by reviewing the sleep diary or the actigraphy.

IDENTIFY AND REVIEW THE INDICATIONS OF ANY MEDICATIONS THAT CAN CAUSE SLEEPINESS

Once the culprit medications that cause the sleepiness are identified, the sleep physician should liaise with the prescribing physician to decide to either stop the medications if there is no clinical indication to continue, or to switch to other non-sedative medications. Any recreational drugs or alcohol should be stopped.

LOOK FOR ANY CO-MORBID ORGANIC SLEEP PATHOLOGY AND TREAT ACCORDINGLY

PLMD, narcolepsy and IH can be diagnosed by taking a good history, and supported by performing a PSG or MSLT, while on a CPAP.

TREAT ANY CO-MORBID MOOD DISORDERS

Treating co-morbid depression can reduce the sleepiness in OSA patients while on a CPAP.

TO CONSIDER THE USE OF MODAFINIL

Modafinil is licensed in the USA, for use in OSA patients who still have persistent sleepiness after the use of a CPAP. It is a stimulant and the exact mechanism of action is yet to be ascertained.

CONCLUSION

Persistent sleepiness in OSA patients while on a CPAP is not uncommon. The possible underlying cause should be looked into and managed accordingly before considering Pharmacotherapy (modafinil).

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Insomnia

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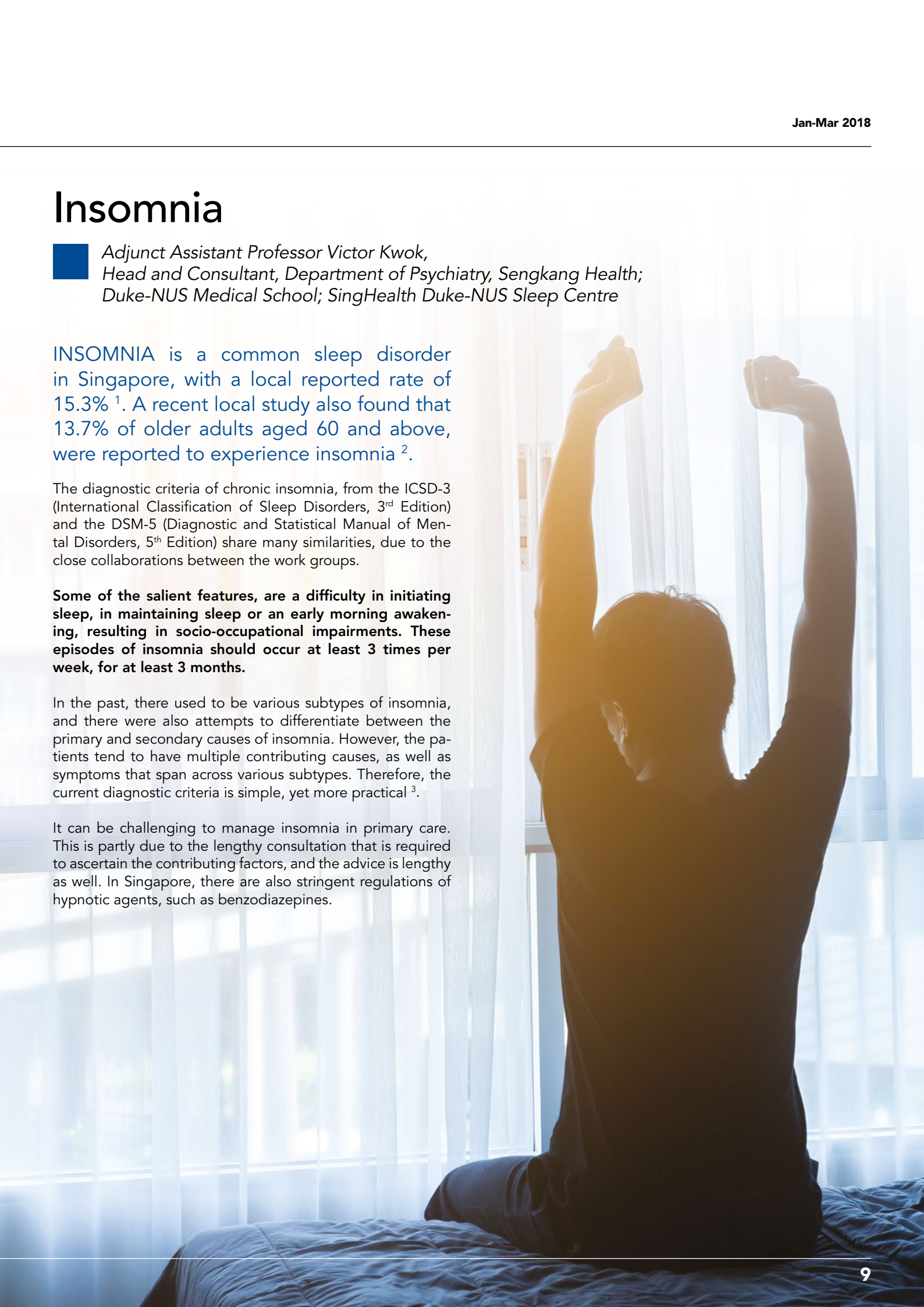
INSOMNIA is a common sleep disorder in Singapore, with a local reported rate of 15.3% [1]. A recent local study also found that 13.7% of older adults aged 60 and above, were reported to experience insomnia [2].

The diagnostic criteria of chronic insomnia, from the ICSD-3 (International Classification of Sleep Disorders, 3rd Edition) and the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th Edition) share many similarities, due to the close collaborations between the work groups.

Some of the salient features, are a difficulty in initiating sleep, in maintaining sleep or an early morning awakening, resulting in socio-occupational impairments. These episodes of insomnia should occur at least 3 times per week, for at least 3 months.

In the past, there used to be various subtypes of insomnia, and there were also attempts to differentiate between the primary and secondary causes of insomnia. However, the patients tend to have multiple contributing causes, as well as symptoms that span across various subtypes. Therefore, the current diagnostic criteria is simple, yet more practical [3].

It can be challenging to manage insomnia in primary care. This is partly due to the lengthy consultation that is required to ascertain the contributing factors, and the advice is lengthy as well. In Singapore, there are also stringent regulations of hypnotic agents, such as benzodiazepines.



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HOW GPs CAN ASSESS

It is important to ask for more details of the sleep patterns and the daily routine (*Refer to Table 1*), so as to elicit the contributing factors of the insomnia.

The next step, will be to screen for the psychiatric conditions, such as depression and anxiety disorders, as well as other sleep disorders, such as the Restless Legs Syndrome (RLS) and Obstructive Sleep Apnoea (OSA).

It will be helpful to find out what methods have been tried, as well as to ask for the expectations of the patient. If possible, a corroborative history from the partner, and the family members of the patient, should be obtained.

Patients often report experiencing anxiety, associated with automatic negative thoughts, as the night falls. Some of these could be "I will not be able to perform well at work tomorrow", "I will drive poorly" and "my friends will notice that I look tired." These thoughts and feelings, make the reaching of the state of relaxation that is required for sleep, harder.

A mental state examination, a physical examination and appropriate investigations as guided by the history, should follow. Sleep logs or sleep diaries can give a clearer account, and may also be helpful for the monitoring of progress.

In a Sleep Centre, investigations such as polysomnography (a type of sleep study), and multiple sleep latency tests, are ordered. This is to exclude the diagnosis of other sleep disorders (such as OSA, a periodic limb movement disorder and narcolepsy), and are not used to diagnose insomnia.

Table 1 **Important Sleep History to Elicit**

1. ONSET AND DURATION:
• Days, weeks or months
2. TIMES:
• The times at which the patient goes to bed, falls asleep and wakes up, as well as any intermittent awakenings that occur
3. SLEEP HYGIENE:
• Naps (duration and time) • Drinks with stimulants (coffee, tea and cola) • Exercise • Use of the bed for other activities • Irregular sleep-wake timing
4. ANY RECENT STRESSOR
5. ENVIRONMENTAL FACTORS:
• Noise • Shift work • Uncomfortable surroundings
6. TO SCREEN FOR PSYCHIATRIC DISORDERS:
• *Depression* Low mood, appetite changes, withdrawal from pleasurable activities, a lack of meaning in life • *Anxiety Disorders* Excessive worries over the circumstances of life, and not only worries about poor sleep • *Alcohol or Substance Use Disorders* A history of frequent alcohol use or illicit drug use
7. TO SCREEN FOR OTHER SLEEP DISORDERS:
• *Obstructive Sleep Apnoea (OSA)* The partner of the patient observed signs of snoring and a gasping for air • *Restless Legs Syndrome (RLS)* Restlessness, discomfort in the limbs precipitated by rest • *Periodic Limb Movement Disorder* Jerks observed by the partner of the patient • *Circadian Rhythm Disorders* Sleep and waking up at unusual times
8. TO SCREEN FOR MEDICAL-RELATED ISSUES:
• Other medical problems (for e.g., urinary frequency and chronic pain) • Medications (for e.g., theophylline and beta-blockers)
9. CONSEQUENCES DURING THE DAY:
• How it impacts relationships, leisure, school and work activities

BEHAVIOURAL MANAGEMENT

Cognitive-behavioural therapy, in the management of insomnia, is a first-line treatment, and it might be better than pharmacological treatment in the long-term [4]. It consists of various techniques, that may target either the *behavioural* or *cognitive* aspects of insomnia.

Behavioural techniques include advice on sleep hygiene, relaxation techniques and stimulus control. ***Cognitive*** techniques focus on challenging the negative and distorted thoughts, and replacing it with helpful ones. All these techniques take time to learn, more effort to execute and may not offer same-day results.

However, they do not have the risk of a dependence, or the other side effects, of medications. Some patients may have already tried some of these methods with limited success. It takes patience to explain that the causes are multifactorial. Hence, the interventions should also have a multi-pronged approach, and should be persisted.

Educating patients on good sleep hygiene is straightforward and essential. This includes having a regular sleep-wake time even during the weekends, avoiding long naps and avoiding coffee, tea and drinks with stimulants. The information is easily accessible on the Internet, and can be printed out for the patients.

Stimulus control is a type of conditioning, where the patient pairs the concept of sleepiness with the bed. They are told to go to the bed, only when feeling sleepy. If they are unable to sleep after 15 minutes, they are told to get out of bed, and to return again only when they feel sleepy.

Relaxation techniques, such as progressive muscle relaxation, deep breathing exercises, and mindfulness techniques, can help the patient achieve a state of relaxation. The instructional videos are easily found on the Internet.

The patients who face stressors may benefit from **counselling**. The primary care doctor can also consider referring the patient to external agencies, such as to a nearby Family Service Centre. The website of the Agency for Integrated Care carries a list of other counselling centres, that the doctors can refer to.

PHARMACOLOGICAL AGENTS

All medications that are sedative may increase the risk of falls, especially in elderly patients, or in those with multiple medical problems. This can result in hip fractures and resulting consequences. It is important to discuss the pros and cons, and to make a joint decision with the patient. Medications should be started judiciously at low doses, and be carefully monitored.

Antihistamines are sedative, and it is commonly used by doctors for insomnia. It is safe, the least likely to cause a dependence, and inexpensive. The ones that are commonly prescribed, are hydroxyzine and chlorpheniramine. However, patients often report a drowsiness on the next day. As it antagonises the muscarinic cholinergic receptors, it may result in a urinary retention and an impaired cognitive function.

Benzodiazepines are effective [5] and inexpensive. It works by potentiating GABA actions, via specific benzodiazepine receptors on the GABA-chloride ion channels. However, it should not be the first-line choice, as it carries a risk of developing a dependence (which is now termed as a *Substance Use Disorder* in the DSM-5).

The tolerance will result in escalating doses to achieve the same sedating effects, and the patient may experience withdrawal syndromes, including life-threatening ones, for those who used high doses. This is similar to the onset of delirium tremens during alcohol withdrawal.

Therefore, benzodiazepines are best prescribed in small quantities, and patients should be told to use it intermittently. It should be stopped within 4 weeks.

It is best avoided in those patients with personality disorders, or those with a history of taking illicit medications. It should be used cautiously in those with a respiratory failure, or a liver impairment.

The other side effects of benzodiazepines include falls, amnesia, an impaired cognitive and motor performance, daytime sleepiness and paradoxical reactions.

For elderly patients, benzodiazepines with shorter half-lives (such as lorazepam or alprazolam) should be chosen to reduce the risk of falls. For adults, the ones with longer half-lives (for e.g., diazepam) have a lower risk of dependence, and is helpful for those with intermittent awakenings and early morning awakenings.

Benzodiazepine receptor agonists also consist of non-benzodiazepines, such as zolpidem and zopiclone. However, it also carries the risk of a dependence. Hence, it should be used as cautiously as benzodiazepines. It is not helpful in reducing anxiety, and does not abort seizures. It has also been linked to sleepwalking and sleep-related eating [6].

Antidepressants are used for insomnia, because it does not carry the risk of a dependence. However, the use is mostly off-label for insomnia, with the exception of doxepin. It is helpful, if the patient also has depression or anxiety disorders.

Some antidepressants include trazodone, mirtazapine and tricyclic antidepressants. The 2nd generation antipsychotics, that are sedative, increase the risk of a metabolic syndrome. Therefore, they are often less frequently considered.

Recently, **prolonged-release melatonin** has become available in Singapore. It may be prescribed to patients above the age of 55, for up to 3 months, and has been useful for insomnia [7]. A possible mechanism, could be a decrease in the production of melatonin in the older patients. Agomelatine, a new antidepressant that also acts on melatonin receptors, may be helpful for insomnia in the patients with depression.

CONCLUSION

Insomnia is a common disorder in Singapore. It is important to elicit a detailed history, so as to identify the plethora of contributing factors. Co-morbidities, such as depression, anxiety disorders, and other sleep disorders, should be screened.

Behavioural techniques may be tedious, but carry long-term benefits and lower risks. Sedating agents can cause falls, and benzodiazepine receptor agonists, although effective, may increase the risk of a dependence. Therefore, it should be cautiously used for only short periods.

WHEN TO REFER TO A SLEEP SPECIALIST

Insomnia should be treated at the primary care level. However, when other sleep disorders such as OSA or RLS are detected, or when the patient has failed to respond to the medications, they may be referred to a Sleep Disorders Unit.

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GPs can call for appointments through the GP Appointment Hotline at **6472 2000** or scan the **QR code** for more information.

What Do We Know About Sleep In Adolescence?

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Sleep is important for optimal cognitive performance and health. However, many adolescents do not get adequate sleep. This short review examines factors that contribute to insufficient sleep during adolescence and potential consequences of poor sleep on well-being and metabolic health. Possible solutions for improving sleep and health outcomes in adolescents are also discussed.

FACTORS THAT INFLUENCE SLEEP

Sleep duration tends to decrease during adolescence compared with earlier in childhood. With increasing age, adolescents usually go to bed later due to the convergence of biological and socio-cultural factors (discussed below) [1], which can result in reduced time in bed for sleep on school nights.

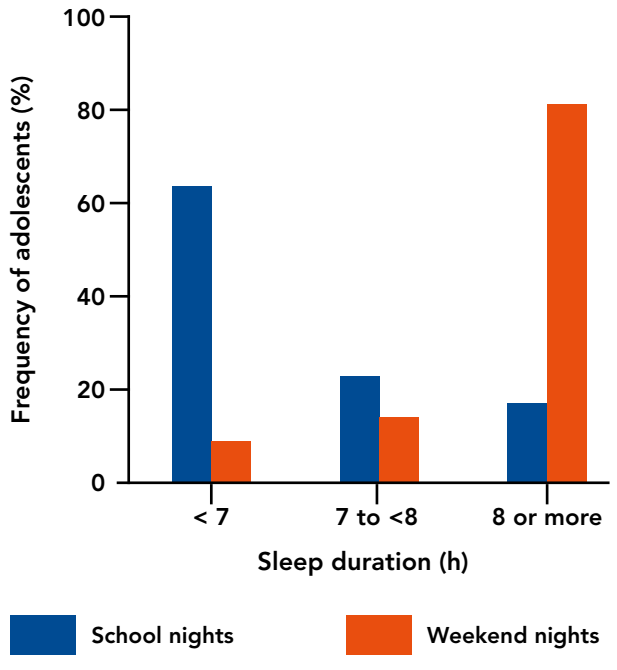

Figure 1 Distribution of nocturnal sleep duration in adolescents.

Based on self-reported sleep behaviour (n = 2,214), most adolescents get insufficient sleep on school nights and attempt to catch up on sleep on weekend nights.

Consequently, many adolescents are exposed to partial sleep deprivation during the school week and exhibit 'catch-up' sleep on weekends *(Refer to Figure 1)*.

The National Sleep Foundation (NSF) in the United States recommends that adolescents get 8 to 10 hours of sleep per night for optimal health and cognitive functioning [2].

Based on data collected in Singapore, about 80% of adolescents report getting less sleep than what is recommended by the NSF. This is alarming because insufficient sleep in adolescents has been linked with impaired learning and mood disturbances [3].

Adolescence is associated with biological changes that affect the circadian timing of sleep. There is a phase delay shift in circadian rhythms during adolescence that results in a preference for later bedtimes and wake-up times. Hence, adolescents at a more mature Tanner stage have later bedtimes and a delayed circadian rhythm of the sleep-promoting hormone melatonin [4].

The ability to fall asleep also depends on how long a person has been awake, due to the build-up of homeostatic sleep pressure. There is evidence that the build-up of sleep pressure during wakefulness occurs more slowly in adolescents compared with younger children [5], which makes it easier for post-pubertal children to delay their bedtime.

Therefore, contrary to popular belief, achieving earlier bedtimes on school nights is not simply a matter of exercising better self-discipline. Rather, adolescents are biologically predisposed to go to bed later than younger children and adults.

Socio-cultural factors also contribute to changes in sleep patterns. With increased autonomy and independence, adolescents are more likely to make their own decisions regarding when to go to bed. For example, many adolescents may be willing to exchange sleep for more study time, despite evidence that shorter sleep durations are associated with poorer academic performance [6].

The use of electronic devices at night is also more common during adolescence compared with earlier childhood, and the ability to socialise with friends is facilitated by the proliferation of smartphones and tablets in this age group.

The use of electronic devices near bedtime has been shown to contribute to later and shorter nocturnal sleep [7], and exposure to light emitted by these devices may contribute to delayed circadian rhythms and increased sleepiness on the following morning [8].

EFFECTS OF INSUFFICIENT SLEEP

The most obvious sign of insufficient sleep is daytime sleepiness. Based on data collected in Singapore, most adolescents extend their sleep duration by more than 2 hours on weekends, suggesting that they are not getting sufficient sleep on school nights *(Dr. Joshua J. Gooley, Duke-NUS, unpublished)*.

Adolescents with shorter sleep are also more likely to engage in coping mechanisms for their tiredness, including taking naps and using caffeine with the explicit purpose of staying awake during the daytime. We have also found that most adolescents in Singapore rely on a parent or alarm to wake them up in the morning, indicating that their nocturnal sleep is truncated by having to get ready for school.

Insufficient sleep impairs cognitive processes that are essential for optimal learning and academic success. Studies conducted by Duke-NUS researchers have demonstrated that adolescents who are exposed to a week of sleep restriction (i.e., short sleep each night) exhibit cumulative negative effects on attention, processing speed, and working memory [9].

The ability to learn and recall facts is also impaired by sleep restriction [10], which raises important concerns about whether the ability of students to learn is compromised by recurrent exposure to partial sleep deprivation.

In fact, recent work in Singapore indicates that the catch-up sleep that adolescents get on weekends may not be sufficient for their attention to recover fully [11].

Sleep restriction also has cumulative negative effects on mood [9], and adolescents with short sleep on school nights are more likely to report depressive symptoms.

Research findings in Singapore are consistent with those in the United States, in which adolescents with later bedtimes and shorter sleep durations were more likely to suffer from depressive symptoms and suicide ideation [12]. These studies suggest that sleep is important for adolescents' mental health.

Over that past decade, several studies have shown that **exposure to short sleep in childhood is associated with obesity [13].** Using self-reported data collected in Singapore, we have found that the odds of being overweight are about 2-fold higher in adolescents exposed to short sleep (< 7 hours on school nights) compared with those with healthy sleep (8 - 10 hours). Other researchers have shown that short sleep may contribute to overeating and increased sedentary activity [14,15].

Hence, the epidemic of short sleep among adolescents should be a cause of concern for Singapore's War on Diabetes.

Notably, exposure to short-term sleep restriction has been associated with **decreased insulin sensitivity in healthy adolescents [16]**, and extending sleep duration has been shown to improve insulin sensitivity in healthy adults regularly exposed to sleep restriction [17,18]. Future studies in adolescents should therefore examine whether sleep protects against the development of impaired glucose metabolism.

POSSIBLE SOLUTIONS FOR IMPROVING SLEEP AND HEALTH OUTCOMES

Because sleep is important for cognitive performance and health, it is important to consider strategies for improving sleep behaviour in adolescents.

As highlighted above, it can be difficult for adolescents to advance their sleep schedule due to age-dependent changes in circadian timing and sleep homeostasis. Nonetheless, the tendency for adolescents to go to bed late can be minimised by improving their sleep hygiene practices.

This includes educating adolescents and their parents about the importance of sleep for well-being so that they can both make informed decisions that lead to behaviours conducive to better sleep habits.

For example, adolescents whose bedtime is set by their parents have earlier bedtimes, more sleep, and less daytime fatigue [19], suggesting that parental involvement can facilitate improvements in sleep behaviour and cognitive functioning.

It is also important that teachers, policy makers, and healthcare providers are adequately informed on the benefits of healthy sleep so that they can encourage and reinforce healthy sleep habits.

An alternative approach for extending nocturnal sleep duration is to make changes that would allow for later wake-up times. The American Academy of Paediatrics (AAP) issued

a policy statement urging middle/high schools to start no earlier than 8:30am, with the aim of allowing more students to achieve a healthy amount of sleep each night [20].

Consistent with this recommendation, a large body of evidence collected in the United States has shown that delaying school start time increases sleep duration on school nights, with many studies also demonstrating improved mood, less falling asleep in class, and better grades [6,21].

In Singapore, almost all local schools start about an hour earlier than what the AAP considers a healthy school start time in adolescents.

Recently, Nanyang Girls' High School delayed their school start time by 45 minutes from 7:30 am to 8:15 am [22]. After the change in school start time, adolescents reported more time in bed for sleep and fewer depressive symptoms, assessed up to several months after the intervention *(Dr. Michael Chee, Duke-NUS, unpublished).*

These results suggest that adopting later school start times may have sustained benefits for adolescents' sleep and well-being.

CONCLUSION

In summary, it can be challenging for adolescents to get sufficient sleep on school nights. Paediatricians and thought leaders in sleep research can have a positive impact on sleep behaviour in adolescents by educating the public about the importance of sleep for adolescents' cognition and health.

It is important to empower **parents and their children** to make informed, healthy decisions about the timing and duration of their nocturnal sleep. Late-night activities that are stimulating and that delay bedtimes should be avoided because they contribute to short nocturnal sleep and can negatively affect learning and mood during the daytime.

Finally, **schools** should be encouraged to integrate instructional materials on sleep into multiple areas of the curriculum, and to consider whether administrative changes can be made (e.g., changing school start times, improving transportation options, or reducing evening workload) to foster better sleep, learning, and health outcomes in adolescents.

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For appointments at the SingHealth Duke-NUS Sleep Centre, **GPs** can call through the GP Appointment Hotline at **6321 4402** or scan the **QR code** for more information.

Paediatric Obstructive Sleep Apnoea

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Children with Obstructive Sleep Apnoea (OSA) experience partial or complete obstruction of the upper airway during sleep, resulting in oxygen desaturation, hypercapnia and arousals from sleep. It is estimated that up to 20% of normal children snore occasionally, with OSA occurring in 1% - 6% of the paediatric population.

Both boys and girls are equally affected, with the peak incidence of OSA occurring between the ages of 2 to 8 years old (coinciding with the age where lymphoid hyperplasia and adenotonsillar hypertrophy are common).

A second peak occurs in the older children and adolescents who are usually obese.

RISK FACTORS

The risk factors for OSA in children differ greatly from that of adults. In children, **adenotonsillar hypertrophy** is the most recognised risk factor of OSA.

Other common risk factors are obesity and allergic rhinitis.

Other risk factors include children with :

- Neuromuscular disorders (such as muscular dystrophies, cerebral palsy and so forth)
- Craniofacial abnormalities (such as micrognathia and midface hypoplasia)
- Trisomy 21 (Down Syndrome)
- Prader-Willi Syndrome
- Achondroplasia
- A family history of sleep and breathing disorders

WHAT TO LOOK OUT FOR?

The symptoms of OSA may be difficult to elicit, and the guidelines from the American Academy of Paediatrics recommend that children and adolescents be screened for snoring during their routine medical visits.

Night-time symptoms include snoring, witnessed apnoeas, snorting or gasping during sleep, restless sleep, increased effort in breathing, excessive sweating and enuresis.

Daytime symptoms include daytime sleepiness, unrefreshed sleep, hyperactivity, attention-deficits, behavioural problems and academic deterioration.

COMPLICATIONS

Untreated OSA is associated with significant complications, including neurocognitive morbidities (such as behavioural issues, mood disturbances and attention-deficits) and cardiovascular morbidities (such as hypertension, endothelial dysfunction, cardiac failure), as well as diabetes, obesity, poor growth, and in very severe and rare cases, even death.

A DIAGNOSTIC APPROACH

A detailed history of snoring, especially habitual snoring (i.e. for 3 or more nights in a week), and other symptoms of OSA (as previously mentioned) should be sought. The physical examination should include an assessment of the child's growth, the tonsillar size, features of atopy, and craniofacial structure.

However, clinical history and physical examination are not sufficiently reliable to differentiate between OSA and primary snoring (snoring without evidence of sleep disruption or gas exchange abnormalities). **Whenever available, a Polysomnography (PSG) is the gold standard for the diagnosis of OSA.**

In children, an attended PSG in the Sleep Laboratory is preferred. This would involve an overnight stay in a single-bedded room, with the continuous monitoring of the child's oronasal airflow, the nasal pressure, the Electrocardiogram (ECG), the Electroencephalogram (EEG), the oxyhaemoglobin saturation, chest and abdominal respiratory efforts, as well as muscle tone.

The 'hook-up' of the monitoring leads is done by a certified sleep technician before the child goes to sleep, and most children are able to fall asleep after they get used to the set-up. During the study, a caregiver is usually encouraged to stay overnight with the child.

When a PSG is not available, an alternative would be an overnight pulse oximetry. This can be done in the comfort of the child's own home. However, this monitoring may miss episodes of obstruction of the airway that are associated only with EEG arousals, and is useful only when the OSA is associated with significant oxyhaemoglobin desaturation. In paediatric studies, the positive and negative predictive values of oximetry testing were estimated to be at 96.8% and 58.1% respectively. A positive study is useful in deciding on the subsequent management. However, a negative study does not rule out the diagnosis of OSA, especially in the presence of suggestive symptoms.

TREATMENT

The treatment of paediatric OSA depends on the underlying cause, and involve surgical and medical measures.

In children with OSA due to adenotonsillar hypertrophy, the first-line treatment would be adenotonsillectomy. In a large randomised, controlled trial (The Childhood Adenotonsillectomy Trial, CHAT), where early adenotonsillectomy was compared to the watchful waiting of children with mild to moderate OSA, there was normalisation of the PSG findings in 79% (versus 46%) after 7 months. A reduction in symptoms, and an improvement in behaviour and the quality of life was also reported in the group that underwent surgery.

The risk factors for residual OSA (post-surgery), include the following:

- Obesity
- Severe OSA (pre-surgery)
- Significant weight gain after the surgery
- Trisomy 21
- Neuromuscular weakness
- Craniofacial abnormalities

In children who are obese, weight reduction measures such as healthy eating and regular exercise, are encouraged. They may be referred to paediatric specialists, for enrolment into weight management programmes, and to screen for co-morbidities, such as for diabetes, hypertension and hyperlipidaemia.

In contrast to the management of adult OSA, the use of nocturnal Continuous Positive Airway Pressure (CPAP) is less common. It is reserved for children who do not have the option of surgery, or if they continue to have significant residual OSA, following adenotonsillectomy.

> Adherence to CPAP is a major limitation in the treatment of paediatric OSA. Often, a multidisciplinary team comprising of a paediatric sleep specialist, a sleep nurse, homecare or community nurses, and a child psychologist, is beneficial in ensuring regular usage of CPAP, as well as adequate education and training of the caregivers. Follow-up sleep studies (titration studies to check for an optimal CPAP pressure) are also recommended.

The concurrent control of allergic rhinitis, with the use of intranasal corticosteroids, antihistamines and/or leukotriene receptor antagonists, is important in children with atopy.

In a selected few, orthodontic treatment involving rapid maxillary expansion or a mandibular advancement device may be beneficial for their OSA.

CONCLUSION

In the past few decades, there has been increasing awareness of the importance of paediatric OSA. The significant morbidity, with its neurobehavioural, cardiovascular and endocrinological implications, emphasise the importance of early recognition and timely evaluation.

Adenotonsillectomy should be considered as first-line therapy for most children, and close post-operative follow-up is important to monitor for any residual disease, especially in those patients with accompanying risk factors.

Current research point towards greater understanding of the underlying complexities of the pathogenesis of OSA. Future advances include the use of biomarkers to aid in the diagnosis, as well as to individualise the therapies for improved care.

Primary care doctors play an important role in the screening of snoring and other symptoms during a child's regular clinic visits, and in making the onward referral of a child suspected of having OSA to the sleep specialist for further investigation.

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GPs can call for appointments through the GP Appointment Hotline at **6294 4050** or scan the **QR code** for more information.

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A Multidisciplinary Centre for Sleep Disorders

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- KK Women's and Children's Hospital (KKH)
- National Dental Centre Singapore (NDCS)
- National Neuroscience Institute (NNI), Tan Tock Seng Hospital campus

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Left Ventricular Assist Device (LVAD)- A Guide for Healthcare Workers

Adjunct Assistant Professor Tan Teing Ee, Head and Senior Consultant, Department of Cardiothoracic Surgery, and Co-Director, Mechanical Circulatory Support, Heart and Lung Transplant Unit, National Heart Centre Singapore

As a result of an ageing population and advances in the treatment of heart diseases, an increasing number of patients are reaching the AHA/ACC advanced stage D, also known as the end-stage, refractory or the stage of terminal heart failure.

These patients are often characterised by a poor quality of life, dyspnoea at rest despite optimal medical therapy, an objective evidence of structural heart disease, multiple hospital admissions and early signs of deteriorating function in the kidneys and liver. They have a prognosis that is worse than many cancers, with very few surviving beyond a period of 2 years.

There are only a few available options. Heart transplantation provides excellent results, but the supply of donor organs is very limited in Singapore. Only younger patients, aged 60-years-old and below, are eligible with a few exceptions, and the patients used to pass away while waiting.

In 2008, a new option was made available. The Food and Drug Administration (FDA) approved the use of a new generation continuous flow Left Ventricular Assist Device (LVAD), which doubled the survival rate as compared to the older generation of LVADs, and it grew rapidly all over the world.

By the end of 2014, more than 20,000 Heartmate IIs had already been implanted worldwide. It has become the standard of care in advanced countries and is still continuing to grow.

In 2009, the National Heart Centre Singapore (NHCS) started offering the continuous flow LVADs for patients on the transplant waiting list, and it was extended to non-transplant eligible patients (Destination therapy) in December 2012.

As of October 2017, the NHCS has implanted a total of 90 patients with excellent outcomes. Many of them are leading active working lives and can potentially turn up at the doorstep of any healthcare facility in Singapore. This article is a short guide for healthcare professionals, who might meet these patients.

WHAT IS A LEFT VENTRICULAR ASSIST DEVICE (LVAD)?

The LVAD is an egg-sized rotary blood pump, that draws from the left ventricle and outputs into the ascending aorta. An electrical driveline exits from the upper abdomen, to obtain electrical power from a controller and 2 batteries. Over the past 8 years, we have used 3 different models of LVAD – the HeartMate II, HVAD and HeartMate III. (*Refer to Figures 1, 2 and 3*)

WHEN DO PATIENTS NEED AN LVAD?

The indications and contraindications for a surgery are summarised in *Table 1* (*Refer to page 24*). Patients should be referred before the low cardiac output state results in cachexia, as well as severe renal, liver, respiratory and other end-organ dysfunction, or even a circulatory collapse.

The risks for a surgery, and the chances of a good recovery, are much better before the patient requires dialysis, mechanical ventilation, an Intra-Aortic Balloon Pump (IABP) or Cardiopulmonary Resuscitation (CPR).

WHAT IS IT LIKE TO LIVE WITH AN LVAD?

The patients need to be on a long-term prescription for aspirin and warfarin. They must carry out daily dressing to the driveline. The batteries last up to 8 hours and they need to carry spare batteries if they go out. They can only shower with an adequate protection of the driveline exit site and the electrical equipment. They cannot swim.

The patients cope well with such inconveniences. They carry the battery and controller in inconspicuous backpacks, handbags, waist pouches or in custom-made vests. The device is so silent, that it becomes "forgettable" as the patients go about their daily lives.

The improvement in the effort tolerance is dramatic. The majority go from New York Heart Association (NYHA) Class 4 to Class 1 within a few months. Slightly under half of them go back to their work or studies. The rest of the patients do return to a normal active lifestyle.

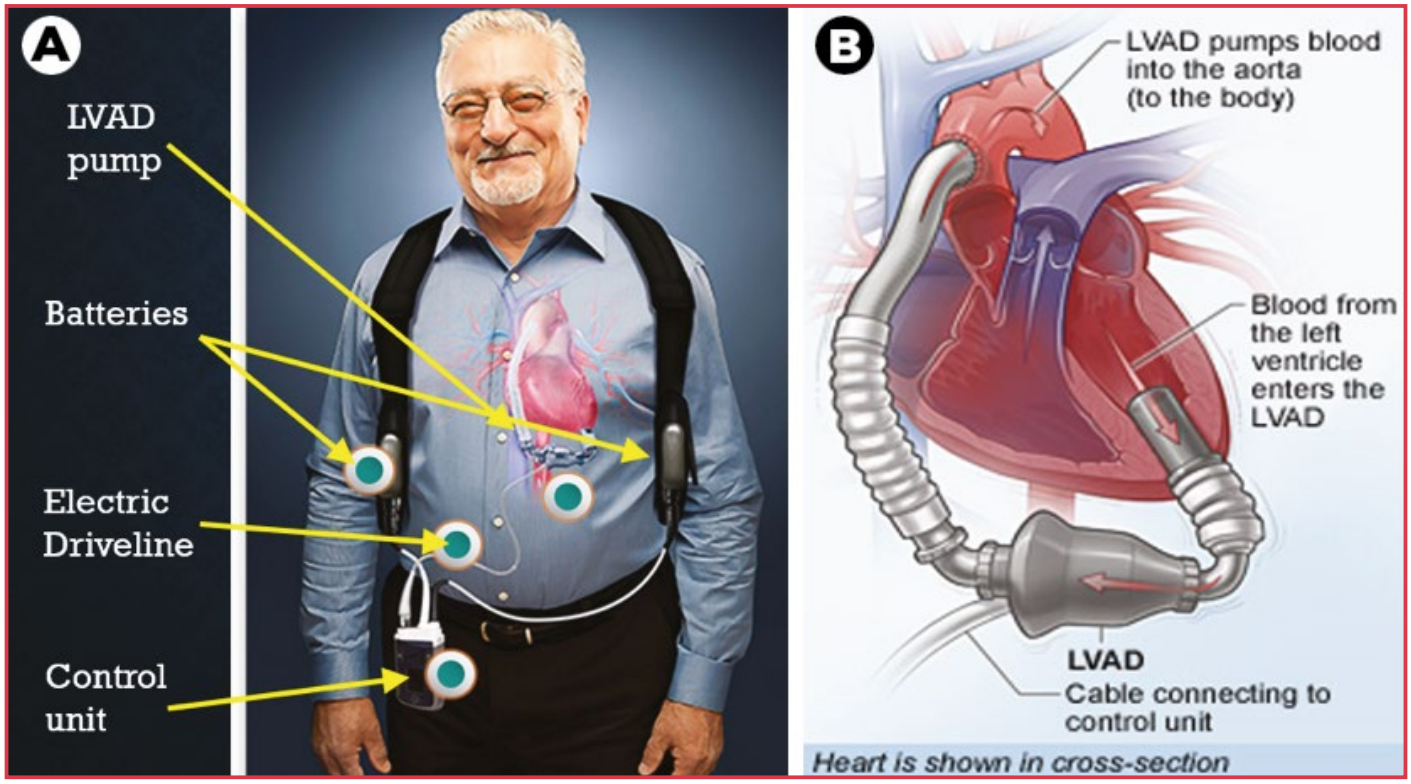
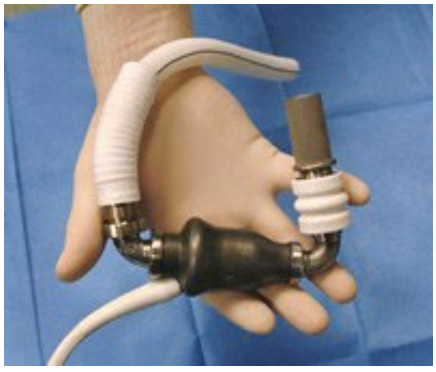


Figure 1 Components of an LVAD system

A. HeartWare HVAD controller

B. HeartMate II and HeartMate III controller

Figure 2



HeartMate II pump

HeartWare HVAD pump

HeartMate III pump

Figure 3

Table 1 **Surgery Indications and Contraindications**

Indications	Contraindications
A combination of the following: • Frequent hospitalisations for heart failure • NYHA Class IIIb – IV functional limitations, despite maximal therapy • Intolerance of neurohormonal antagonists • Increasing diuretic requirement • Symptomatic, despite a CRT Inotrope dependence • Low peak Vo2 (< 14 – 16) • End-organ dysfunction attributable to low cardiac output	**Absolute** • Irreversible hepatic disease • Irreversible renal disease • Irreversible neurological disease • Medical non-adherence • Severe psychosocial limitations **Relative** • Age > 80-years-old for DT • Obesity or malnutrition • Musculoskeletal disease that impairs rehabilitation • Active systemic infection or prolonged intubation • Untreated malignancy • Severe PVD • Active substance abuse • Impaired cognitive function • Unmanaged psychiatric disorder • Lack of social support

**CRT indicates: Cardiac resynchronisation therapy*
DT: Destination therapy
NYHA: New York Heart Association
Vo2: Oxygen consumption
PVD: Peripheral vascular disease

Travelling overseas for the holidays is slightly inconvenient, with the need to carry the charger and extra batteries. However, this is manageable and not difficult with prior planning.

Sexual activity is not an issue. We strongly advise the younger female patients to use contraceptive measures, because a pregnancy will be hazardous.

WHAT DO HEALTHCARE PROVIDERS NEED TO KNOW ABOUT LVAD PATIENTS?

The most important thing that healthcare workers need to know, is that these patients have no pulse because the blood flows continuously, like water from a tap.

The aortic valve is closed almost all of the time. The LVAD will emit a continuous humming sound when you auscultate the heart, and the aortic and mitral heart sounds cannot be heard, only the softer pulmonary and tricuspid valves.

If the patient is unconscious, cardiac compressions should *not* be done if the pump is still operating well (humming is auscultated and there is no alarm from the controller), and the patient is pink, warm, and looks well perfused. There is a risk of pump dislodgement. Cardiac compressions should be started, if there are no signs of life, and there is clinically no perfusion of the body.

Alarms go off when the Ventricular Assist Device (VAD) malfunctions. There is a contact number on the controller for the NHCS VAD coordinators. One of our patients was saved by a passer-by at the Novena MRT station, when her pump stopped because of a controller failure. She became unconscious, the shrill VAD alarms went off, and her young daughter started screaming for help. A passer-by successfully changed her controller, with instructions from our VAD coordinator over a mobile phone.

The Blood Pressure (BP) is usually measured using a doppler probe and a pressure cuff. A pressure of 70 to 80

mmHg, at the point where the blood flow starts, is adequate. If an arterial line is used, a mean BP of 70 - 80 is also ideal.

If the patient is in Ventricular Tachycardia (VT) or Ventricular Fibrillation (VF), the cardioversion can be done without any damage to the pump. Surprisingly, most of the patients who develop VT or VF are usually only mildly symptomatic, and they remain conscious and ambulant because the pump flow remains adequate.

WHAT IS THE PROGNOSIS FOR PATIENTS SUPPORTED BY AN LVAD?

At NHCS, the perioperative mortality at 3 months is only 4.4%. 4 out of 5 patients are expected to survive for at least 4 years, compared with none before the LVADs were available.

Since May 2009 to September 2017, of the 89 patients we have seen, 47 are still on the LVAD support. Of these, 22 patients are on the transplant waiting list, 10 opted to remain on the LVAD and 15 were not suitable for a transplant, because of their age or co-morbidities. Eventually, 21 were transplanted, 2 recovered and 19 died.

The deaths occurred at various periods, from a few months to 4 years after the implant, due to complications that included strokes, pump thrombosis, a right ventricular failure, pump pocket infection, a bleeding gastrointestinal tract and kidney failure.

Other less serious complications include, a superficial driveline infection, depression and an equipment malfunction.

The patients' average 6-minute walk test, at 6 months after surgery, is 437 metres, which is normal for any healthy individual. They also report large improvements in the quality of life after an LVAD implant.

SUMMARY

The LVADs are an excellent option for patients with an advanced heart failure. There are dramatic improvements in survival and in the quality of life. It has changed the lives of many all over the world. Most transplant programs all over the world, now perform more LVAD procedures than transplants.

Some patients have opted to remain on an LVAD, because they have not had any complications at all.

The average waiting time for a heart transplant in Singapore has increased from 153 days, before we had LVAD, to 680 days currently, because of the longer survival rate. The majority of the LVAD patients are likely to live with their LVAD for the rest of their lives.

For more interesting information, please visit the following websites:

HeartMate II
http://heartmateii.com/heart-failure-lvads.aspx

Youtube Video of an LVAD Patient
https://www.youtube.com/watch?v=gNUATS8Jhuk

A Blog Post by a Patient, Serene Lee, on Her Experience with the LVAD
https://paulineltl.wordpress.com/2015/05/03/keep-calm-mother-on-my-daughter-saved-my-life/

REFERENCES:

1. The 2013 International Society for Heart and Lung Transplantation Guidelines for mechanical circulatory support: Executive summary, http://www.jhltonline.org/article/S1053-2498(12)01294-6/pdf.

2. Recommendations for the Use of Mechanical Circulatory Support: Ambulatory and Community Patient Care - A Scientific Statement From the American Heart Association, http://circ.ahajournals.org/content/circulationaha/early/2017/05/30/CIR.0000000000000507.full.pdf.

Assistant Professor Tan Teing Ee is the Head and Senior Consultant with the Department of Cardiothoracic Surgery and the Director of the Cardiothoracic Surgery Intensive Care Unit at the National Heart Centre Singapore. He is also the Director of Quality Assurance and Risk Management, and the Co-Director, Heart Transplant and Mechanical Assist Device.

Assistant Professor Tan's sub-specialty interest is in cardiac surgery (adult), robotics surgery, heart and lung transplant, and mechanical heart assist device. He performs adult cardiac surgeries, including coronary artery bypass, valvular heart disease, left ventricular assist device implantation and heart transplantation.

GPs can call for appointments through the GP Appointment Hotline at **6704 2222** or scan the **QR code** for more information.

The Renal Transplant Programme at Singapore General Hospital

The **Renal Transplant Programme** at Singapore General Hospital (SGH) is the oldest and largest Renal Transplant Programme in Singapore. It is a core programme of the Department of Renal Medicine at SGH, which is a national referral centre for kidney diseases.

The first kidney transplant in Singapore was performed at SGH in 1970. Since then, 1,464 transplants, consisting of 1,002 deceased donors and 462 living donor kidney transplants, have been performed there.

Several landmark transplants have also been performed at SGH, such as the:

- 1976: First unrelated living kidney donor transplant
- 2000: First laproscopic kidney donor nephrectomy
- 2009: The living kidney donor transplant from the oldest living kidney donor in Singapore
- 2017: Living kidney donor after a liver transplant

In 2015, it also participated in the first paired-kidney donor exchange transplant with National University Hospital.

The clinical services are provided by a multidisciplinary team, which includes nephrologists, urologists, infectious disease physicians, endocrinologists, cardiologists, hepatologists, advanced practice nurses, transplant coordinators, pharmacists, dieticians, physiotherapists and medical social workers from the various departments of SGH.

These healthcare professionals possess either or both of the following characteristics:

- Been trained in the field of transplantation
- Have a special interest in the area

The team operates at a one-stop Transplant Centre, that is located at SGH, Level 1, Block 7. They meet together on a weekly basis to discuss patient care.

The Transplant Centre offers outpatient procedures, such as biopsies and intravenous therapies, which reduces the need for the patient to be admitted for such procedures.

As a result, the patient benefits from the convenience of meeting their healthcare providers in one location, as well as from receiving an integrated multidisciplinary patient-centric healthcare service.

The Renal Transplant Programme provides the following clinical services, that includes education, evaluation, preparation and post-operative follow-ups:

- Deceased donor kidney transplantation, for Singaporean citizens and Permanent Residents
- Living donor kidney transplantation, for Singaporean citizens/Permanent Residents, as well as for Non-residents with spousal or immediate blood-related donors
- ABO-incompatible (Blood Group-incompatible kidney transplantation
- HLA-incompatible (Human Leukocyte Antigen-incompatible) kidney transplantation
- Diabetic transplant programme
- Systemic immunosuppression programme for complex corneal transplantation

In addition to the Transplant Centre, the Renal Transplant Programme also runs general transplant clinics, follow-up clinics for living kidney donors, and disease management transplant clinics, which are catered for the patients who have recently transplanted in the first 3 months, as well as for those after 3 months, who have complicated problems that require the management of a Transplant team.

In order to provide a more seamless and efficient evaluation of living kidney donors and recipients, patients are also offered the choice of a two-day inpatient stay in the hospital, for evaluation and counselling for the living kidney donor transplantation.

To facilitate the outpatient care of these patients, there is a team of Transplant coordinators, that are supported by an IT system to promptly track laboratory results and follow-up plans. The Transplant coordinators and doctors are also on 24-hours call, to attend to the needs of recently-transplanted recipients.

RESEARCH

The Renal Transplant Programme is active in Academic Transplantation, and is involved in single-centre, as well as collaborative research projects with many partners, such as Nanyang Technological University, SingHealth Duke-NUS Academic Medical Centre and Duke Transplant Centre (USA).

Its signature research programmes are in Immune Biomarkers, Pharmacogenomics and Clinical Immunosuppression. There are also collaborative experimental transplantation projects for uterine, islet cell and composite vascularised allograft transplantation. To support research, the programme also has an online Renal Transplant database system.

EDUCATION

The Renal Transplant Programme is active in undergraduate and postgraduate education for doctors, nurses and allied health professionals, by organising postgraduate courses in Renal Transplantation.

In addition, the programme also has a 1-year fellowship programme with the *Postgraduate Medical Institute of Singapore General Hospital* (SGH-PGMI), for overseas doctors and surgeons who would like basic and advanced training in the field of Renal Transplantation medicine and surgery.

End-Stage Kidney Disease (ESKD) is the last stage of Chronic Kidney Disease, where the function of the kidneys has gradually declined, to the stage where the patient requires additional treatment in order to survive. The treatment options available include dialysis or kidney transplantation.

Kidney transplantation is the best treatment option, as it provides for a longer and better quality of life for the patient. Due to a shortage of deceased donor kidneys and the growth of patients on the wait list, a living kidney transplant has become the treatment of choice for patients suffering from ESKD.

WHO CAN BE A LIVING KIDNEY DONOR?

- An individual of at least 21 years of age (no upper age limit)
- Have normal kidneys structure and function
- No other conditions, that increase the risk of kidney failure and surgery
- Different blood and tissue types can be considered

HOW TO VOLUNTEER AS A DONOR?

- Share your intention to donate, with the physician in charge of the care of your loved one(s)
- Make an enquiry with the SGH Renal Transplant Programme (**Hotline: 6321 4661**)

The Renal Transplant Team

Assistant Professor Terence Kee Yi Shern is the Medical Director of the SGH Renal Transplant Programme. Transplant patients are taken care of by a multidisciplinary team of healthcare professionals.

For more information, please contact:

SingHealth Transplant
Tel: **6326 6368**
Email: **singhealth.transplant@singhealth.com.sg**
Website: **www.singhealth.com.sg/transplant**

SINGAPORE GENERAL HOSPITAL

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Interested applicants are to email your CV with full personal particulars, educational and professional qualifications (including housemanship details), career history, present and expected salary, names of at least two professional references, contact numbers and e-mail address together with a non-returnable photograph.

Please email your CV to the respective institutions' email addresses/online career portals with the Reference Number MN1801.

SingHealth

The SingHealth Duke-NUS Academic Medical Centre draws on the collective strengths of SingHealth and Duke-NUS Medical School to drive the transformation of healthcare and provide affordable, accessible, quality healthcare.

With 42 clinical specialties, a network of 3 Hospitals, 5 National Specialty Centres, 9 Polyclinics and Bright Vision Community Hospital, it delivers comprehensive, multidisciplinary and integrated care.

In 2018, SingHealth welcomes the assimilation of the Changi General Hospital in the provision of seamless patient care in the eastern region of Singapore. The Sengkang General Hospital and the Sengkang Community Hospital will also be completed to better serve the north-eastern community.

To enhance community care, the new Outram Community Hospital on the SGH Campus will be completed in 2020.

Singapore General Hospital

Departments seeking Resident Physicians:

- Ear, Nose and Throat
- General Surgery (Same Day Admission Centre)
- Staff Clinic

Website: www.sgh.com.sg
Career Portal: www.sgh.com.sg/subsites/sgh-careers/medical/pages/career-opportunites.aspx
Email: careers.medical@sgh.com.sg

KK Women's and Children's Hospital

Departments seeking Resident Physicians and Staff Registrars:

- Emergency Medicine

Website: www.kkh.com.sg
Email: medical.hr@kkh.com.sg

Sengkang Health

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- Emergency Medicine
- General Surgery
- General Medicine (with interest in Endocrinology, Gastroenterology, Geriatric Medicine, Rehabilitation Medicine, Renal Medicine and Respiratory Medicine)
- Intensive Care Medicine
- Neurology
- Orthopaedic Surgery

Website: www.ah.com.sg
Career Portal: www.ah.com.sg/jobseekers/Pages/JoinUs.aspx
Email: careers@skh.com.sg

National Heart Centre Singapore

Departments seeking Resident Physicians:

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- Cardiothoracic Surgery

Website: www.nhcs.com.sg
Email: hr_mgr@nhcs.com.sg

National Neuroscience Institute

Department seeking Resident Physicians:

- Neurology

Departments seeking Resident Physicians and Service Registrars:

- Neuroradiology
- Neurosurgery

Website: www.nni.com.sg
Email: nni_hr@nni.com.sg

Singapore National Eye Centre

Departments seeking:

- Staff Registrars / Physicians
- Primary Eyecare Physicians (Full-time / Locum)

Website: www.snec.com.sg
Email: recruitment@snec.com.sg

SingHealth Community Hospitals (Sengkang Community Hospital and Bright Vision Hospital)

Departments seeking:

- Staff Registrars / Resident Physicians (Family Medicine)

Website: www.singhealth.com.sg
Career Portal: www.singhealth.com.sg/Careers/Pages/Home.aspx
Email: joann.teo.m.e@singhealthch.com.sg

GP Forum
World Sleep Day

Sleep plays a very important role in our physical health as we spend a third of our lives sleeping. We all know that poor sleep causes dramatic health consequences and increased risk of developing chronic conditions.

Many patients come forward presenting mainly with poor and non-refreshing sleep or a difficulty in initiating and maintaining sleep. There is a role for primary care and patients' family physicians, like you, to make a difference for your patients.

To find out the answers to common sleep complaints in adults, we invite you to join us at our World Sleep Day GP Forum for an informative and practical session.

Date
17 March 2018, Saturday

Time
1.00pm - 3.35pm
(Registration starts at 12.30pm)

Venue
Singapore General Hospital,
Academia Level 1, Auditorium

Fee
Free

CME point
1 point

Programme	
Time	**Topic & Speakers**
1.00pm	**Lunch**
2.00pm	**Opening Address** ***Dr Toh Song Tar*** Head, SingHealth Duke-NUS Sleep Centre Director, Sleep Disorders Unit Senior Consultant, Department of Otolaryngology, SGH
2.05pm	**OSA and Overview of OSA Management** ***Dr Ong Thun How*** Senior Consultant, Department of Respiratory & Critical Care Medicine, SGH
2.35pm	**How to Order A Sleep Study** ***Dr Shaun Loh*** Associate Consultant, Department of Otolaryngology, SGH
3.05pm	**Ambulatory Sleep Study Talk (Alice Night One)** Philips Respironics
3.15pm	**Ambulatory Sleep Study Talk (Apnoea Link)** Resmed
3.25pm	**Ambulatory Sleep Study Talk (WatchPat)** Easmed

REGISTRATION REQUIRED BY 14 MARCH 2018.
For more details, please contact: **gnrsdu@sgh.com.sg**

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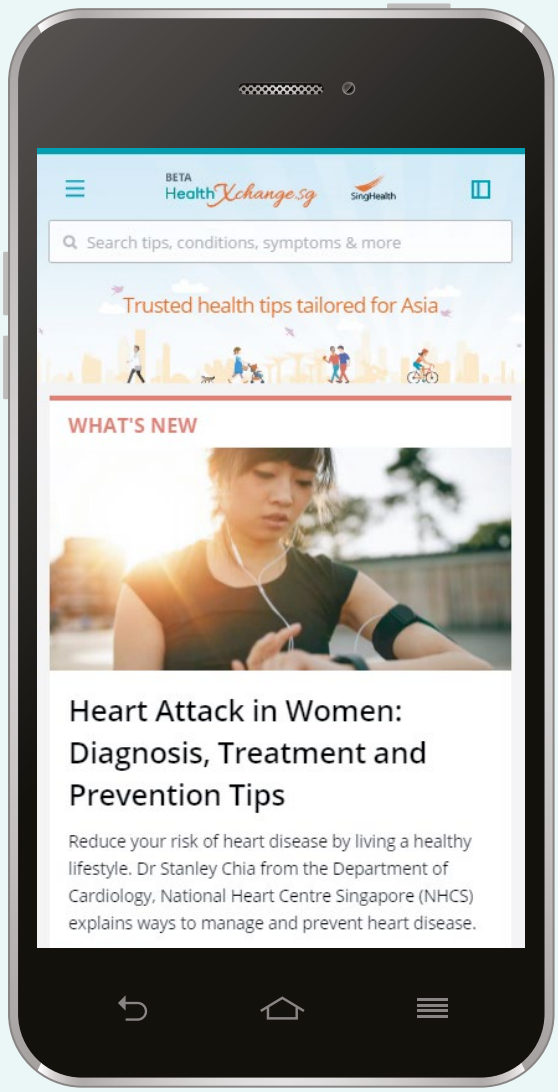

HIGHLIGHTS

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- WOMEN
- CHILDREN
- 65+ SENIORS
- DIABETES
- CANCER
- BLOOD PRESSURE
- CHOLESTEROL
- MEDICINE & FIRST AID
- HEART & LUNGS
- DIGESTIVE SYSTEM
- FOOD & NUTRITION

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Courses

National Neuroscience Institute
8th Singapore International Parkinson Disease and Movement Disorders Symposium

The symposium will focus on the causes, diagnosis and the management of Parkinson Disease and Movement Disorders. It will include plenary sessions, parallel sessions and workshops, as well as poster and video presentations.

An academically rich and enjoyable programme awaits the participants from Singapore and the region. Together with various local and regional specialists, the following renowned international experts make up the faculty:

• Prof Jean-Marc Burgunder	Switzerland
• Prof Olivier Rascol	France
• Prof Zbigniew K. Wszolek	USA
• Prof Martin J. McKeown	Canada
• Assoc Prof Darren Moore	USA
• Prof Hyder A. Jinnah	USA
• Assoc Prof Simone Engelender	Israel
• Prof Andres Lozano	Canada
• Assoc Prof Alfonso Fasano	Canada

The symposium will include a **Main Symposium** and **2 Pre-symposium Seminars**:

MAIN SYMPOSIUM
Date: 29 - 30 June 2018, Friday - Saturday | **Time:** 8.00am - 5.30pm

FEES

Category	Early-Bird Registration Registration and payment must be made before 1 May 2018	Normal Registration Registration and payment must be made from 1 May to 14 June 2018	On-Site Registration All registration and payment received from 15 June 2018 onwards will be considered as an *On-Site Registration*
Physicians and Researchers	**S$220**	**S$270**	**S$320**
Trainees, Nurses, Allied Health Professionals and Other Medical Professionals	**S$140**	**S$190**	**S$240**
NNI-CCPP Partners	**S$100**	Rates are as per the above respective categories	

PRE-SYMPOSIUMS
- Translational Research in Parkinson Disease and Related Movement Disorders
- Deep Brain Stimulation (DBS) Surgery for Parkinson Disease

Date: 28 June 2018, Thursday
Time: For details, please visit https://www.nni.com.sg/education/events/Pages/SIPDMDS.aspx

FEES

With Registration for the Main Symposium	Without Registration for the Main Symposium
S$30 per Seminar	S$60 per Seminar

Venue: Academia, Singapore General Hospital, 20 College Road, Level 1, Singapore 169 856

For enquiries:
Email: **nni_secretariat@nni.com.sg** | Tel: **6357 7152 / 6357 7640**
For more details, please visit:
https://www.nni.com.sg/education/events/Pages/SIPDMDS.aspx

SingHealth
www.singhealth.com.sg

GP FAST TRACK APPOINTMENT HOTLINES

Singapore General Hospital	6321 4402
Changi General Hospital	6850 3333
Sengkang General Hospital	6472 2000
KK Women's and Children's Hospital	6294 4050
National Cancer Centre Singapore	6436 8288
National Dental Centre Singapore	6324 8798
National Heart Centre Singapore	6704 2222
National Neuroscience Institute	6357 7095
Singapore National Eye Centre	6322 9399

DIRECT WARD REFERRAL CONTACT NUMBERS

Singapore General Hospital	6321 4822
Changi General Hospital	6788 8833
KK Women's and Children's Hospital	6394 1180

SINGHEALTH DUKE-NUS ACADEMIC MEDICAL CENTRE

- Singapore General Hospital
- Changi General Hospital
- Sengkang General Hospital
- KK Women's and Children's Hospital
- National Cancer Centre Singapore
- National Dental Centre Singapore
- National Heart Centre Singapore
- National Neuroscience Institute
- Singapore National Eye Centre
- SingHealth Community Hospitals
- Polyclinics SingHealth

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