Snoring and Sleep apnea

1. Snoring and obstructive sleep apnoea are different.
2. Snoring on its own is mostly a social problem.
3. Weight reduction is usually the most important therapy.
4. None of the available treatments, nasal CPAP, mouth guards and surgery are 100 percent effective.
5. In children symptoms of obstructive sleep apnoea are different from adults.

In this chapter we will discuss snoring and disturbed breathing during sleep, their significance, and why people are investigated and treated for these conditions.

In discussing breathing and sleep the following definitions are useful.

1. **Snoring.**
   Snoring is the noise produced by the air going through the throat while the person is asleep.

2. **Apnoea.**
   Apnoea is a word used by doctors which means stopping breathing completely.

3. **Hypopnoea.**
   This is another medical word which refers to stopping breathing partially. This is usually defined as a 50 percent decrease in breathing compared to breathing when awake.
Snoring is very common with one in five people snoring almost every night. Men snore more than women, with a ratio of four to one. Women are also more likely to complain of the bed partner snoring than men.

Disturbed breathing during sleep is also common. Studies conducted among the general population in the Hunter area of NSW suggest that at least one in every 25 people (4 percent) have sleep apnoea. Similar results are found in other studies across the world.

**Reason for investigating snoring**
There are a few reasons why a person with snoring is investigated.

1. the snorer may disturb other people around him even though he dose not feel a problem himself
2. the bed partner has noticed that breathing stops and is concerned for his safety
3. the person is a snorer, may wake up with choking feelings and feels unrefreshed in the morning with tiredness and sleepiness during the day

**Breathing and sleep**
When we fall asleep the body muscles tend to relax and become floppy, including the muscles in the back of the throat. As the air goes through, the floppy tissue vibrates and makes the noise of snoring. In some people the muscles become so floppy that they tend to collapse in the back of the throat, the air stops going through and the person stops breathing completely (apnoea) or partially (hypopnoea). Stopping breathing can last from a fraction of a second up to 30 or 40 seconds or more.

**Obstructive sleep apnoea**
Stopping breathing up to five times per hour, once every ten minutes on average, is unlikely to be harmful and it is still considered normal. Stopping breathing completely more than five times per hour is called **obstructive**
Sleep apnoea (OSA). If we consider both stopping breathing completely (apnoea) and partially (hypopnoea), the 'normal' limit is set at fifteen disturbed breathing per hour. The higher the number of disturbed breathing the more severe the condition. By convention stopping breathing below 30 times per hour is considered mild and more than 30, moderate to severe.

The term Pickwickian syndrome was used in the past to describe grossly overweight subjects with respiratory failure and daytime sleepiness. The majority had obstructive sleep apnoea, and also decreased drive to breathe when awake.

Implications of sleep apnoea
During sleep apnoea, each time the person stops breathing the oxygen starts falling and this fall in oxygen triggers the body to wake up. Sometimes the person will wake up completely, sometimes with choking feelings lasting a few seconds or a very dry mouth. However, the majority of the time the person does not wake up, instead sleep is lightened up from deep stages to very superficial sleep, causing the person to be very restless.

These events account for the two most important consequences of sleep apnoea.

1. Poor sleep quality due to sleep fragmentation
2. Chronic lack of oxygen

The most immediate consequence of disturbed breathing during sleep is sleep fragmentation. For example, if a person has stopped breathing 30 times per hour his sleep tends to be disrupted that many times. The person wakes up unrefreshed even if he has been asleep for ten hours because sleep quality has been poor. He has increased tiredness and lethargy during the day. His memory and concentration tend to deteriorate, his mood can change, being moody, irritable, short-tempered. This in turn can cause
personal, interpersonal and job related problems. It is also reported that sexual drive and potency is reduced in patients with obstructive sleep apnoea.

It is important to realise that, although symptoms occur during the day, sleep apnoea occurs while the person is asleep and is often unaware of the problem. So persons with sleep apnoea may be investigated and treated for chronic tiredness and fatigue or for depression when the problem is actually sleep apnoea.

The other important consequence of disturbed breathing during sleep is chronic low oxygen at night. If the person stops breathing long enough, the oxygen drops below levels which are considered safe. If sleep apnoea continues undiagnosed and untreated for years the person spends long periods with low oxygen in the body. Although not proven with certainty, obstructive sleep apnoea may carry an increased risk of cardiovascular diseases such as hypertension, heart attack and cerebrovascular accidents (stroke).

It has been suggested that chronic lack of oxygen due to sleep apnoea may be a cause of dementia. However there is no evidence for it.

**Will my husband/wife stop breathing and not start again?**

This is a frequently asked question and a major concern to many people attending our sleep centre. The answer is no. When a person stops breathing and the oxygen drops to low levels the body tends to wake the person and breathing starts again. It is surprising how the body can tolerate prolonged period of low oxygen. The only possible situation when breathing may not restart is in some cases of sudden infant death syndrome (SIDS). However even in this situation evidence is not strong.
Who is at risk for sleep apnea

There are a number of factors which can increase the risk of having sleep apnoea. In order of importance

1. Obesity

Increased weight is the most important risk factor for sleep apnoea. As you put on weight snoring and stopping breathing increase and vice versa. One possible explanation for this is that fatty tissue can cause narrowing of the space in the throat. Together with obesity, a short and thick neck is often associated with sleep apnoea.

A good measure of obesity is the body mass index (BMI) calculated by dividing the weight in kilograms by the height in meters squared. Normal values are between 20 and 25, overweight 25 to 30, and obesity above 30. A weight reduction of six to eight kilograms if often effective.

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BMI = \frac{weight(Kg)}{height^2(m)}
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Normal = 20-25
Overweight = 26-30
Obese = >30

2. Alcohol and sedatives

Alcohol, like many sedative medications, is a muscle relaxant and can make the lining of the throat flaccid and in turn increase the risk of snoring and
stopping breathing. It is common knowledge that if a person has a few drinks in the hours close to going to bed he is likely to snore and stop breathing more. Because the action of alcohol is short, usually two or three hours, the snoring and disturbed breathing are more obvious in the first part of the night. This effect of alcohol on breathing also accounts in part for the fact that, if someone has excess alcohol before falling asleep at night, he can fall asleep faster but wakes up unrefreshed.

3. Blocked nose
Breathing through the nose is our normal way of breathing. If someone has a blocked nose because of previous trauma, allergic rhinitis, hay fever or upper respiratory tract infection, snoring and sleep apnoea are more likely to occur.

This is one of the reasons why there are commercially available devices which can be put inside the nostril or outside (nasal strips) to try and improve nasal breathing. By and large these devices have not been shown to be effective but occasionally patients report improvement.

4. Hormonal problems
Patients with insufficient thyroid hormone (hypothyroidism) or excess of growth hormone are at increased risk of snoring and sleep apnoea. In people who suffer from diabetes sleep apnoea is more common.

The frequency of sleep apnoea increases in women after the menopause which suggests that female hormone may reduce the risk of snoring and obstructive sleep apnoea.

5. Smoking
Although less important than obesity and alcohol, smokers have chronic inflammation of the lining of the throat which can make apnoea more likely.
6. Male gender
Men are four times more likely to have sleep apnoea than women. This is probably due to hormonal influences as gender differences tend to disappear after menopause. In children before puberty the risk is the same between boys and girls.

There are other factors and other rare medical conditions that can make sleep apnoea more likely. For example, people with a very small chin, children with cranio-facial abnormality and people with Marfan’s syndrome\(^1\) are more likely to have sleep apnoea.

**Upper airway resistance syndrome and central sleep apnoea**
Before considering what to do if someone is suspected of having sleep apnoea, it is worth mentioning two further conditions in which breathing is disturbed during sleep: upper airway resistance syndrome and central sleep apnoea.

**Upper airway resistance syndrome** is a condition half-way between pure snoring (noise making) and obstructive sleep apnoea. In upper airway resistance syndrome the patient does not stop breathing and therefore the oxygen level does not drop like it does with sleep apnoea. However, the body has to perform extra work to drive the air through the narrow passage of the throat during breathing. This extra effort causes disruption of sleep from a deep stage to a lighter stage. The person does not necessarily wake up completely but his sleep is broken and often unrefreshing. The symptoms of upper airway resistance syndrome are the same as obstructive sleep apnoea.

The word sleep apnoea usually refers to *obstructive* sleep apnoea but often obstructive is omitted. Collapse of the “muscles” at the level of the throat during sleep is the most common cause of sleep apnoea accounting for 95 percent of the cases. However there is another form of sleep apnoea called

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\(^1\) Patients with Marfan syndrome are tall, thin with long arms and legs. They often have very loose joints. They can for example bend their thumb backward down to their wrist.
‘central’ where the mechanism of stopping breathing is different. **Central sleep apnoea** is sometimes seen in children, often without causing any symptoms. It is also seen in patients with heart failure and with previous stroke. In central sleep apnoea the person stops breathing because the breathing centre in the brain, located in close proximity to the sleep and wake centre, does not send the information to the breathing muscles. The symptoms are similar to obstructive sleep apnoea but treatment is more difficult and often not successful.

**Ondine’s curse** is a rare form of central apnoea, which is seen in neonates and infants. In this condition the respiratory centre in the brain stem (see figure 1 in chapter one) is not functioning well and causes apnoeas. The young patients stop breathing when asleep but also when awake. It can occur in adults following damage to some part of the brain. The name, Ondine’s curse, is taken from a legend about a nymph, Ondine, who having been abandoned by her husband, condemned him to remember to breathe in order to continue to live.

**What to do if you suspect sleep apnoea?**

Sleep apnoea is well known to medical practitioners and you should discuss your concerns with your family doctor. Depending on the situation further investigation may be needed.

A simple home test called oximetry (chapter 2) can be done as a screening test. The person’s oxygen is monitored through a finger clip and up to 8 hours of information can be stored in a computer chip. If a person is a snorer but does not stop breathing the oxygen remains unchanged through the night with values above 90 percent (fig. 9, chapter 2). However if the person is stopping breathing the oxygen will fluctuate up and down which is suggestive of sleep apnoea. The most comprehensive test available is the overnight sleep study described in the previous chapter.
Treatment of obstructive sleep apnoea

Weight Reduction
For the large majority of patients with sleep apnoea weight reduction is the most important treatment but also the most difficult to achieve. It is the only cure available compared to the other forms of treatment which improve symptoms but do not cure the condition.

Symptomatic Treatment

Nasal continuous positive airway pressure (nCPAP) (fig.below)
A mask is attached to the nose while air is blown through a tube connected to a sophisticated compressor. This increases the pressure in the back of the throat preventing it from collapsing by creating a pneumatic splint. It is a very effective treatment but cumbersome and impractical. About 30 percent of patients can not use it. It is however, the treatment of choice for severe sleep apnoea (i.e. stopping breathing more than 30 times per hour).
A variation of nasal CPAP is called bi-level positive airway pressure. With these devices the pressure increases when the person breathes in and decreases when the person breathes out which makes it easier to use.

**Mandibular advancement devices ‘mouth guards’ (figure)**

These are oral appliances similar to the mouthguards used by patients who grind their teeth, and the ones used in sport. They are usually made of soft material and the mould is taken with the lower jaw in a forward position. There are many different kinds of mouthguards available commercially but the principle of action is the same. It is proposed that they modify the position of the lower jaw, together with the base of the tongue and the soft tissue structure of the throat. The forward and slightly downward positioning of the lower jaw may bring about an increase in space in the back of the throat as well as altering the mechanical properties of the soft tissue of the palate.

![Example of mouth guard “NovaSleep™️](image)
Mouthguards are effective in about 70-80 percent of patients who snore and are also indicated in mild sleep apnoea (stopping breathing less than 30 times per hour). It can be tried also in patients with severe sleep apnoea who cannot tolerate or do not want to use nasal CPAP.

The use of mouth guards can cause teeth discomfort in the morning and extra salivation. It is important that the bite is centred otherwise temporo-mandibular pain (jaw pain) can result. Teeth need to be well maintained for a mouth guard to be applied.

**Surgery to the palate (figure)**
Surgery to the palate is called uvulopalatopharyngoplasty, often shortened to UPPP.

This surgery can be accomplished with a variety of techniques including scalpel and suturing, laser surgery, radiofrequency needle and other techniques to try and “stiffen” up the soft palate.
It was initially thought that surgery could be a curative procedure for sleep apnoea. However, this is not the case and results suggest the following:

1. surgery is not indicated in patients with severe sleep apnoea. In this setting the benefit is usually limited, with a recurrence of stopping breathing within a few months of the surgery
2. surgery is an effective treatment for snoring and in some patients with mild sleep apnoea
3. surgery to the palate does not bring about a permanent cure. This is to say that as time passes there is a risk of snoring recurring. This is particularly true if the person puts on weight

There are potential complications due to surgery. The area which is operated on is involved with swallowing mechanisms as well as with voice production. Although rare, after surgery, some patients may have difficulty swallowing and the characteristics of the voice may change. This may be relevant in people who use their voice for professional reasons.

It should also be considered that, although the soft palate is the most common site of vibration causing snoring, in some people the site of vibration is the back of the tongue. In this situation surgery to the palate will be ineffective. Currently there is no certain way to identify the patients who have this problem.

Surgery to the palate can either be done with a scalpel or with a laser beam. Both procedures are painful and the ‘laser’ treatment when done in one session is particularly painful.

The laser treatment is a more recent technique and long term consequences are not fully known.
Other surgical techniques can be applied to the mandible in an effort to bring it forward. These are performed in the United States but are not common in Australia.

**Treatment of snoring**

There are people who snore loudly but sleep well, wake up refreshed and feel well during the day. These patients are evaluated, not because they feel they have a problem but because the bed partner or the family complains bitterly about their snoring.

With few exceptions loud snoring is a problem not only because the patient makes the noise but also because the bed partner is a light sleeper. This is to say that in these situations snoring is a ‘couple’ problem where the snorer wears the brunt of the blame.

The treatment of snoring includes general advice such as weight reduction, avoidance of alcohol in the 2 or 3 hours before going to bed and the maintenance of clear nasal passages. If these manoeuvres are not sufficient the use of a mouth guard can be effective in 60 to 70 percent of the cases.

Surgery to the palate either with a scalpel or laser beam is also been tried with poor result in the long run. When considering surgery for pure snoring it should also be remembered that treatment is undertaken for cosmetic reasons and not for strictly medical ones. There is no evidence that snoring causes short term or long term ill health. Surgery for snoring is quite different from, for example, surgery for an inflamed appendix where surgery can be life saving.

It should also be understood that surgery for snoring is not a permanent cure.

As the time passes by, and in particular if a person puts on weight, snoring is likely to recur.
On occasions the choice to sleep in different rooms, because the husband or wife is a snorer, is a convenient excuse for not sleeping together. In this case no treatment is effective or indicated.

**Treatment of central sleep apnoea**
This is difficult because treatment with nasal CPAP is usually not effective. The problem in central sleep apnoea is not obstruction at the level of the palate, instead the breathing centre does not supply the appropriate information to the breathing muscles. Some beneficial effect is obtained by the use of a medication called theophylline which was extensively used in the past for the treatment of asthma (Theodur™).

**Treatment of upper airway resistance syndrome**
The treatment of this condition is the same as for sleep apnoea. However, in upper airway resistance syndrome, weight reduction is paramount and usually effective.

**Pregnancy, snoring and sleep apnoea**
Snoring and sleep apnoea are less common in women than in men. However during pregnancy important changes occur in the woman body which may make snoring and sleep apnoea more likely. In particular fluid retention(accumulation of fluid) may contribute to narrowing of the airway. Snoring is reported by 10 percent of pregnant women compared to 4 percent on non pregnant ones. It more common in the 3rd trimester.
Snoring itself does not appear to increase the risk of delivery or cause foetal distress. However cases of obese women with sleep apnoea (snoring and stopping breathing) in whom pregnancy was complicated by foetal distress have been documented. In pre-eclampsia, a condition characterised by high blood pressure and marked fluid retention, congestion of the airways may precipitate disturbed breathing during sleep and result in low oxygen level with potential increased risk for the foetus. Overnight sleep study can be performed safely in pregnancy and may help clarify if sleep apnoea is present.

The treatment of these conditions in pregnancy is the same as in non pregnant women.

Other causes of “choking” sensations during sleep
Although obstructive sleep apnoea is a common cause of waking up from sleep with choking sensations, the following conditions can also be causes of choking during sleep.
Gastric reflux (hiatus hernia)
This a very common complaint. Reflux is caused by fluid from the stomach coming back in the gullet and sometimes in the throat. Usually the person is aware of it because of a burning feeling in the chest (heartburn). However one in four people with reflux do not have heartburn and therefore may not be aware of it. During sleep, when muscles relax, small amount of fluid can reach the throat and irritate the vocal box and even spilling in the trachea and bronchi. The person may wake up with a choking feeling. In sleep apnoea the sensation lasts only a second or two. In reflux the choking can last 10-20 seconds or more and there is also prolonged coughing.

Avoidance of food and fluid in the two-three hours before going to bed may help, together with medical treatment of reflux.

Panic attack, sleep laryngospasm and sleep choking syndrome
Not many people are aware that panic attacks can occur during sleep. The person wakes up with the sensation of not being able to breath in (contrary to asthma where the difficulty is mostly to breath out). There is also a feeling of anxiety, sometime of impending doom and fright. As a spontaneous reaction the person tries to breath harder. The harder they breath the more difficult it seems. The condition is frightening but not life threatening. It can lasts few minutes and then resolve. Treatment requires the person to become aware of this mechanism and then to try to breath slowly. Explanation and reassurance is often all is needed. If it happens frequently, benzodiazepine or other anti anxiety medication can be very useful. Sometime people with this presentation are said to have sleep laryngospasm or sleep choking syndrome.
Further reading


