

Management of obstructive sleep apnoea

Submission to NICE on behalf of the Sleep Section of the
Royal Society of Medicine



Contents:

Introduction

- 1 Obstructive sleep apnoea
 - 1.1 Definition
 - 1.2 Epidemiology
 - 1.3 Clinical features
 - 1.4 Pathophysiology
 - 1.5 Diagnostic methods

- 2 Impact of sleep apnoea
 - 2.1 Social
 - 2.2 Medical
 - 2.3 Driving / Road traffic accidents
 - 2.4 health related quality of life

- 3 Treatment options
 - 3.1 Weight loss life style
 - 3.2 Surgery
 - 3.3 Orthodontic devices
 - 3.4 CPAP

- 4 Conclusion

Introduction

This submission is made on behalf of the sleep section of the Royal Society of Medicine. The scoping exercise was attended by [REDACTED], Consultant Physician at the University Hospital of North Staffordshire and Treasurer of the Sleep Section of the Royal Society of Medicine who has also prepared this report on behalf of the above.

The exercise is to look at whether Continuous Positive Airways Pressure (CPAP) is effective in the management of Obstructive Sleep Apnoea (OSA) and, if so, is it universally available. I have not considered the paediatric population or the role of CPAP in heart failure. I have made several statements which are supported by clinical evidence but for brevity have not included them.

1 Obstructive sleep apnoea

1.1 Definition

Obstructive sleep apnoea is a clinical syndrome with a wide spectrum of clinical symptoms the cardinal features of which are loud snoring, witnessed apnoeas, nocturnal choking and excessive daytime sleepiness due to the pathophysiological problems of recurrent upper airway collapse.

1.2 Epidemiology

The epidemiology of obstructive sleep apnoea depends upon case selection and the tools made to confirm the diagnosis.

In the UK there have been no large epidemiological studies using polysomnography (see below) to make the diagnosis. Where epidemiological studies have been conducted oximetry has been the major tool and regrettably this does have a false negative rate.

The best data on the epidemiology comes from North America where 9% of adult men and 4% of adult women were found to have more than 5 episodes of sleep disordered breathing per hour. If symptoms of excessive daytime sleepiness are also included the figure becomes 4% and 2% respectively that would require treatment i.e. an average across the genders of 3%.

Clearly the body mass index of individuals in North America is greater than those of the UK (but we are catching up!) but a prevalence of around 1% appears realistic.

The "cut off" of either symptoms as in the Epworth scale and /or number of episodes of apnoea when treatment needs to be introduced is something that will need to be determined. Studies have shown that there is cognitive impairment in patients who have more than 10 episodes of sleep disordered breathing per hour and partial impairment in all individuals who have more than 5 episodes per hour. If a cut off of 10 episodes per hour is used together with symptoms an estimated 0.5% of the adult population are likely candidates to require treatment for sleep apnoea.

Although normally considered a disease of obesity sleep apnoea occurs in normal weight individuals especially if they have craniofacial abnormalities (see below).

In pre-menopausal women the prevalence of sleep apnoea is low whilst in post menopausal women the incidence will approach that of men. Overall there is an approximate 9:1 of males: female ratio.

1.3 Clinical features

The clinical features range widely and depend upon the individual's response. In the absence of upper airway surgery loud snoring associated with pauses in breathing (apnoeas) terminated by the airway re-opening, characterised by a loud "grunt", is very typical. This produces considerable marital disharmony and often leads to the partner moving into a separate bedroom.

The frequent awakenings at the termination of the events, arousals, are the cause of the excessive daytime sleepiness. In the current concept of sleep arousal of the brain there are intra and inter individual differences in the extent of the excessive daytime sleepiness due to this recurrent arousal. While some individuals are able to keep awake whilst doing physical or mental activity, when in the position of being able to relax they fall asleep. In some individuals sleepiness is a predominant feature which they find difficult to override.

This marked excessive daytime sleepiness when relaxed together with the loud snoring leading to partners being in a separate bedroom produces considerable marital disharmony. Given the endocrine changes associated with sleep apnoea together with the marked excessive daytime sleepiness there is a significant reduction in libido further putting a strain on marital / partner relationships.

Associated with the termination of the episode of apnoea is a considerable release of catecholamines. The adrenaline / noradrenaline is associated with wide variation in blood pressure and is a major factor in the development of daytime hypertension. Furthermore the release of cortisol and adrenaline explains the impaired glucose tolerance found in many patients.

The wide intra-thoracic pressure swings associated with the airway collapsing also put a strain on the heart and affect venous return with a release of cardiac hormones (atrial natriuretic peptide) and therefore frequent nocturia is a common symptom which also causes considerable patient distress.

The loss of cognitive function because of sleepiness means that routine tasks become much more difficult and individuals may make errors not only in driving but in the activities of daily living.

1.4 Pathophysiology

The pathophysiology of obstructive sleep apnoea relates to recurrent upper airway collapse. The normal site for this is in the velopharyngeal or oropharyngeal areas or, more commonly, multi-segment.

The reasons for this collapse are often an anatomical abnormality of the upper airway, abnormality be this either an abnormal jaw e.g. retrognathia or hypoplastic, large tonsils. Weight gain and tobacco use both exacerbate the narrowing.

When the individual falls asleep there is a relatively loss of upper airway muscle tone causing upper airway collapse. This may be partial, producing a limitation of airflow leading to snoring, or more extensive leading to a reduction in ventilation or overt obstruction of the airway. Whether there is complete or partial occlusion of the

airway the clinical effects are similar. The determination of whether it is partial or complete collapse depend upon the method of investigation/diagnosis.

The airway collapse is associated with “asphyxia” and once the oxygen stores in the body/lungs are utilised there is progressive arterial oxygen desaturation. The individual continues to make efforts to breath, that the partner may notice as “squeaks” while the individual attempts to breathe, generating large inter-pleural pressure swings as above.

The episode of apnoea is terminated by a cortical arousal as determined from EEG or sub cortical arousal as determined by other autonomic markers. With this arousal tone returns to the upper airway which “pops open” with a loud noise. The individual is rarely aware that they have been awake and go back to sleep immediately for the whole cycle to repeat itself.

The length of apnoeas varies widely but by definition must be greater than 10 seconds and is often 20-30 seconds or longer. The time between apnoeas likewise varies between and within the same individual but it is not uncommon for them to occur 50 or more times per hour of sleep.

As expected this marked sleep fragmentation leads to the features of excessive daytime sleepiness and impaired cognitive function.

1.5 Diagnostic methods

Although not part of the NICE remit it is clearly important that a diagnosis of sleep apnoea is confirmed if we are going to offer an effective treatment.

There are numerous ways of making the diagnosis but an investigation to confirm the upper airway collapse or the sequelae thereof, is required because sleep apnoea is only one of many causes of excessive daytime sleepiness and snoring occurs in 40% or so of the adult population and therefore the use of snoring together with daytime sleepiness alone are inadequate for the diagnosis.

Overnight oximetry in the patient’s home may be considered as a screening procedure. When positive it may confirm the diagnosis but does not exclude it. More limited studies looking at cardio-respiratory movement together with oximetry are usually required and rarely is full polysomnography (when the EEG is recorded) is necessary. Full polysomnography may be required if alternative diagnoses are considered at the outset.

If CPAP is to be provided some thought does need to be considered on the issue of diagnosis to ensure that the CPAP therapy is given to individuals who require it.

2 Impact of obstructive sleep apnoea

2.1 Social

As stated above the recurrent episodes of snoring, witnessed apnoeas, excessive daytime sleepiness, nocturia and loss of libido produce a considerable strain on any relationship. Furthermore daytime sleepiness means that there is lack of engagement with the partner during the day or when the individual returns from work. As a consequence it is often the partner who promotes the individual to attend for investigation of their problem.

2.2 Medical

While an extensive review of the literature is not appropriate there is evidence to show that untreated obstructive sleep apnoea is associated with a development of hypertension and that patients with refractory hypertension may have obstructive sleep apnoea, treatment of which may give better control of the hypertension. There is an association with ischaemic heart disease, with untreated patients having an excessive cardiovascular mortality whilst there is some compelling although variable evidence linking sleep apnoea to stroke. Recent work has suggested that sleep apnoea is a common feature of the metabolic syndrome and may have a role in precipitating diabetes, a patient group who appear to have a greater prevalence of sleep apnoea.

2.3 Driving / Road traffic accidents

Obstructive sleep apnoea is associated with excessive daytime sleepiness via the mechanisms stated above. This increases the risks of road traffic accidents considerably. Moreover given that an individual is not alert they fail to take evasive action and therefore such road traffic accidents are associated with a high fatality rate. Overall such road traffic accidents, including insurance claims are associated with a considerable financial burden by the National Health Service which would considerably reduced if effective treatment was utilised.

2.4 Health related quality of life

As expected from this chronic condition there is considerable impairment of the health related quality of life in obstructive sleep apnoea. This has been measured by a variety of standard techniques all of which confirm a marked impairment that improves with therapy. Moreover there is an increase in healthcare utilisation prior to the diagnosis of obstructive sleep apnoea which falls once effective therapy is in place.

3 Treatment Options

3.1 Weight loss / life style changes

Although life style changes should be advocated for patients the evidence that they make a significant difference is not present. Clearly if an individual is consuming large amounts of alcohol prior to bedtime this is likely to have an adverse impact on the sleep apnoea by both making the upper airway collapse occur more readily and by raising the arousal threshold i.e. they do not wake up so readily. Modifying the alcohol intake will improve this but not necessarily treat the underlying sleep apnoea. Weight loss has been advocated by many parties however there is no evidence to suggest that this is an effective therapy with just anecdotal patients losing weight showing a reduction in the number of apnoeas.

3.2 Surgery

On the face of it upper airway surgery to increase the diameter of the airway lumen would seem a simple therapeutic option. However given that the upper airway collapse often occurs in several segments including the base of tongue, simple upper airway surgery is of little benefit and this has been confirmed in a Cochrane review. Furthermore there are a few studies which would suggest that upper airway surgery

(uvulopalatopharyngoplasty) may make the use of CPAP less viable because of increased leak.

In individuals with abnormal facial appearance it is possible to consider maxilla and mandibular advancement. Such surgery may be effective but is associated with considerable morbidity, not insignificant mortality and cost so the true cost benefit is questionable.

The ultimate surgical response to sleep apnoea is to bypass the site of the obstruction by a tracheostomy. Work from many years ago certainly confirmed that this was effective in managing sleep apnoea although is truly the last resort given the associated morbidity.

3.3 Orthodontic devices

There have been a variety of different devices placed in and around the upper airway to try and improve sleep apnoea. Nasopharyngeal tubes, tongue retaining devices and nasal dilators have been tried with little evidence of success.

Mandibular advancement devices which bring the mandible forward are a more recent development with evidence of benefit. They are effective especially if there is collapse of the oropharyngeal area in the setting of marked retrognathia. Provided there is adequate dentition to attach the device to and good dental hygiene these devices may work and they are certainly well tolerated however in severe sleep apnoea the devices tend to produce only a partial response.

3.4 Continuous Positive Airways Pressure

Although sleep apnoea has been known about since the mid 1960's it was only in 1982 when a facial mask was used to apply a pressure to the upper airway to prevent the collapse. This showed a remarkable improvement in symptoms and therefore continuous positive airways pressure has effectively become the treatment of choice. Such treatment initially was limited by problems of both the machine blower and the mask (interface). Technological improvements in both of these areas have led to masks with a better seal and improved comfort while the blowers that generate the pressure have become much quieter and portable.

Continuous Positive Airways Pressure is now the treatment of choice for the majority of patients as shown by its use extensively worldwide.

Unfortunately in the UK continuous positive airways pressure has not been available for patients in all health economies or if available is very limited and so rationed. Although difficult to get clear data, some primary care trusts do not fund CPAP machines whilst others will fund relatively few. For patients the choice is either a prolonged wait for CPAP or to purchase their own machine.

Given that the DVLA are quite clear on advising that patients with excessive daytime sleepiness should not drive and certainly individuals with a HGV/PSV licence should not drive unless effectively treated this will mean either a significant loss of income or loss of job for many individuals unless they purchase their own machine.

Within my own area of previously four and now two PCT's one PCT has allowed all patient who require CPAP to be investigated and managed, two of the PCT's would consider CPAP if I wrote a letter and it went through an escalation process while a fourth PCT flatly refused to allow the investigation or management of patients with

suspected sleep apnoea even though they may lose their job because of the nature of the licence they held.

4 Conclusion

The above account highlights briefly what is obstructive sleep apnoea, the pathophysiology and the symptoms that it causes. I have not gone into great detail about the impact of obstructive sleep apnoea as these are widely available in the literature but sufficed to say that there is significant morbidity from sleep apnoea and an excess mortality predominantly through cardiovascular problems. The impacts on the individual are huge both socially and in the need for additional health care and, moreover, in their ability (or not) to drive.

Different treatment options for obstructive sleep apnoea do exist but the only ones with an evidence base are either orthodontic devices or CPAP. While orthodontic devices may be beneficial in mild sleep apnoea / snoring they are of limited use in more severe disease, meaning that CPAP is the treatment of choice. Regrettably there is wide variation across the UK and within localities in the ability for the investigation of sleep problems and the provision of continuous positive airways pressure, a therapy with a clear evidence base which improves health related quality of life, reduces healthcare utilisation, dramatically reduces risks of road traffic accidents and other medical issues let alone giving quality of life back to individuals and their partners.