# Obstructive sleep apnoea and anaesthesia

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## Abstract

Obstructive sleep apnoea is the most prevalent sleep disorder, affecting up to 5% of the population. It can have profound effects on patients perioperatively and can have a considerable impact on morbidity and mortality. Patients require thorough preoperative assessment including the taking of a detailed history, the use of scoring systems to assess severity (such as the STOP-Bang questionnaire) and physical examination with particular attention to the airway. Elective surgery patients who are deemed to be high risk for OSA should be referred for polysomnography with implementation of CPAP prior to surgery if indicated. Those deemed low risk may be suitable for day surgery. Intraoperative anaesthesia management may include regional anaesthesia, local anaesthetic infiltration or general anaesthesia, depending on the symptoms and the nature of surgery. Particular attention should be paid to a potential difficult airway, the use of short acting agents with a rapid wake up and avoidance of sedatives and opioids. OSA patients have an increased risk of cardiovascular and respiratory postoperative complications. Postoperative management should be based on the severity of OSA, the occurrence of adverse respiratory events in the recovery unit and the need for opioid analgesia.

**Keywords** Apnoea-hypopnoea index (AHI); continuous positive airway pressure (CPAP); obesity; obstructive sleep apnoea (OSA); oxygen desaturation index (ODI); perioperative management; postoperative complications; STOP-BANG questionnaire

**Royal College of Anaesthetists CPD Matrix:** 1C01, 2A01, 2A03, 3A01

Obstructive sleep apnoea (OSA) is defined by the British Thoracic Society as the 'absence of breathing (>10 seconds) during sleep despite continuing respiratory effort; usually due to transient closure of the upper airway (pharynx)'. OSA is the most prevalent sleep disorder. It is characterized by repetitive partial or complete upper airway obstruction with cessation in airflow due to a decrease in upper airway tone. The patient suffers from periods of wakefulness and sleep leading to a disrupted sleep pattern. The condition effects 3–7% of middle-aged men and 2–5% of women and can have significant impact on morbidity and mortality. Up to 80% of patients with OSA in the general population are thought to be undiagnosed and therefore untreated.

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## Learning objectives

After reading this article, you should be able to:

- describe the risk factors and associated conditions in OSA
- explain how to diagnose OSA including the use of scoring systems and polysomnography
- identify characteristics of OSA patients that may be suitable for day surgery
- perform competent pre-assessment on OSA patients with stratification of severity
- describe key intraoperative and postoperative concerns in OSA patients.

## Presentation

OSA is particularly common in obese patients and can present in up to 40% of obese women and 50% of obese men. Patients often present with a history of snoring, daytime somnolence and impaired concentration. Family members may give a history of pauses in breathing of up to 30 times an hour followed by a loud snort or choking sound leading to arousal from sleep and a return to normal breathing. Refer to Table 1 for the predisposing factors for OSA.

OSA is linked to the development of metabolic syndrome (syndrome Z) which is characterized by obesity, insulin resistance, hypertension and dyslipidaemia. Its prevalence amongst OSA patients varies from 74 to 85% and the combination of these characteristics with OSA results in early development of cardiovascular disease.

## Pathophysiology

OSA has a complex pathophysiology. There are multiple factors which lead to a reduction in airflow (hypopnoea) or complete cessation (apnoea) resulting in episodes of hypoxia and hypercapnia and ultimately surges in sympathetic activation (Figure 1).

In the absence of abnormal anatomy, the disorder involves repeated collapse of the pharyngeal airway as a result of a reduction in oropharyngeal muscle tone (relaxation of genioglossus and pharyngeal constrictor muscles). This increases

### Predisposing factors for OSA

| Patient factors | Physical factors | Genetic/disorders |
|---|---|---|
| • male | • retrognathia | • Down's syndrome |
| • collar size >17 inches/43 cm | • macroglossia | • Pierre–Robin syndrome |
| • obesity | • maxillary constriction | • acromegaly |
| • excess alcohol intake | • hypertrophied tonsils | • hypothyroidism |
| • smoking | • nasal deformities/ septal deviation | • glycogen storage diseases |
| | | • Cushing's disease |
| | | • connective tissue diseases |

**Table 1**





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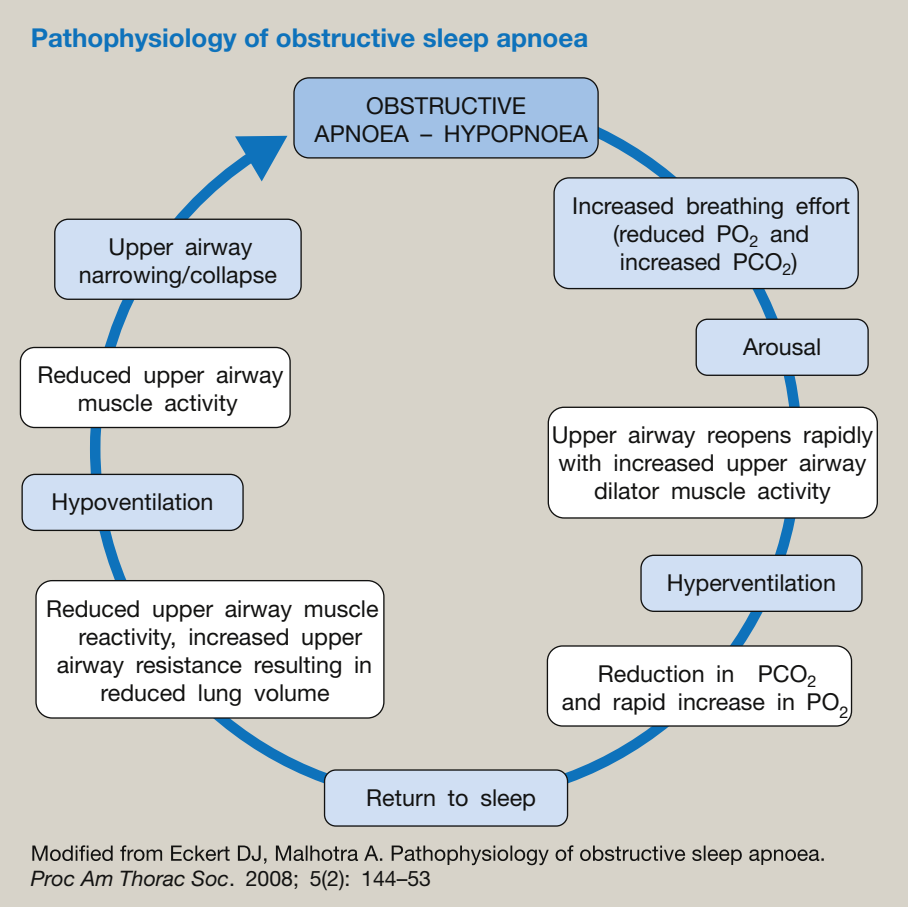


**Figure 1**

inspiratory pressures and causes alteration of the arousal threshold.

Hypoxia/reperfusion injury occurs in OSA secondary to these fluctuations in oxygenation during the sleep cycle. This leads to a massive release of oxygen radicals with activation of the inflammatory system, endothelial dysfunction and increased platelet aggregation. Ultimately, there is cellular and endothelial damage leading to vascular smooth muscle proliferation and increased sympathetic vasoconstrictor activity. This leads to hypertension and atherosclerosis.[1]

During the perioperative period, surgical stress, postoperative pain and endocrine changes associated with surgery can increase sympathetic activation leading to cardiovascular insult (myocardial ischaemia/infarction and arrhythmias).

The physiological changes, apart from arterial hypoxaemia and hypercarbia, are polycythaemia, systemic hypertension, cardiac rhythm disturbances, pulmonary hypertension and right ventricular failure.

## Diagnosis

There are a number of diagnostic tools including the STOP-Bang and Epworth scoring systems that can be useful.

STOP-Bang consists of eight Yes/No questions with a possible total highest score of 8. It is easy to use and is a reliable screening tool[2] (Table 2). Studies have demonstrated that with an increase in the STOP-Bang score there is an increase in the predicted probability and specificity of OSA, which makes the questionnaire ideal for identifying patients at high risk for OSA.[3] The specificity of STOP-Bang is quoted as 43% and 37%, respectively, for moderate and severe OSA, suggesting a high false positive rate.

In a more recent study by Chung et al., the consideration of serum bicarbonate ($HCO_3^-$) level along with STOP-Bang score improved specificity.[4] By combining serum $HCO_3^-$ level $\geq$28 mmol/L and STOP-Bang score $\geq$3, the specificity for all OSA, moderate/severe OSA and severe OSA was 85%, 82% and 79% respectively. It is thought the serum $HCO_3^-$ is elevated due to renal $HCO_3^-$ retention as a consequence of frequent respiratory acidosis during the obstructive apnoea/hypopnoea episodes.

There are also more formal investigations available to diagnose OSA including a sleep study known as polysomnography (PSG) which involves monitoring chest movement, airflow dynamics, heart rate, blood pressure and arterial oxygen saturation. In sleep studies, an obstructive apnoeic episode is defined as complete or near-complete disruption to airflow lasting at least 10 seconds. An obstructive hypopnoeic episode is an event of at least 30% reduction in airflow lasting at least 10 seconds with associated 4% oxygen desaturation. The number of apnoeic and hypopnoeic events divided by the number of hours of sleep derives the apnoea-hypopnoea index (AHI). The guidelines of the American Academy of Sleep Medicine stratify the severity of OSA




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