OBSTRUCTIVE SLEEP APNEA (OSA) is a significant problem in the United States and worldwide. The prevalence in men is estimated to be between 3% and 7% and the prevalence in women between 2% and 5%. Obesity is considered the main risk factor for OSA, and being overweight is also a risk factor. Some patients with OSA aren’t obese or overweight. OSA occurs in approximately 48% of people who have a body mass index (BMI) greater than 28 and is more common with advancing age.1 Less common in children, OSA affects about 3% of them.2 Because OSA is often unrecognized, it may be untreated and lead to medical and employment problems. These problems can be costly, lead to unintended injuries, depression, and anxiety; and affect social and family relationships.1,2

Take the case of Mr. J, an executive in a publishing company. In the past year, he’s increased his work time to 60 hours/week and decreased his physical activity level. He’s not exercising at all now, often eats fast food on the go, and has gained 50 pounds. He’s averaging 5 to 6 hours of restless sleep per night. He finds himself losing his patience or falling asleep at work and yelling at his kids at home. He’s gotten into two minor car crashes over the past year. At his last physical exam, his BP was elevated and he was complaining of gastroesophageal reflux disease (GERD) symptoms. His wife reports that he’s been snoring more and sounds as though he’s choking at times.

Most likely, Mr. J is suffering from OSA, which is characterized by repeated periods of apnea and hypopnea during sleep.1,2 These periods of absent breathing or inadequate
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breathing lead to hypercapnia (increased partial pressure of carbon dioxide in arterial blood) and hypoxemia (decreased partial pressure of oxygen in arterial blood).2,3

Because lack of oxygen isn’t compatible with life, the brain signals a person with OSA to wake up and breathe. Repeating this process many times per night is like getting mugged on every street corner as you try to walk through a large city for 6 to 8 hours. By the end of the night, you’re not only exhausted mentally, but your cardiovascular system is tired out as well—in a stressed-out way, rather than in a good way as from exercise.

What’s OSA?

OSA is characterized by many apneic and hypopneic periods during the sleeping cycle. For OSA, the definition of apnea is arrest of breathing for 10 seconds or longer and hypopnea is defined as ventilating 50% or less of normal.2 OSA occurs when the musculature of the pharynx and tongue relax during sleep, obstructing ventilation. Many structures contribute to airway obstruction.4 (See An inside look at OSA.)

The lack of ventilation decreases oxygenation, activating the fight-or-flight response of the sympathetic nervous system, which leads to an increase in heart rate, BP, respiratory rate, blood glucose levels, and mental activity.2 These changes aren’t conducive to well-rested sleep. Over time, the repeated episodes put a strain on the cardiovascular system, leading to hypertension as well as daytime sleepiness, nonrestorative sleep, fatigue, and difficulty concentrating.2,5
A host of signs and symptoms
Initially, the only noticeable problem may be snoring, which is often considered simply a nuisance, especially for the bed partner. Up to 40% of all adults and 12% of all children report snoring. Eventually, excessive daytime sleepiness and lack of concentration occur. Symptoms of daytime sleepiness and impaired concentration may be so intense that they interfere with the patient’s ability to function at work. Falling asleep at work, showing up late, not completing work on schedule, being forgetful, and having mood changes may diminish an employee’s productivity. Work performance may deteriorate so much that the patient is fired or laid off.

Hypertension and choking during sleep, signs of OSA, can increase the heart’s workload. Many signs and symptoms, including nocturia and restlessness and fitful sleep, also interfere with sleep, increasing daytime sleepiness and inability to concentrate. Libido changes can impair relationships at home. In children, behavioral signs and symptoms include hyperactivity, irritability, and aggression as well as daytime sleepiness, snoring, and nocturnal enuresis. Often the signs and symptoms of OSA are confused with attention-deficit hyperactivity disorder (ADHD). Children may also experience difficulty in school and with relationships.

Reaching a diagnosis
Obtain a comprehensive health history, including a sleep history. The health history should include questions about sleep hygiene such as these:
• How many hours do you normally sleep each night?
• Do you wake up refreshed?
• Do you feel sleepy during the day?
• Are you fatigued during the day?
• Do you know if you snore?

Assess sleepiness severity by asking the patient to complete the Epworth Sleepiness Scale (ESS). The ESS will provide information about the impact of excessive sleepiness on daily activities and quality of life. The ESS was developed by Dr. Murray Johns. Individuals, including clinicians and researchers, can obtain it for free from http://epworthsleepinessscale.com/. All other users must have a license to use it. See the website for details.)

The ESS, which is self-administered, measures the chance of falling asleep in eight common scenarios. Scoring for each situation ranges from 0, not likely to fall asleep, to 3, highly likely to fall asleep. ESS scores have been found to correlate well with sleep study results.

Perform a thorough physical assessment. Obtain vital signs as well as height, weight, and neck circumference. Pay special attention to the upper and lower respiratory systems. Anatomic abnormalities that increase the risk of OSA include nasal obstruction as a result of septal deviation and turbinate hypertrophy. Other factors that contribute to OSA include abnormalities of the palate, uvula, tonsils, and tongue (including posterior placement and thickening of the palate, a thick or long uvula, enlarged tonsils, and large tongue volume). Assess the cardiovascular system as well as the thyroid gland. (See Risk factors for OSA.)

Diagnostic testing
Referral to a sleep center for a sleep study and evaluation is an excellent
way to confirm OSA. Sleep centers often use self-administered assessment tools such as the ESS. Healthcare providers will thoroughly examine the patient, looking at physical characteristics such as neck and upper respiratory tract structure and function as well as cardiac and pulmonary function. These providers are also well-versed in medications and other conditions that may interfere with sleep, such as sedatives, stimulants, and alcohol; neurologic conditions, including depression and narcolepsy; sleep movement disorders, such as restless legs syndrome; and hypothyroidism.10

A sleep study involves an overnight stay unless the patient is a shift worker and normally sleeps during the day; in this case, the study is done during the daytime. The entire sleep process, including sleep movements and awakenings, is video recorded. The overnight sleep evaluation includes and records a number of parameters including an electroencephalogram for brain wave activity, electrooculogram for eye movement, chin electromyogram to detect bruxism (teeth grinding), airflow, oxygen saturation \( \text{SpO}_2 \), respiratory effort, and heart rate or ECG to detect dysrhythmias. The leg electromyogram may also be recorded to detect periodic limb movements that often contribute to sleep disturbances.6

OSA is then measured for severity (mild, moderate, or severe) as indicated by the number of OSA episodes per hour. The number of events per hour is also called the apnea-hypopnea index (AHI) or respiratory disturbance index (RDI).6 (See Determining severity of OSA.)

Some portable monitoring devices for the home have been approved by the FDA, but they’re not offered in all areas and insurance may not pay for them. Portable monitoring can be used for screening but not for diagnosis.6,11

Managing OSA

The incidence of OSA increases in patients who are obese, smoke, drink alcohol, and use sedatives.10 If these factors are present, counsel the patient and offer support to encourage the patient to make lifestyle changes that address these issues contributing to OSA.

The definitive treatment for OSA is positive airway pressure (PAP) delivered as continuous positive airway pressure (CPAP), bilevel positive airway pressure (BPAP), or auto positive airway pressure (APAP) modes during sleep. PAP keeps the structures of the pharynx and tongue from collapsing during sleep, thus inhibiting or eliminating the airway obstruction. CPAP and BPAP are applied through an oral, nasal, or oronasal interface. These devices are secured by soft headgear and adjustable straps. Using PAP improves sleep, decreases daytime sleepiness, improves concentration, and reduces BP. Effective treatment also reduces the number of motor vehicle crashes involving patients with OSA.12

Medicare guidelines have approved the use of CPAP in patients with moderate or severe OSA; that is, in those with 15 or more apnea/hypopnea episodes per hour. The use of CPAP is also approved for patients with fewer than 15 documented episodes per hour if they also have excessive daytime sleepiness (noted by an ESS score of 10 to 12), hypertension, and/or cardiovascular disease.6

Trained technicians in the sleep lab can achieve the optimal amount of pressure for the patient with a PAP device. They monitor the patient as he or she sleeps, adjusting the mask and pressure to achieve optimal results, keeping apnea/hypopnea episodes in the mild range, preferably less than 10 episodes per hour.

CPAP requirements can change over time and aren’t “one pressure fits all.” Patients who are more obese and have shorter, fatter necks tend to tolerate higher pressures than thinner patients and those with longer, thinner necks. Often after the first month, pressure is decreased by around 1.5 cm H2O. As airway edema decreases with treatment, less pressure is thought to be needed. PAP may need to be adjusted through the months and years as patients change weight, medications, and other variables. Sleep studies are repeated if snoring, daytime sleepiness, or other signs or symptoms return.6

### Risk factors for OSA

- History of snoring
- History of excessive daytime sleepiness
- Complaints of fatigue, nonrestorative sleep
- Large neck circumference (women, >16 inches [41 cm]; men, >17 inches [43 cm])14
- BMI ≥ 306
- Male gender
- Increased age
- Craniofacial abnormalities
- Smoker or previous smoker
- Alcohol use
- History of cardiovascular disease including:
  - Hypertension
  - Coronary artery disease
  - Heart failure
  - Dysrhythmias
- History of cerebrovascular disorders including:
  - Transient ischemic attacks
  - Stroke
  - Dementia
- History of depression
- Erectile dysfunction
- Hypothyroidism16
- Postmenopause

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APAP can be used to titrate pressure and meet the patient’s changing needs. As the patient changes position, sleep stages, or has different needs on different nights, the device self-adjusts accordingly, which may improve adherence to therapy.\(^6\)

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Patients who need CPAP pressures greater than 15 cm H\(_2\)O and patients who have pulmonary barotrauma, ear infections, or abdominal distension from increased airway pressures often do better on BPAP\(^6,12\).

Increasing the amount of pressure slowly over time is called ramping; it lets the patient fall asleep first, which may make the device more comfortable. Most CPAP devices include the ramping feature. In patients without nasal obstruction problems, the use of nasal pillows or a nasal mask may be more comfortable than a face mask. The patient may need a chin strap to maintain an open airway.\(^6,10,12\)

Some problems from using CPAP are related to the mask or the dryness of the air. The pressure applied can cause dryness of the nasal passages leading to congestion, rhinitis, and/or epistaxis. Pressure on the face from the mask or air leakage around the mask can lead to skin irritation, allergies, or skin breakdown. Advise the patient to keep the nasal passages moist (for example, with over-the-counter saline nasal spray or gels) and be sure that the mask fits properly. Adding a humidifier can also help maintain airway moisture. If nasal sprays and humidification don’t work, the patient can try a heated humidified system as discussed earlier.

Patients with claustrophobia may not be able to tolerate any type of device. Many patients wear the device for part of the night only. As many as 50% of patients don’t wear the device as prescribed.\(^10,12\)

More options for managing OSA

Patients with mild OSA may be treated with custom made oral appliances (OAs), which are generally fitted by dentists, to keep the tongue from obstructing the airway. OAs are recommended for use in those patients with mild OSA who qualify for CPAP but don’t want to use it and in patients with mild-to-moderate OSA who don’t respond to CPAP or in whom CPAP has failed. If an OA is used, a sleep study is recommended after initiation of the appliance to confirm its effectiveness.\(^6\)

Surgical treatments including palatal procedures are often used to treat patients who snore, but they haven’t been consistently effective for OSA.\(^1,6\)

Surgery may be tried for patients when adequate control of OSA hasn’t been achieved with lifestyle changes and optimal treatment and adherence with PAP. Palatal surgery often involves uvulopalatoplasty, which is removal of the uvula and part of the soft palate.\(^1,6\)

Weight loss can help patients with OSA. Patients who haven’t been able to lose weight with dietary changes and who have a BMI of 40 or more, or who have comorbidities with a BMI of 35 or more, can achieve major weight loss with bariatric surgery.\(^6\)

Occasionally, the anatomy of the patient’s jaw may be part of the reason for the obstruction and treatment may include measures to move the jaw and tongue forward and increase the airway diameter. Maxillomandibular surgery is invasive, and the jaw must be wired shut during the healing process. Complications include paresthesias and mandibular malposition, as well as general surgical complications such as bleeding, infection, and complications of general anesthesia. Maxillomandibular surgery can alleviate OSA in up to

### Determining severity of OSA\(^6\)

<table>
<thead>
<tr>
<th>Severity</th>
<th>Episodes per hour of apnea/hypopnea</th>
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<tr>
<td>Mild</td>
<td>5-14</td>
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<tr>
<td>Moderate</td>
<td>15-30</td>
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<tr>
<td>Severe</td>
<td>&gt;30</td>
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86% of certain patients.13 Daytime sleepiness that persists may be related to inadequate treatment or nonadherence to treatment.

In general, medications (stimulants) approved for excessive daytime sleepiness are generally initiated when ESS scores remain at 10 or greater despite effective PAP treatment and when no other cause for sleepiness has been identified.6 The sleep center or the primary care provider should closely follow patients being treated with medication.

Modafinil, considered standard treatment, is an oral wakefulness-promoting agent indicated to improve wakefulness in adult patients with excessive sleepiness associated with narcolepsy, OSA, and shift work disorder.14 It’s generally well tolerated; headache is the most common adverse reaction. Many patients using modafinil feel better, and some think that they don’t need to use PAP. Continue to educate patients about need for PAP as the mainstay of treatment for OSA.6

Oxygen supplementation may help some patients but isn’t recommended as a primary treatment for OSA.6

**Be on alert for complications**

Although the exact reason for systemic hypertension that develops from OSA isn’t known, possible factors include hypoxia and hypercapnia, which increase sympathetic nervous system activity. These same mechanisms may also increase the patients’ risk of developing other cardiovascular problems, including myocardial ischemia, heart failure, stroke, and dysrhythmias. In one 10-year study, patients with severe, untreated OSA were 2.5 times more likely to have a fatal cardiovascular event and 2.68 times more likely to have a nonfatal cardiovascular event than patients with treated OSA, snorers without OSA, and controls.2

Glucose intolerance, insulin resistance, and diabetes are potential complications of OSA. The incidence of diabetes ranges from about 3% in those with mild OSA to 15% in those with severe OSA.2 Overall mortality is also increased in patients with OSA. The more severe the disease, the greater the mortality. Those with moderate-to-severe OSA have a mortality of 33% over 14 years, compared with 6.5% in patients with mild OSA. These statistics are derived after adjusting for age, gender, BP, lipid levels, BMI, and other risk factors.2

Rates of obesity increase as length of sleep decreases. Risk of obesity is less in patients who sleep at least 7 hours per night. The hormones that help control appetite are thought to be affected by lack of sleep. Leptin, an appetite suppressant, is reduced and ghrelin, an appetite stimulant, is increased during sleep deprivation. Sympathetic nervous system activation, via OSA, may also influence weight through changes in cortisol, growth hormone, inflammatory markers, and glucose metabolism. In one study, those who slept 5 hours or less a night had a 65% increased risk of obesity compared with those who slept 7 hours or more per night. Obesity is also a cardiovascular risk as well as a risk factor for diabetes, both potential complications of OSA.2

Due to OSA or its treatment with PAP, patients with OSA are likely to be depressed. Besides helping with depression, antidepressants may possibly lessen sleep apnea by decreasing rapid eye movement sleep. Even so, the American Academy of Sleep Medicine doesn’t recommend treating patients with OSA with selective serotonin reuptake inhibitors, the antidepressants used most often to treat depression.6

**Nursing interventions**

Nursing interventions begin with identifying patients at risk for OSA. Assess every patient for potential risk factors as part of your patient’s health history, even if the patient hasn’t expressed concerns about signs and symptoms of OSA, such as snoring and excessive daytime sleepiness. Pay particular attention to patients with neurobehavioral problems such as anxiety, depression, anger, and ADHD; cardiovascular problems such as hypertension, heart failure, angina and/or myocardial infarction, dysrhythmias, or stroke; type 2 diabetes; and/or obesity.

Sleep deprivation may also result from poor sleep hygiene as well as OSA. If the patient history suggests
poor sleep habits, discuss proper sleep hygiene with your patient. Topics can include going to bed and arising at the same time every day, including days off; using the bedroom for only sleep and sex; and keeping the room dark and cool.

Consider discussing “Going Green” with your patient: Green for the environment and green for the wallet! Because obesity contributes to the development of OSA and can result from OSA, encourage reducing and maintaining body weight. One way for your patient to be “green” is to walk or ride a bike to work, if feasible. Another way is for your patient to increase the intake of “green” foods and foods of other colors by eating more vegetables and fruits and reducing high-calorie and high-fat foods, such as those that are fried, processed, or have a high glycemic index. Doing these “green” interventions will put “green” in the patient’s pocket by saving money on auto fuel and maintenance costs as well as decreasing food costs. Losing weight increases “green” in the pocket by decreasing health risks associated with obesity such as cardiovascular disease, diabetes, and cancer. Many of these health issues are also risk factors associated with OSA.

Smoking cessation will decrease the risk of OSA as well as put “green” in your patient’s pocket by decreasing daily costs and potential healthcare costs related to the risks of smoking. Discuss other lifestyle changes with your patient, such as decreasing or abstaining from alcohol and sedatives, especially before bedtime. These substances may contribute to sleep disruption and relaxation of the muscles of the oral airway, leading to airway obstruction.

Sleeping position can affect the tongue’s position. Having the patient raise the head of the bed with a wedge device, use a hospital-type bed, or elevate the legs of the head of the bed on blocks can not only keep the tongue forward but also reduce GERD symptoms. Sleeping in a lateral position will move the tongue laterally and prevent obstruction. Patients should avoid using extra pillows to elevate their head because this tends to cause cervical flexion and increased intra-abdominal pressure, increasing the risk of both OSA and GERD. Patients who do better with positional changes are typically younger and thinner and have less severe OSA.

Another major concern to discuss at each appointment with your patient is excessive daytime sleepiness, which may lead to motor vehicle crashes and injuries at work. An Australian study demonstrated that truck drivers with ESS scores greater than 18 had almost three times more collisions than truck drivers without OSA. In an Internet study of over 35,000 participants, respondents with OSA reported having collisions and near-miss collisions two times more often than drivers who didn’t have OSA. Patients with OSA using driving simulations have performance values similar to drivers impaired by alcohol.

The U.S. Department of Transportation published guidelines in early 2008 for commercial motor vehicle drivers with OSA. According to these recommendations, drivers should be screened for OSA and, if the problem is diagnosed, treated effectively. These drivers need continued monitoring of the problem and treatment. Nurses should inform patients that their judgment is likely to be impaired and that they need to effectively use PAP and any prescribed medications, and to participate in close follow-up to protect themselves and others from motor vehicle crashes.

Waking up to the risks
Nurses should be aware that OSA increases with age and know the risk factors for OSA. Those with risk factors for OSA should be referred to a sleep center.

Our executive, Mr. J, was referred to a sleep center and was found to have moderate OSA. He was fitted with a CPAP device at a setting of 12 cm H₂O and was followed up monthly for the first 6 months to ensure proper use and to answer his questions. After that time, he was followed every 6 months. He was taught about sleep hygiene and maintaining a proper body weight through diet and exercise. After continuing to complain of excessive daytime sleepiness, he was started on modafinil. To date, he uses his CPAP most nights of the week and

Having the patient raise the head of the bed can keep the tongue forward and reduce GERD symptoms.
his hypertension is well-controlled. He’s getting 7 to 8 hours of sleep most nights and is more productive both at work and at home. He says he feels like a new and younger man, is better able to concentrate, is no longer taking naps in the office behind a closed door, and has more energy and fewer headaches. His wife and kids say he’s much nicer to live with as well, and he no longer snores when using his CPAP.

REFERENCES

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The authors and planners have disclosed that they have no financial relationships related to this article.

DOI:10.1097/01.NURSE.0000412921.89889.ba