OSA Diagnosis and Treatment – Part 2

RESP001b

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Description

This is the second in a two-part series of modules which make up a course on obstructive sleep apnea (OSA), a serious breathing disorder characterized by periodic cessation or markedly diminished breathing during sleep. Part 1 explained how OSA is identified and diagnosed. Part 2 will discuss treatment options, comorbid conditions, and consequences if OSA is untreated.

Chapter 1 – Getting Started

This chapter contains the following page titles:

- About the Authors
- Introduction
- Objectives

About the Authors

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Introduction

As discussed in Part 1 of this course, obstructive sleep apnea (OSA) is a serious breathing disorder caused by an airway blockage. Hallmark symptoms of OSA include excessive daytime sleepiness (EDS) and loud, disruptive snoring. Left untreated, OSA can result in very serious consequences to a person's overall health.

Although OSA is a serious breathing disorder, most people with OSA have not been diagnosed. Obesity and certain physical characteristics are among the risk factors. About twice as many men than women suffer from OSA, and older people are more likely to develop OSA. Common symptoms of OSA include excessive daytime sleepiness and loud, disruptive snoring.

Diagnosis of OSA typically involves a physical exam and screening questionnaires, followed by a sleep study performed in a lab (polysomnography) or at home (home sleep study). A sleep study measures the number of apneas (cessation of breathing) and hypopneas (decreased breathing) to determine if a person has OSA and, if so, whether it is mild, moderate, or severe.

Objectives

Upon completion of this course, you will be able to:

1. Describe various lifestyle modifications and medical, mechanical, and surgical options for treating OSA.
2. Explain the impact of untreated OSA on individuals and society.
3. Identify risks and co-morbidities associated with OSA.

Chapter 2 – OSA Management Through Lifestyle Modification

Lifestyle modification is a therapeutic option for managing OSA. Behavior or lifestyle modification is the most benign approach to management of OSA.

This chapter contains the following page titles:

- Weight Loss
- Alcohol
- Drugs
- Sleep Habits

Weight Loss

Obesity compromises the upper airway by altering its size. The quantity and distribution of the fat tissue is an important consideration. Weight loss through dietary control can have a great effect on decreasing or eliminating OSA in certain patients. Many clinicians believe a critical reduction in body weight must be achieved for a significant reduction in OSA to occur. Even if weight loss does not eliminate the need for therapy, it may minimize the need for more complex therapies.

Alcohol

Alcohol induces OSA in patients who snore and increases the number and/or duration of apneas in patients with OSA. Alcohol decreases the upper airway dilator muscle tone and alters the patient's response to hypoxemia and hypercapnia. Therefore, patients are encouraged to either abstain from alcohol or limit their intake to one drink three hours or longer before bedtime.

Drugs

Narcotics, barbiturates, benzodiazepines, testosterone, and recreational drugs have undesirable effects on OSA and should be avoided.

Narcotics, barbiturates, and benzodiazepines depress the respiratory drive and thus can cause OSA to worsen.

Testosterone therapy is a popular treatment for low libido, male fertility, and energy. However, treating low testosterone can actually worsen OSA symptoms. There is a direct association between sleep and testosterone levels. Testosterone levels rise while we sleep, particularly during the REM period of sleep, and fall when we are awake. Therefore, it is no real surprise that men with OSA also have sexual problems such as low libido or erectile dysfunction. Treating the OSA and improving sleep quality can improve or normalize testosterone levels.

Sleep Habits

All OSA patients should be encouraged to develop good sleep hygiene, including the proper number of hours of sleep each night and a dark, quiet room. In addition, some patients experience obstructive events when sleeping in different body positions especially supine (lying on the back with face upward). These patients should attempt to sleep on their sides if possible. A tennis ball sewn into the back of the pajama top causes discomfort that has helped some patients to move from their backs to their sides during sleep.

Chapter 3 – Mechanical Treatment of OSA

This chapter contains the following page titles:

- Positive Airway Pressure Devices
- CPAP
- How CPAP Works
- CPAP Masks
- Auto-CPAP
- Bi-Level Positive Airway Pressure
- BiPAP and Ventilatory Disorder
- Benefits of CPAP
- Common Side Effects of CPAP
- Humidification
- Oral Appliances

Positive Airway Pressure Devices

There are three types of positive airway pressure (PAP) devices that can be used to treat all forms of sleep apnea. They are **continuous positive airway pressure (CPAP)**, **auto-adjusting CPAP (Auto-CPAP)**, and **bi-level positive airway pressure (BPAP or BiPAP)**.

The titration protocol for positive airway pressure therapy is to eliminate complete and partial airway obstructions that are manifested in apneas, hypopneas, desaturation, snoring, and EEG arousals from sleep. The patient should be studied in all body positions and during all stages of sleep.

CPAP

The primary treatment of choice for OSA is CPAP. CPAP is a highly effective, well-tolerated therapy. Its use in adults with OSA was first reported in *The Lancet* in 1981. The first commercially available CPAP unit in the United States was introduced in 1985. CPAP is the most effective treatment for OSA available today. It is also the most cumbersome.

CPAP, rather than CPAP machine or CPAP system, is the term commonly used to refer to the type of machine/system that maintains one continuous level of pressure for both inspiration and exhalation as the patient sleeps.

A CPAP pneumatically splints open the upper airway throughout the breathing cycle. The CPAP system consists of a small blower (air pump) with tubing connecting the blower to a mask.

How CPAP Works

The pump draws air from the room and pressurizes it, then blows the pressurized air through the tube and mask into the patient's throat, acting as a pneumatic splint. This pressure prohibits the airway from collapsing, keeping the throat open and ensuring that air can flow freely in and out of the lungs while the patient sleeps.

A polysomnography with titration will determine the correct pressure setting needed to relieve the patient's obstruction.

Most units can be set to gradually ramp up the pressure at startup. During ramp the unit starts at a pressure lower than prescribed, then pressure is

gradually increased over several minutes to the prescribed level. This makes it easier for the user to fall asleep. There are also units that offer pressure relief on exhalation. The patient chooses the level of pressure on exhalation to increase comfort when exhaling.

CPAP Masks

Masks in a variety of shapes and sizes accommodate individual patients and create the most comfortable fit possible. Three-fourths of individuals using CPAP will use a nasal-type mask. Other options are full face mask and nasal pillow. **Note**: For more detailed information about mask fitting, see VGMU course *RESP004 — Mask Fitting 101*.

Nasal pillow mask

Nasal mask

Full face mask

(Images courtesy of Philips Respironics)

Auto-CPAP

Auto-CPAP is capable of automatically adjusting continuous positive airway pressure to the patient's needs during sleep. A patient may require less pressure when lying on their side versus when supine, for example.

The adjustment is based on patient airway dynamics and device algorithm – what change in breathing the device is designed to detect and how it adjusts to that change.

There are several mechanisms by which these units operate. Some devices respond to changes in airflow. Other devices respond to vibrational changes within the upper airway that may precede airway obstruction.

Auto-CPAP is also referred to as self-adjusting CPAP or automatic positive airway pressure (APAP).

Bi-Level Positive Airway Pressure

Some patients may be intolerant of CPAP, either during sleep center testing or during home use after the CPAP has been prescribed. Bi-level positive airway pressure (BiPAP) is indicated when a patient does not tolerate CPAP or does not respond to CPAP. For example, when the titration of CPAP to higher levels does not eliminate abnormal breathing events and desaturations.

BiPAP provides two pressures that the machine alternates between during use: higher pressure on inspiration (IPAP) and a lower, more comfortable pressure on exhalation (EPAP).

BiPAP is sometimes referred to as BPAP or variable/bilevel positive airway pressure (VPAP), depending on the manufacturer of the machine.

BiPAP and Ventilatory Disorder

This diagram depicts the upper airway during obstructed breathing. Two different forces act on the airway during inspiration and exhalation, and the airway narrows or collapses at the end of exhalation. This event formed the basis for the use of bi-level therapy for the treatment of OSA. If two different forces act to obstruct the airway, then two different pressures are used to alleviate the obstruction or narrowing of the airway.

BiPAP may also be indicated for those patients who have sleep apneas with a ventilatory disorder, such as:

- Obesity hypoventilation
- Neuromuscular or musculoskeletal disease
- Severe chronic obstructive pulmonary disease (COPD)
- Restrictive thoracic disorders
- Central/complex sleep apnea

This therapeutic modality will augment ventilation in patients with these types of disease states.

Benefits of CPAP

Use of CPAP to treat OSA has many benefits:

- The pneumatic splint keeps the airway open enabling free air movement in and out of the lungs.
- Quality of sleep is improved.
- CPAP users may fall asleep faster and wake less often.
- Snoring is alleviated so others in the household may sleep.
- Excessive daytime sleepiness is reduced or alleviated.
- Daily function, including attentiveness and mood, is improved after the patient adjusts to CPAP use.
- Reaction time, concentration, and memory may improve with consistent, regular CPAP use that studies have linked to fewer vehicle accidents or near accidents.

Common Side Effects of CPAP

CPAP is a safe, painless, and long-term treatment option for OSA. Although CPAP is generally well tolerated, some patients may complain of side effects. These are usually minor with easy solutions to treat or eliminate the problem.

Mask discomfort and irritation: Work with an experienced respiratory care practitioner (RCP) to determine the proper mask style and best fit.

Dry mouth caused by breathing through the mouth or CPAP: Use a heated humidifier to add moisture to the air for relief or chin strap.

Sinusitis, runny nose, nasal congestion or nosebleeds: Use a heated humidifier to add moisture to the air for relief.

Aerophagia (air swallowing) that results in bloating and discomfort: Treatment involves nonprescription gas relief medication.

Chest discomfort: In patients treated with higher pressures; can be overcome by using the ramp feature or bi-level therapy.

Note: More in-depth information about assisting patients with positive airway pressure devices is available in *RESP019 — Improving Patient PAP Compliance*.

Humidification

Humidification may be used in conjunction with positive airway pressure therapy to ensure better long-term compliance by patients by reducing dry mouth and nasal issues. Patients who have nasal congestion/allergies or mouth-breathe or those who live in arid areas particularly benefit from heated humidity.

Note: For more detailed information about the use of humidification with CPAP, see VGMU course *RESP013 — CPAP Humidification*.

Oral Appliances

Oral appliances (OA) may be an option for certain patients with mild to moderate OSA or for patients who snore but do not have OSA. The American Academy of Sleep Medicine recommends oral appliances for individuals with mild to moderate sleep apnea who are not candidates for CPAP or tried but did not tolerate CPAP.

Various studies indicate that because OAs do not reduce a patient's apnea-hypopnea index (AHI) or improve oxygenation as effectively as CPAP, OAs should not be used as first-line therapy for patients with severe OSA, severe daytime sleepiness, or very low oxygen saturation levels during sleep.

Oral appliances cannot be sold over the counter in the United States. A dentist or orthodontist experienced in oral appliances should custom fit the individual for a device. An experienced sleep professional should evaluate the effectiveness of the oral appliance during polysomnography or a home sleep test.

There are several dozen oral appliances currently on the market. Most are mandibular repositioning dental appliances that move the jaw forward. Other appliances function by splinting the tongue in place.

The most common side effects associated with the use of oral appliances are excessive salivation and **temporomandibular joint discomfort**. With long-term use, oral appliances can cause permanent changes to the position of jaw and teeth.

Chapter 4 – Surgical Treatment of OSA

This chapter contains the following page titles:

- Surgical Options
- UPPP
- Adenotonsillectomy
- Soft Tissue Implants
- Hyoid Suspension
- Genioglossus (Tongue) Advancement
- Tongue Base Reduction
- Maxillomandibular advancement
- Tracheostomy

Surgical Options

Even with these potential benefits, studies have shown that the actual compliance of PAP — CPAP, Bi-level PAP, and Auto-PAP — is only about 50 percent, according to the American Sleep Apnea Association.

Individuals with severe sleep apnea who cannot tolerate CPAP may opt for surgical treatment. Surgery should be customized for each patient to the area of obstruction.

Since 1996, the American Academy of Sleep Medicine has had in place practice parameters for surgical modification of the upper airway in adult OSA sufferers. Every patient's airway presents unique challenges, and surgery often requires a combination of multiple procedures to achieve a successful outcome.

As with most surgical procedures, there is a risk of pain, bleeding, and infection.

UPPP

The most common surgical treatment of individuals with severe OSA is **uvulopalatopharyngoplasty (UPPP or UP3)**. This is a surgical procedure that removes redundant tissues of the upper airway to enlarge the oropharyngeal airway. Tissues removed may include including the uvula, tonsils, and part of the soft palate, tonsils, and adenoids.

UPPP is often effective in reducing snoring because snoring is often caused by the reverberation of the soft palate with the back wall of the pharynx. Surgery for nasal obstruction, such as a deviated septum, may be combined with this procedure.

Research shows that UPPP provides a 20 percent to 50 percent decrease in the number of abnormal breathing events. The patient may still have pathological sleep apnea if the number of events post-UPPP is high. Long-term side effects are unknown.

Adenotonsillectomy

In children, adolescents, and some adults with enlarged tonsils or adenoids, **adenotonsillectomy** (removal of adenoids and tonsils) may improve or be curative of OSA.

The surgery may be suggested to treat sleep apnea if enlarged tonsils and adenoids block the patient's airway during sleep.

Studies have found the surgery to be effective in treating OSA in children; tonsillectomy (surgical removal of the tonsils) and adenoidectomy (surgical removal of the adenoids) are the most common treatments for children with OSA. The surgery is not very effective in adults and is often done in combination with UPPP.

Soft Tissue Implants

Soft tissue implants, also referred to as Pillar Procedure, is a minimally invasive procedure to treat habitual snoring and mild to moderate OSA. The surgery involves placement of polyester rods in the soft palate. The intended result is to firm up a loose and floppy soft palate. As a result, during sleep as the muscles relax, the stiffer soft palate will be less likely to touch the pharynx. Snoring and apnea are reduced.

The surgery can be performed under local anesthesia on an outpatient basis.

Hyoid Suspension

Some patients with OSA have a large tongue base. While sleeping, the tongue falls back against the pharynx resulting in an obstruction. The back muscles of the tongue and pharynx attach to a small bone in the neck called the hyoid.

Hyoid suspension is usually done through two small incisions in the neck. A suture is placed around the hyoid bone, pulling it anteriorly and suspending

the hyoid in front of the jaw bone. This prevents the airway from collapsing and expands the size of the airway. No hospital stay is required, and results have been impressive.

Genioglossus (Tongue) Advancement

This procedure can be done to address some of the same obstruction issues as hyoid advancement: patients experience obstruction when the tongue falls back against the pharynx causing an obstruction. However, it is more invasive than hyoid advancement, and an overnight hospital stay is recommended.

Tongue advancement involves moving forward the **genioglossus**, which is the main tongue muscle. A small rectangle of the jawbone to which the genioglossus is attached is cut, moved forward, and then secured to the bone with a metal plate.

Tongue Base Reduction

Tongue base reduction is sometimes performed with tongue advancement to reduce the amount of soft tissue at the base of the tongue. There are several methods in use to remove tongue base tissue. One method is to use radiofrequency waves; another is midline **glossectomy** which involves a surgical excision.

Because there is a risk of airway occlusion from this procedure, an overnight stay in the hospital is often required.

Maxillo-Mandibular Advancement

Individuals with small, narrow jaws that result in narrower airways may develop OSA.

Lower jaw advancement surgery involves enlargement of the upper airway by expanding the skeletal framework surrounding the upper airway. The upper jaw (maxilla) and lower jaw (mandible) are cut, moved forward 10-12 mm, and secured in place with titanium plates. The jaws may be wired shut for several weeks while the bones heal.

The long-term success rate in treating OSA is greater than 90 percent with this type of intervention.

However, lower jaw advancement is a complicated procedure that requires great technical precision in cutting the bones and positioning the teeth. The surgery is painful and a hospital stay of several days is required. Very few surgeons perform this procedure due to the complexity and risk of surgical complications; the procedure is not readily available everywhere. The surgery also results in changes in the facial appearance.

Tracheostomy

A surgical opening is made below the site of obstruction to allow air to get to the lungs from the trachea (windpipe). By bypassing the upper airway, a tracheostomy is 100 percent effective in treating the obstructed airway.

Prior to the 1980s, tracheostomy was the treatment of choice for OSA. Today tracheostomy is rarely used.

Tracheostomy is associated with numerous medical and psychosocial problems. This surgery is reserved for patients with severe OSA for whom lifestyle modifications and all other treatments for OSA have failed or have been refused.

Chapter 5 – Comorbidities and Consequences of Untreated OSA

This chapter contains the following page titles:

- Impact of OSA on Society
- OSA and Vehicle Crashes
- Potential Impact on Health if Untreated
- OSA and Hypertension
- OSA and Heart failure
- OSA and Atrial Fibrillation
- OSA and Diabetes
- OSA and Stroke
- Other Risk Factors
- OSA and Anesthesia
- OSA and Bariatric Surgery

Impact of OSA on Society

People with untreated OSA are more likely to develop certain health conditions. Untreated OSA patients have higher health care costs of the general population, often because of increased cardiovascular disease.

One study analyzed health care utilization over a 10-year period prior to diagnosis for OSA and found that compared to the general population OSA patients:

- Used twice the health care resources
- Nearly double the hospitalizations

In addition, a group of Canadian researchers reported that in the year prior to diagnosis and treatment, people with severe OSA spent nearly three times the number of days in the hospital as people not diagnosed with OSA.

OSA and Vehicle Crashes

There are several studies reporting the increased incidence of vehicle accidents in people with OSA.

People with OSA are nearly 2.5 times more likely to be the driver in a vehicle crash, according to a Swedish study published in March 2015. Experts estimate that the rate may be higher for American drivers.

One study reported in the *Journal of Respiratory Care Practitioners* found that obese truck drivers with OSA caused 45 percent more accidents per mile driven than obese drivers without the syndrome.

A group of German investigators compared the number of traffic accidents in patients with OSA one year before and one year after initiation of CPAP. They reported an 82 percent reduction in traffic accidents per mile driven after treatment. The same study also showed a significant reduction after treatment in daytime sleepiness, quicker reaction time to tasks, and an increased ability to sustain attentiveness to monotony.

The good news? Risk can be reduced by 70 percent for patients who use CPAP for four hours per night.

Potential Health Consequences if Untreated

It is important that the medical community increase identification and treatment of OSA patients as it is not a benign condition.

For example, there is a strong link between sleep apnea, hypertension, and cardiovascular disease, according to the American Heart Association. A Brazilian study found nocturnal cardiac arrhythmias occurred almost twice as much in people with severe sleep apnea than those without sleep apnea.

Untreated OSA can also affect the brain.
Participants in a neuroimaging study with severe, untreated OSA were found to have a significant reduction in brain white matter fiber integrity that lead to impairments in cognition, mood, and daytime alertness. The brain damage was almost completely reversed after a year of CPAP therapy. Another study found functional and anatomical changes in the brainstem region of people with sleep apnea.

We will discuss some of the health care risks of OSA in more detail in the following sections.

OSA and Hypertension

Hypertension is a chronic condition; it can lead to heart disease, stroke, and other diseases. Hypertension-related deaths increased nearly 62 percent between 2000 and 2013, according to data from the National Center for Health Statistics.

Various studies have found a causal role of OSA in hypertension. In particular, OSA is common in people with resistant (hard-to-control) hypertension.

- A Wisconsin Cohort Study, published in 2000, determined sleep-disordered breathing is a likely risk factor for hypertension and consequent cardiovascular morbidity.
- People with moderate or severe OSA have three times the risk of developing new hypertension.
- A 2009-2011 Spanish study found that 70 percent of patients with resistant hypertension have OSA. Treatment with CPAP improved blood pressure.

The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure in 2004 recommended screening patients for OSA when they have new-onset hypertension or refractory hypertension.

OSA and Heart Failure

Nearly 375,000 Americans die annually from heart disease, and cardiovascular disease is the leading cause of death globally, according to The American Heart Association's 2015 Heart Disease and Stroke Statistics Update. About one in three deaths in the U.S. is attributed to heart disease, stroke, or other cardiovascular diseases.

A study found that moderate to severe OSA can cause changes in the heart's shape and function. However, six months of CPAP treatment caused the abnormalities to return to near-normal levels.

Men with the most severe OSA faced a 58 percent higher risk of developing **heart failure** than those without OSA, according to the Sleep Heart Health Study. Heart failure is a condition in which the heart is unable to generate appropriate blood flow to meet the body's metabolic needs.

Several studies have found a high prevalence of OSA in people with congestive heart failure (CHF); other studies find a higher rate of central sleep apnea with severe CHF.

OSA and Atrial Fibrillation

A 2004 Mayo Clinic study found that patients with untreated OSA have a significantly increased risk of **atrial fibrillation (AF)**. This study showed patients with untreated OSA demonstrated a higher association between OSA and AF than those with traditional risk factors such as body mass index (BMI), neck circumference, and hypertension. Patients with AF should be screened for OSA because successful treatment may reduce the risk of AF recurrence.

- Patients with untreated OSA have a higher recurrence of AF after cardioversion than patients without polysomnographic diagnosis of sleep apnea.
- Appropriate treatment with CPAP of OSA is associated with lower recurrence of AF.
    - 82 percent recurrence in untreated OSA
    - 42 percent recurrence in treated OSA with CPAP

OSA and Diabetes

About 9.3 percent of Americans are diabetic: about 21 million have been diagnosed with diabetes and another 8.1 million have diabetes but have not yet been diagnosed, according to the CDC. Diabetes was the seventh leading cause of death in the U.S. for 2013, the latest statistics available from the CDC.

- Seven in 10 people with Type 2 diabetes have OSA.
- Effective treatment of sleep-disordered breathing led to improved glycemic control in subjects with Type 2 diabetes.
- In subjects who used CPAP more than four hours per day, a decrease in HbA1c is significantly correlated with days of CPAP use.

OSA and Stroke

Stroke is the fifth leading cause of death and the leading cause of disability in the United States.

According to a Mayo Clinic study, men with moderate to severe OSA are three times more likely to have an ischemic stroke (caused when a blood vessel to the brain gets blocked). Research is needed to determine what happens physiologically as the result of OSA. The increased stroke risk may be due to an increase in undiagnosed paroxysmal atrial fibrillation in the OSA population. During apneic episodes, the body exerts significant energy to inhale. Oxygen levels drop and carbon dioxide levels rise repeatedly with each apneic episode. This causes surges in sympathetic nervous activity that raises heart rate and blood pressure. Over time, there is a remodeling effect to the cardiovascular system that leads to hypertension and atrial fibrillation — both key risk factors for stroke. Another key fact is that when we sleep, our blood pressure will drop 10 percent to 15 percent. This phenomenon does not occur in people with OSA.

Note: More in-depth information about the link between OSA and cardiovascular disease is available in two other VGMU courses, *RESP022a — OSA Links to CVD and Diabetes — Part 1* and *RESP022b — OSA Links to CVD and Diabetes-Part 2*.

Other Risk Factors

Patients with hypothyroidism are at increased risk of developing sleep apnea. The weight gain and **macroglossia** that can accompany hypothyroidism may narrow the upper airway, and the function of the upper airway muscles may be compromised. Thyroid hormone replacement therapy can reduce the degree of sleep apnea, independent of weight change.

Other disorders that increase the risk of developing sleep apnea by narrowing of the upper airway include:

- Acromegaly
- **Amyloidosis** and vocal cord dysfunction
- **Marfan syndrome**
- Down syndrome

Neuromuscular disorders, such as muscular dystrophy, increase the risk of sleep apnea through their effects on upper airway muscle activity.

OSA and Anesthesia

A study published in October 2014 in *Anesthesiology* shows that postoperative cardiovascular complications were reduced by about half when sleep apnea was diagnosed and CPAP therapy was prescribed before surgery.

Patients with OSA may have an increased risk of complications related to anesthesia and analgesia due to their susceptibility to airway collapse and sleep deprivation.

OSA can affect all phases of the perioperative period and requires increased vigilance on the part of the anesthesiologist even when the patient has not been diagnosed with OSA. Because a high percentage of people with OSA have not been evaluated or treated for the condition, an anesthesiologist may be the first person to discuss sleeping issues with the patient.

The American Society of Anesthesiologists has released practice guidelines on the perioperative management of patients with confirmed or suspected OSA. These guidelines include an evaluation to identify undiagnosed OSA long enough before surgery, initiation of treatment with CPAP or oral appliances in advance of surgery, and intraoperative management during sedation of patients previously treated with these devices.

OSA and Bariatric Surgery

Obesity is a well-known risk factor for OSA. Bariatric surgery is becoming more frequent for the treatment of clinically severe obesity. Many bariatric patients have OSA. Research supports identifying bariatric candidates at risk for OSA through polysomnography and initiating treatment if OSA is indicated.

- Clinically severe obesity – BMI greater than 40 or BMI 35-40 with comorbid conditions
- 71 percent of patients evaluated for bariatric surgery were identified as having OSA
- Initiate CPAP therapy and continuous monitoring for at-risk patients
- Research supports referring bariatric candidates for sleep study as part of preoperative evaluation

Chapter 6 — Summary

This chapter contains the following page title:

- Summary

Summary

Although OSA is a serious breathing disorder, most people with OSA have not been diagnosed. Obesity, age, and certain physical characteristics are among the risk factors. There are treatment options for OSA, beginning with lifestyle modifications such as weight loss and developing good sleep hygiene. Many people with OSA benefit from positive airway pressure devices — most commonly CPAP — that use air to keep the upper airway open as the patient sleeps. For people with severe OSA who cannot tolerate positive airway pressure devices, there are also several surgical options.

People with untreated OSA are more likely to develop certain health conditions, and untreated OSA patients have higher health care costs than the general population.

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