

# **DENTIST'S INVOLVEMENT IN SNORING AND SLEEP APNEA PART 1**

**Dr. Brock Rondeau, D.D.S., I.B.O., D.A.B.C.P**

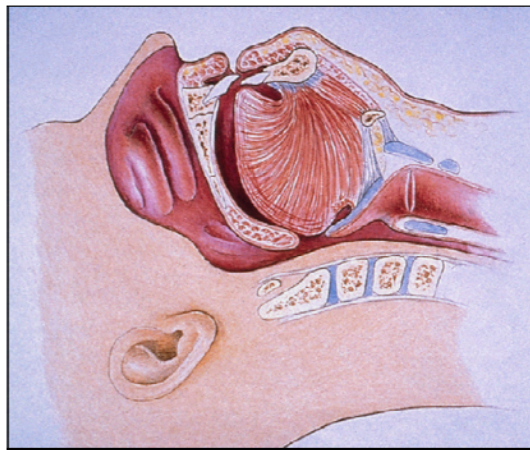
It has been estimated that 60 million Americans snore and at least 18 million have obstructive sleep apnea (OSA). The most common signs of OSA are snoring and excessive daytime sleepiness. Patients visit their dentist on a more regular basis than any other health care professional. Therefore, dentists have an excellent opportunity to help educate, diagnose and treat their patients with oral appliances when it is determined to be the treatment of choice.

**SNORING**

**INSOMNIA**



Snoring is defined as obstructive sleep breathing. Snoring is caused by vibrations of the pharyngeal tissue during sleep. Various factors can cause a partial collapse of the pharyngeal tissue including an increase in fat deposits due to obesity. Patients who drink alcohol before bedtime or take a sedative to help them sleep will also experience more collapse of the pharyngeal airway which will increase the incidence of snoring. Snoring usually occurs on inspiration but can also occur on expiration. A unique problem to snoring is that the snorer is unaware of the problem but it is a big problem for the bed partner. Snoring occurs when there is a partial blockage of the airway. Sometimes snoring occurs when the tongue falls back at night and partially blocks the airway. If this is the cause of the snoring it can be easily corrected by using an oral appliance which moves the lower jaw forward and hence the tongue forward at night.



**SNORING  
TONGUE PARTIALLY BLOCKS THE AIRWAY**

**Social Problem**

Snoring is a serious problem for the bed partner and adversely affects many relationships. When the bed partner is deprived of an adequate night's sleep this can result in separate bedrooms and in some cases even contributes to a divorce. The combination of extreme daytime fatigue as well as snoring can cause marital discord, sexual dysfunction including decreased libido and impotence<sup>1</sup>. As the diagram below shows one is snoring and the bed partner has insomnia. Some studies report that when the bed partner's sleep is affected by as much as one hour each night this can have a negative affect on the bed partner's health due to the lack of adequate sleep. Years ago it was discovered that second hand smoke had an extremely negative affect on the long term health of non-smokers. This has resulted in a ban on smoking in most hotels, restaurants, airlines, etc., in order to decrease the risk. The public needs to be made aware of the fact that snoring can potentially be hazardous to both the snorer as well as the bed partner.

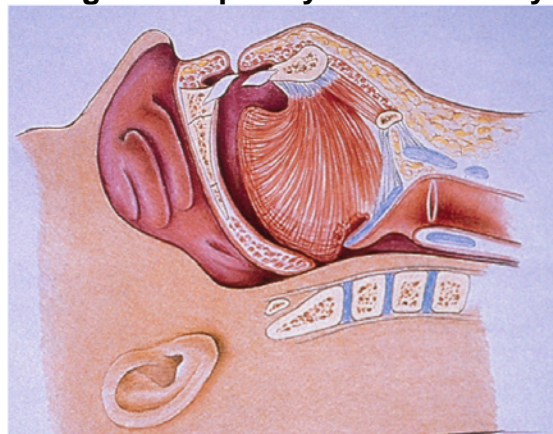


*U.S.A. Today* reported that 27% of couples over age 40 sleep in separate bedrooms. I think there is a direct correlation between this and the incidence of snoring. As the incidence of obesity continues to increase in our society these numbers are going to continue to increase.

## Snoring Dangerous to Health

Snoring has usually been regarded as a social problem with minimal adverse health affects. However, a study in Sydney Australia involving 110 patients who snore found that heavy snoring significantly increases the risk of carotid atherosclerosis and their risk factor was independent of obstructive sleep apnea. It appears that the vibrations on the pharyngeal walls are transmitted to the walls of the carotid artery <sup>2</sup>. Ultrasound was used to measure the amount of plaque in the carotid arteries. The conclusion was that the prevalence of carotid atherosclerosis was 20% with mild snoring, 32% with moderate snoring and 64% with heavy snoring. Therefore, patients must be made aware of this important fact so that they can find a solution before the increase in atherosclerosis in their carotid arteries can cause more cardiovascular complications.

### **SLEEP APNEA** **Tongue Completely Blocks Airway**



**APNEA**                      **A cessation of breath for 10 seconds or more**

**HYPOPNEA**                **The blood oxygen level decreases 4% or more**  
**Cessation of breath for less than 10 seconds**

**MILD SLEEP APNEA (OSA)**                      **5 – 15 events per hour**

**MODERATE SLEEP APNEA (OSA)**                **16 – 30 events per hour**

**SEVERE SLEEP APNEA (OSA)**                    **More than 30 events per hour**

Obstructive sleep apnea is caused when the tongue completely blocks the airway repeatedly throughout the night for 10 seconds or more. This repetitive collapse or blockage of the pharyngeal airway causes obstructive sleep apnea (OSA). Some of the signs of OSA include daytime sleepiness, loud snoring, witnessed breathing interruptions or awakening due to gasping or choking. Apnea is defined as a cessation of breath for 10 seconds or longer. Hypopnea is an episode of shallow breathing with a 50% reduction in airflow and a decrease in blood oxygen level of 4% or more.

Oxygen saturation is an extremely important factor regarding the health of the patients. When the blood oxygen level decreases this adversely affects the health of the patient by increasing blood pressure which can lead to cardiovascular complications including cardiac arrhythmias, heart attacks and strokes.

## **Diagnose Obstructive Sleep Apnea**

Sleep apnea is a medical disorder that can only be diagnosed by a sleep specialist in a sleep clinic. The patient must have an overnight sleep study called a polysomnogram which is evaluated by the sleep specialist. Many sleep specialists prefer to prescribe the CPAP (Continuous Positive Air Pressure) device to treat obstructive sleep apnea and do not appreciate the effective role that oral appliances can provide for patients who have mild or moderate OSA (Obstructive Sleep Apnea) or patients who cannot tolerate the CPAP device.

Obstructive Sleep Apnea (OSA) is the most common of the sleep related breathing disorders and is widely recognized as a public health issue<sup>3</sup>. OSA is more prevalent than asthma and is as common as diabetes mellitus in the United States<sup>4</sup>.

OSA has been misdiagnosed for many years as patients have been misdiagnosed with depression, chronic fatigue syndrome, and children with ADHD (Attention Deficit Hyperactivity Disorder). All these disorders can result from lack of adequate oxygen in the blood which is common with patients with OSA. Patients with OSA fall asleep during the daytime, in meetings, at work, while driving, watching TV due to inadequate sleep at night. Other side effects include gastro-esophageal reflux disease (GERD), migraine headaches and metabolic syndrome. Can you imagine waking up 20-50 times per hour, every hour all night long? It is no wonder that patients with OSA are extremely tired the next day.

## **Three treatment options for Obstructive Sleep Apnea**

1. Oral Appliances
2. CPAP Device (Continuous Positive Air Pressure)
3. Surgical removal of structures causing the obstruction

Once the patient has gone for the sleep study and the AHI has been determined, then the treatment options as listed above must be explained to the patient. Clinicians must distinguish between mild, moderate and severe OSA. Patients that are diagnosed with severe OSA should be encouraged by the dentist and sleep specialist to wear the CPAP device since this is considered to be the gold standard for the treatment of severe OSA. The CPAP device delivers oxygen to the patient through a mask which fits over the nose, or over the nose and mouth,

via an air compressor and a humidifier. The CPAP device is effective in opening the airway as the air pressure is gradually increased during the follow-up sleep study (PSG). The air pressure successfully displaces the tongue, uvula and soft palate and allows an adequate amount of oxygen to enter the lungs.

When the patient wears the CPAP and the air pressure is correct, it is extremely effective in eliminating OSA. Patients that are happy with their CPAP devices should not be encouraged to replace them with oral appliance therapy. Oral appliances are mainly to be used for patients who cannot tolerate the CPAP device or who have mild to moderate OSA.

The majority of patients who come to my office are either encouraged to seek a solution for their snoring problem or because they were diagnosed with sleep apnea (OSA) and were unable to wear the CPAP device. The statistics on the success of the CPAP device vary greatly according to what articles you read, but the consensus is that approximately 60 – 70% of patients are not wearing it after one year. This means there is a tremendous opportunity for dentists to try and relieve the snoring and OSA with oral appliances.

Patients will sometimes ask you about oral appliances that they see advertised on the internet. Most of these appliances are a “boil and bite” type and put the jaw in only one position. They cannot be adjusted and are often ineffective. The other important fact is that one device that is advertised, called “Pure Sleep”, clearly states that it is not designed to treat patients with TM dysfunction or sleep apnea. The company is correct. No one can legally treat sleep apnea unless a diagnosis has been made by a medical professional, usually a sleep specialist. Therefore, the majority of patients do not qualify for these internet devices. The other major problem with these “internet devices” is that there is no follow-up sleep study to determine the efficacy of the appliance in treating OSA which is a serious and indeed life-threatening medical disorder.

After my patients are properly educated, they are not interested in any appliance that will not solve their serious health issue, which is obstructive sleep apnea. My patients who have tried these internet appliances tell me that they are not nearly as comfortable as the custom oral appliances fabricated for them at our office.

The diagnosis of OSA can only be made by medical practitioners such as sleep specialists or E.N.T. specialists. Dentists have one of the solutions for treating this medical disorder but must learn to work with their medical colleagues to make the system work for the benefit of the patients. OSA is an extremely prevalent disorder with some serious health consequences.

Some facts that health care professionals need to be aware of include the following:

## Co-Morbidity Correlations with Obstructive Sleep Apnea

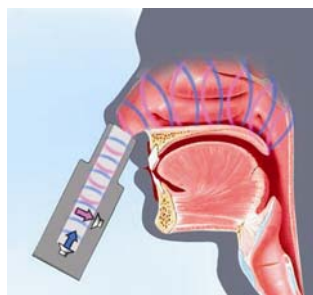
- Hypertension 40 – 50%
- Coronary heart disease 34%
- Congestive heart failure 34%
- Diabetes 65%
- Erectile dysfunction 50%
- Renal disease 50%
- Fibromyalgia 80%
- Nocturnal strokes 84%

There is also a high correlation between patients who have GERD (gastroesophageal reflux) <sup>5</sup> and OSA. With regard to diabetes, excessive apneic events affect the production of insulin which encourages the onset of type 2 diabetes<sup>6</sup>. These apneic events also affect the permeability of the endothelial lining of the arteries. This increases the buildup of plaque in the arteries and the chance of cardiovascular complications, such as a heart attack. The weakening of the walls of the arteries increases the susceptibility of rupturing of these vessels which occurs during strokes<sup>7</sup>.

To assist practitioners in the diagnosis of OSA, we need to focus on airway obstruction in three areas: nasal, oropharyngeal and hypopharyngeal.

### 1. Nasal Obstruction

Prior to treatment, clinicians must determine whether or not there are any nasal obstructions which would interfere with the patient's ability to breathe through their nose. If the patient is a chronic mouth breather, the patient should be referred to an E.N.T. specialist to check for a deviated septum, enlarged turbinates, polyps or other nasal obstructions. A determination must be made whether or not the nasal mucosa is swollen due to allergies which might cause a nasal obstruction<sup>8</sup>.



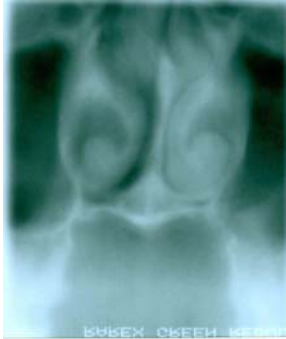
**RHINOMETER**

In our office, we have a diagnostic device known as a rhinometer<sup>9</sup> which is an initial screening device to determine if there is a nasal obstruction in either nostril. The rhinometer is an accurate, non-invasive device which



evaluates the potential obstruction by sending sound waves up the nose and any obstructions are recorded on a computer<sup>10</sup>.

This evaluation of the nasal cavity is also important if the sleep specialist decides to use the CPAP device to force air through the nose. Obviously, if there is a nasal obstruction, the pressure would have to be much higher on the CPAP device. The acceptance of the CPAP treatment is better when the pressure is lower. Therefore, an evaluation of a patient's nasal airway is an important prerequisite to a successful oral appliance or CPAP therapy<sup>11</sup>.



**PRE-TREATMENT  
ENLARGED TURBINATES  
AHI 76 SEVERE OSA**



**RESSECTION INFERIOR TURBINATES  
AHI 32 50% IMPROVEMENT AHI**

The two x-rays above are Para nasal sinus tomogram x-rays of the nasal cavity. The pre-treatment x-ray shows enlarged turbinates severely obstructing the airway. (black area) The patient had an AHI 76 which is severe obstructive sleep apnea (OSA)

The post-treatment x-ray shows the nasal cavity after nasal surgery involving a resection of the inferior turbinates. Clearly the size of the airway (black area) has significantly increased. There was a 50% improvement in the patient's sleep apnea, AHI 32. Possibly now that patient should be offered an oral appliance to move the tongue forward to open up the airway which hopefully would further reduce the AHI and improve the patients' health.

## **2. Oropharyngeal Obstructions**

Prior to the fabrication of the oral appliance or CPAP therapy, an evaluation must be done of the oral cavity to check for obstructions. The areas of concern would be enlarged tonsils or adenoids, large tongue, enlarged uvula, large mandibular tori, excess tissue in the area of the soft palate, or enlarged torus palatinus. Patients with narrow maxillary arches and high palates are also more susceptible to snoring and OSA. Oropharyngeal obstructions must be surgically corrected prior to oral appliance or CPAP therapy.



**ENLARGED TONSILS  
GRADE 4**



**LARGE UVULA**



**LARGE TONGUE**

### **3. Hypopharyngeal Obstructions**

Oral appliances are most effective when there are no nasal or oropharyngeal obstructions and the problem is behind the tongue in the area of the throat. Class II skeletal patients with retrognathic mandibles are the patients that are more likely to have hypopharyngeal obstructions. Their lower jaws are already retruded which subsequently causes their tongues to be retruded. This is particularly serious when the patient sleeps on their back. The tongue falls back further and blocks the airway. If the tongue partially blocks the airway, the patient snores. If it completely blocks the airway for 10 seconds or more, for more than 6 times an hour, the patient is diagnosed with OSA. The main function of the oral appliance is to move the lower jaw forward, increase the posterior vertical dimension and, subsequently, move the tongue forward and open up the pharyngeal airway.

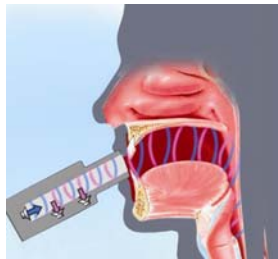


**RETROGNATHIC MANDIBLE**

The pharyngometer is a diagnostic device which is utilized in our office to diagnose the size of the airway during the daytime as well as nighttime<sup>12</sup>. It is utilized at the initial appointment to check the patient's normal airway (daytime) and the collapsed airway (nighttime). To assess the size of the collapsed airway



at night, the patient is instructed to exhale all the air from their lungs and a measurement of the airway is taken. The normal size of a collapsed airway is 2.0 cm. Patients with OSA usually have a much smaller collapsed airway. Bite registrations in different positions are taken to try and see how large the airway may be increased. Our office uses a system called Airway Metrics<sup>13</sup> which consists of a number of plastic bite gigs to help measure the size of the airway in different positions. Various bite registrations are taken including some which may be end to end and open 6 mm, 1 mm. protrusive and open 4 mm, end to end and open 4 mm, etc. By moving the mandible forward at different vertical heights, we determine if the oral appliance will open the airway in that position significantly. In most cases, when a bite registration reveals that the airway opens significantly, when the oral appliance is fabricated in that position, the treatment is usually successful.



**PHARYNGOMETER**

The results using different bite registrations are not always successful if the patient has a physiologically narrow airway or has excessive swelling in the area of the uvula and soft palate due to excessive snoring or smoking. The pharyngometer helps to give the clinician a starting position to fabricate the oral appliance. It is important to select a position that is comfortable for the patient. It is advisable then to use an oral appliance such as a Dorsal, EMA, Modified Herbst, SUAD or TAP Appliance that can be adjusted to move the mandible slowly forward to reduce the snoring and OSA<sup>14</sup>.

As mentioned previously, airway obstructions in the nasal and oropharyngeal (mouth) areas must be eliminated prior to the fabrication of the oral appliance. When oral appliances are utilized in these cases, they are highly effective. Our success rate with oral appliance therapy is over 90%. I routinely evaluate my patients' nasal airways (rhinometer), oropharyngeal and hypopharyngeal airways (pharyngometer) prior to treatment. If you cannot properly diagnose the problem, your treatment will be less successful.

Patients much prefer to wear an oral appliance rather than the CPAP device. However, for severe OSA, the CPAP is the treatment of choice. If a patient is unable to wear the CPAP and they have severe OSA, or if they have mild to moderate OSA, the oral appliance is the treatment of choice.

I recently spoke with a sleep specialist in Nevada who estimated that 18 to 30% of the population is suffering from mild, moderate or severe OSA. Whether you live in the U.S. with a population of 309 million or in Canada with a population of

34 million, this means there are a large number of patients who are suffering from these sleep disorders who desperately need treatment.

If you start helping these patients achieve a higher level of health and extend their lifespan, you will feel better about your practice and yourself. We are presently treating approximately 10 – 15 patients per month at \$3,000 per case. Obviously, this can positively affect your income while you are helping patients become healthier. In Canada, most insurance companies will pay for the CPAP device but will not pay for oral appliances. In the U.S., many medical plans will pay for both CPAP and oral appliances.

I strongly believe that it is the responsibility of the medical and dental profession to identify patients who have airway obstructions leading to snoring and sleep apnea. The two main signs of obstructive sleep apnea (OSA) are snoring and excessive daytime sleepiness. To assist dentists in determining the level of sleepiness, Dr. Murray Johns, Epworth Hospital in Melbourne, Australia, introduced the Epworth Sleepiness Scale in 1991. I have enclosed a copy for your information. I recommend that any patient who snores should complete this questionnaire. It is also advisable to have the bed partner complete the form as well. Our experience has been that many patients, particularly males, underestimate the extent of their daytime sleepiness and the report from the bed partner is usually more accurate.

The Epworth Sleepiness Scale is extremely helpful in determining the extent of the daytime sleepiness which is one of the main symptoms of obstructive sleep apnea (OSA). This scale determines how likely the patient is to fall asleep in certain situations. A zero means they would never doze off, one means a slight chance of dozing, two means a moderate chance of dozing, and three means a high chance of dozing in various situations. The number of patients with daytime sleepiness, especially those over age 50, will be significant.

I had one dentist in my sleep course, involved in a group practice, go back to his office and give the Epworth Sleepiness Scale to all patients who snored. Remember, snoring is one of the main symptoms of obstructive sleep apnea. Within three weeks, he had 50 patients who scored high on the Epworth Sleepiness Scale and who were therefore candidates for oral appliances or the CPAP device. It is important to educate the staff including receptionists, dental assistants and hygienists regarding the diagnosis and treatment of these patients. I find the hygienists are particularly important in conveying the information to patients and asking them to complete the Epworth Sleepiness Scale.

For any patient that has an Epworth Sleepiness Scale higher than 8, it is recommended to seek medical attention in terms of a sleep study in order to diagnose the presence or absence of OSA<sup>15</sup>. Patients who snore but do not have OSA may be treated by the dentist with an oral appliance. Prior to the fabrication

of the oral appliance, the dentist must receive a report from a sleep specialist, stating that the patient does not have sleep apnea. When the patient only snores and does not have sleep apnea, no follow-up sleep study is necessary. If the patient is diagnosed with mild to moderate OSA and the sleep specialist and patient agree, the dentist can then fabricate an oral appliance.

After the oral appliance has been adjusted over several months, the patient must have a follow-up sleep study (PSG) to confirm the efficacy of the appliance. It is imperative that the dentist establish a good working relationship with a sleep specialist in the sleep lab if they want to be successful in the field of sleep dentistry.

I advise all dentists who are interested in expanding their practice to educate themselves and their staff as a first essential step. They must contact a sleep specialist to diagnose these patients with a sleep study prior to treatment and then afterwards to confirm the efficacy of the oral appliance. Most sleep specialists will welcome the opportunity to work with competent dentists. Once a good relationship has been established, this will result in referrals for patients with mild sleep apnea and who cannot tolerate their CPAP device.

Another excellent diagnostic device that I have found to be very useful in my sleep practice is the Embletta 100, a home sleep study. Patients much prefer this home sleep study compared to the hospital sleep study (polysomnogram). The Embletta 100 cannot be used to diagnose OSA unless it is confirmed by a sleep specialist, but it is useful during the titration or adjustment period for the oral appliance. Most oral appliances are not 100% effective when they are first inserted. The uvula and soft palate tissues can be quite swollen due to snoring and/or smoking. As the swelling subsides, the appliance is slowly adjusted to move the mandible and tongue further forward, sometimes taking 2 – 4 months.

During the titration period, it is often advisable to test the efficacy of the oral appliance with the home sleep study (Embletta 100)<sup>16</sup>. The advantages of this device are that it is extremely comfortable, accurate and the patient feels that they get a more normal sleep since they are sleeping in their own bed. The cost is reasonable as the value of the disposables for this home sleep study is only five dollars. Therefore, patients can be given several economical and convenient sleep studies to ensure that the oral appliance is effective in eliminating the snoring and OSA.



### **EMBLETTA 100 HOME SLEEP STUDY**

The Embletta 100 home sleep study device is more acceptable to the medical profession and sleep specialists because it has a nasal cannula, pulse oximeter and chest and abdominal straps. Some sleep specialists in the sleep centers have utilized the Embletta 100 for patients who are unsuccessful with the polysomnogram (PSG). Some patients do not like the polysomnogram due to the odor of the electrodes, suffer from claustrophobia, or cannot sleep in a strange bed with 16 electrodes attached to their body. Most patients feel that they get a more accurate sleep study when they sleep in their own bed with the Embletta 100 home sleep study device. In Europe, most of the studies are home sleep studies due to the significant cost savings as compared to the cost of the polysomnogram sleep study in private sleep clinics or hospital sleep clinics.

It is extremely important that you successfully titrate (adjust) the oral appliance with the Embletta 100 home sleep study device prior to sending the patient for a PSG to a private or hospital sleep clinic. This will prove to the sleep specialists and the E.N.T. specialists that oral appliances are effective in reducing snoring and obstructive sleep apnea. The Embletta 100 will help you to achieve these objectives. This will result in you having more patients referred to you by the sleep specialists and E.N.T.'s for treatment with oral appliances.

The Embletta 100 is the home sleep study that is reputed to be number one in Europe for the past eight years. It has been well researched and the results correlate very accurately with the polysomnogram at the sleep clinics.

The patient is instructed to return to the sleep center for a follow-up PSG, with the oral appliance, to confirm that the appliance is effective. Insurance companies and patients much prefer this approach. You cannot expect insurance companies to pay for three or four sleep studies. The sleep specialists are usually impressed with the results and will, therefore, be encouraged to refer more patients to your office who cannot wear the CPAP or have mild to moderate OSA and request an oral appliance.

Be advised that it is critical for the successful treatment of our patients to work closely with the medical profession. Reports must be sent to the patient's primary care physician to keep them informed of their treatment. Dentists should also inform the sleep specialists that patients with severe OSA must be referred for treatment with the CPAP or BiPAP devices. Patients that are diagnosed with severe OSA should be encouraged to wear the CPAP device since this is the gold standard for the treatment of severe OSA.

Once the patient is diagnosed by the sleep specialist at the sleep clinic, the patient usually returns for a second sleep study when the technician determines what air pressure will be necessary to eliminate the OSA. The more serious the problem and, in some cases, the more obese the patient, the pressure must be increased substantially to obtain the desired result. The lower the air pressure usually results in better compliance. The exception to this would be patients with severe sleep apnea who seem to benefit the most from the CPAP. These patients feel so exhausted prior to wearing the CPAP and feel so refreshed afterwards that their compliance rate is high. My observation has been that patients with mild to moderate OSA are not as compliant. This is where, I believe, the dental profession needs to become involved. If the patient is mild to moderate and there is no necessity for surgery, then the oral appliance fabricated by the dentist is the best option. The fact is that a larger number of patients who are prescribed CPAP devices, cannot tolerate them<sup>17</sup>.

Recently in the U.S, Medicare has started to pay for patients with obstructive sleep apnea. Medicare is willing to pay for a CPAP device but they want confirmation on compliance. They do not want to pay for the device if it is not being utilized on a regular basis by the patient. The newer devices can be integrated with the telephone line and the data is analyzed by a third party to verify compliance. If there is no compliance, Medicare will not pay for the device.



**60% STOP USING CPAP  
OR BIPAP DEVICES AFTER 6 TO 12 MONTHS.**

There are several different CPAP and BIPAP devices so patients should be encouraged to try several types until they find one that is acceptable. I am constantly amazed by the fact that patients who were diagnosed with OSA,

prescribed a CPAP unit and could not tolerate the device, were never contacted again by either the sleep specialist or the Durable Medical Equipment company. Some of these patients already have co-morbid factors such as high blood pressure, cardiovascular disease, type 2 diabetes, GERD, etc. and their health continues to deteriorate. The system certainly needs to be improved for the benefit of these patients.

Dentists and staff who are interested in pursuing their education in sleep disorder dentistry (snoring and sleep apnea) should be encouraged to take some courses. One suggestion would be to consult the website, [www.rondeauseminars.com](http://www.rondeauseminars.com) for sleep courses with experienced clinicians and lecturers offered in different locations in Canada and the U.S. In the near future, some of these sleep disorder dentistry courses will also be conveniently available on the internet.

I would also encourage interested dentists to join the American Academy of Dental Sleep Medicine. This organization offers courses which would help practitioners accumulate new and important information on sleep disorders such as obstructive sleep apnea.