

## Feature Article

# Should the Dentist Independently Assess and Treat Sleep-Disordered Breathing?

With sufficient training and knowledge, the dentist can and should manage the mild snorer and moderate sleep apneic.

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### abstract

*Sleep-disordered breathing is a chronic problem of the inappropriate mechanical collapse of the upper airway. Symptoms range from mild occasional snoring to severe obstructive sleep apnea. The standard of care for the diagnosis and treatment of sleep-disordered breathing by sleep medicine has been the use of the polysomnogram and continuous positive airway pressure. This approach is burdensome, costly, and ineffective due to lack of compliance with or rejection of treatment. Oral appliances are highly effective in managing the mild snorer to the moderate sleep apneic and are approaching the efficacy of continuous positive airway pressure with the severe apneic. The dentist can and should manage these patients. However, the dental practitioner must acquire sufficient training and knowledge to appropriately treat these patients.*

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Dentists have been criticized by sleep specialists and in professional literature for independently assessing and treating sleep-disordered breathing, ranging from snoring to sleep apnea. For instance, Rosalind Cartwright, PhD, a sleep specialist, said that dentists were Adomedicalizing@ sleep-disordered breathing.<sup>1</sup> In addition, she called into question the motivation of otolaryngologists and pulmonary physicians for using home monitoring equipment and self-titrating continuous positive airway pressure devices, thereby "despecializing" sleep-disordered breathing. She assumes that only a multidisciplinary team of otolaryngologists and pulmonologists headed by a sleep specialist can properly provide therapy. Today, many dentists in the United States, Canada, England, and Scotland are successfully treating patients with sleep-disordered breathing. A discussion of whether dentists should treat these patients should be based on what is best for the patient, patient preference, and outcomes. To reach a conclusion, several factors must be analyzed and evaluated. These are:

- \* The anatomy and physiology of the upper airway and the pathophysiology of sleep-disordered breathing;
- \* The diagnosis and treatment of sleep-disordered breathing; and
- \* A proposed standard of care.

## **The Anatomy and Physiology of the Upper Airway and the Pathophysiology of Sleep-Disordered Breathing**

Sleep-disordered breathing is the inappropriate mechanical collapse of the upper airway during sleep. This ranges from slight or infrequent partial collapse to total collapse resulting in a continuum of symptoms from mild snoring to obstructive sleep apnea.

Understanding normal physiology and anatomy of the upper airway from the nose to the glottis is critical to managing the mechanical collapse of the airway. The pharynx acts as a collapsible tube to control breathing, swallowing, and phonation. Because the airway and alimentary canal cross in the pharynx, a very sophisticated mechanism causes this flexible tube to collapse during swallowing,<sup>2</sup> protecting the airway. As swallowing begins, the mandible retrudes, generally into centric occlusion, forming a stable bony base for muscular contraction of the tongue, elevation of the hyoid bone, and contraction of the muscles of the soft palate and constrictor muscles of the pharynx. Once swallowing is complete, the airway is returned to normal by the relaxation of the constrictor muscles, the contraction of the dilator muscles (stylopharyngeal and palatopharyngeal muscles), and a posturing of the mandible straight forward in a "physiologic rest position" or breathing position. The mandibular plane at rest is parallel to the maxillary plane. A forward movement of the mandible brings the condyles down the eminence of the fossa, causing the posterior aspect of the mandible to move away from the maxilla (Christensen's phenomenon). The chin point moves an equal distance down and forward, creating a space between the maxillary and mandibular teeth known as "freeway space" in dentistry.

This position of the mandible has three distinct functions. First, the movement away from the maxilla stretches and tightens the lateral walls of the pharynx and the superior constrictor muscle through the attachment to the medial pterygoid plate, the pterygoid mandibular raphe, the floor of the mouth, and the tongue.<sup>3</sup> Schwab and colleagues<sup>4</sup> point out the importance of the lateral collapse of the pharynx in obstructive sleep apnea patients. Secondly, the volume of the oral cavity increases, allowing room for the tongue. Thirdly, the forward chin point brings the genial tubercles forward to provide a fixed bony base. The tongue then rests behind the upper incisors and independently forms an air seal with the soft and hard palate. A simple test to confirm the mandible/tongue position is to try breathing only through the nose with the jaw rotated back and open. Another test is to part the lips while the tongue is in the proper position, confirming the ability of the tongue to form an air seal. The description of the neuromuscular activity of the tongue in both the nonapneic and apneic individual has been well-described by Mezzanote and colleagues.<sup>5</sup> Thus, the function of the mandible and the temporomandibular joint is similar to that of a tent pole, holding the airway open in a protrusive position and allowing it to collapse in a retruded and/or rotated position. A test to confirm this is to try to swallow or snore in a protruded position.

Virtually every health care professional and many lay individuals have a clear understanding of the role the mandible plays to reverse the collapse of the airway when they are trained in the "ABCs" of cardiopulmonary resuscitation. The "A" represents airway management, clearing the airway of any foreign object, followed by performing a "jaw thrust" maneuver. Only when the mandible is placed in the proper position to open the airway can ventilation, or breathing, "B," be performed easily and successfully. These same techniques apply to managing a patient's airway during conscious sedation or to ventilating a patient with a bag in general anesthesia.<sup>6</sup> The pathophysiology of sleep-disordered breathing and treatment relate directly to this mechanism of airway management. Sleep-disordered breathing occurs because of the increased narrowing of the airway (flow-resistive load), which can be from two basic causes. The first and primary cause is the position of the mandible and tongue. A sleep-disordered breathing patient's decrease in baseline neuromuscular activity during sleep results in rotation of the mandible into a functionally retruded craniofacial position, partial mouth breathing,

and the collapse of the tongue into the pharynx.<sup>7</sup> The reactivation of the neuromuscular control reverses the collapse as indicated by the chin point electromyogram. The position of the mandible can be affected by underlying craniofacial anatomy, soft tissue anatomy, increasing age, pathological changes, medications, alcohol, food, fatigue, and sleep stage (atonia during rapid eye movement sleep).<sup>8-12</sup> A supine sleep position also negatively affects the position of the mandible by allowing it to rotate back and open.<sup>13</sup> The second major cause of airway narrowing is obesity. Fatty deposition in the neck, pharyngeal tissues, and tongue tend to narrow the lumen of the airway and decrease the likelihood of the neuromuscular mechanism and jaw holding the airway open enough to prevent obstruction.<sup>14</sup> Obesity also requires more effort for the patient to ventilate (mass load), although this is separate from the mechanical collapse of the airway. Other causes of airway narrowing, such as a deviated septum or allergies, must be evaluated and may be contributing factors but are not the primary causes of the underlying problem.

## **Diagnosis and Treatment of Sleep-Disordered Breathing**

### *Traditional Medical Approaches*

Sleep-disordered breathing is a continuum from mild, occasional snoring to severe obstructive sleep apnea. Yet, the vast amount of time, effort, and money is spent on the differentiation between the apneic and the nonapneic patient using the polysomnogram for diagnosis. The result is that the diagnosed obstructive sleep apnea patient is treated with continuous positive airway pressure with there being little or no treatment for the failed continuous positive airway pressure patient or the non-obstructive sleep apnea patient. Historically, this treatment paradigm developed in the United States for three reasons. The first was the discovery of sleep apnea by psychiatrists and neurologists during routine experimentation on sleep in the sleep lab setting.<sup>15</sup> The second was the discovery of a way to manage the disorder via the use of continuous positive airway pressure.<sup>16</sup> The third was the high prevalence and the serious consequences of the disorder.<sup>9</sup> Both the diagnosis and treatment of obstructive sleep apnea required the use of the polysomnogram, causing the proliferation of sleep laboratories for clinical purposes. This occurred during a time of adequate funds for new therapies and created a new specialty, sleep medicine, supported by a billion-dollar sleep industry. The focus of this sleep medical-industrial complex has been the improvement of the systems surrounding the polysomnogram-continuous positive airway pressure approach. Millions are spent on mask and continuous positive airway pressure technology to improve compliance. A paucity of resources is allocated to other promising technology. Dr. Cartwright was an early advocate of oral appliance therapy. Her 1988 paper on the Tongue Retaining Device invented by psychiatrist Charles Samuelson cited great promise for oral appliances.<sup>17</sup> The results of treatment of 24 patients were that only five of the 24 remained unimproved (the five included the most obese cases). Her conclusions were that "treatment can proceed in a logical fashion starting with the less invasive treatments for both mild and severe cases and with careful clinical management, most patients will reach acceptable levels of control. Only a few will require the more cumbersome CPAP [continuous positive airway pressure] or more invasive surgical treatments." These therapies would be appropriate "for those who do not respond to a trial of habit change and TRD [Tongue Retaining Device] treatment."

"An appliance ... has an early place in the treatment of these [apneic] patients either alone or as an adjunct to other measures."

However, to date little has been done within the sleep community to further oral appliance technology.

### *Comparison of Treatment Alternatives*

Blinded, crossover, outcome studies on all approaches should be the basis for any discussion of the proper management of sleep-disordered breathing. Since these are not available, continuous positive airway pressure therapy and oral appliance therapy will be compared with published data. Surgical treatment is excluded from this discussion since surgery is usually recommended for sleep-disordered breathing only after the more conservative therapies have been tried. Conservative therapies such as weight loss and positional therapy are also excluded since these should be instituted no matter what other approaches are tried. To date, most of the published studies relate to polysomnograms and continuous positive airway pressure. As explained previously, for lack of access to sleep labs and funding, much less has been done with oral appliances. Any analysis of treatment should include efficacy, effectiveness, cost, availability of medical resources, quality of life, and prevention.

Efficacy is the capacity to produce a desired effect. Continuous positive airway pressure is currently the gold standard for efficacy in normalizing an abnormal polysomnogram, not necessarily the gold standard for managing sleep-disordered breathing. Continuous positive airway pressure has two distinct functions. The first is airway management and the second is ventilation. Less has been written describing the ventilatory effects such as increase in vital capacity or an increase in the pressure gradient across the alveoli. The new autopaps appear to be sophisticated ventilators. However, the effect of continuous positive airway pressure to act as a pneumatic splint preventing the mechanical collapse of the pharynx has been well-described by Sullivan.<sup>16</sup> Two facts reveal that it is doubtful that this is the most efficacious way to manage an airway. The first is that continuous positive airway pressure does not work with the jaw rotated back and open, which is the usual sleep position for most individuals with sleep-disordered breathing. According to Mark Forester, chief technologist at Presbyterian Sleep Institute in Dallas, more than 90 percent of the institute's patients leak air through the mouth, thereby requiring chin straps for continuous positive airway pressure to be effective. Therefore, a significant part of the efficacy of continuous positive airway pressure is the position of the mandible, whether this is accomplished by an external jaw positioning device and/or an increase in the baseline neuromuscular activity of the jaw positioning muscles and tongue to close the jaw and effect an air seal between the tongue and soft palate. The second fact is the difficulty in ventilating a patient with air pressure alone while managing a patient in anesthesia or CPR. Until the jaw and head are in the proper position, ventilation, even with great pressure, is difficult.

The efficacy of continuous positive airway pressure to normalize polysomnograms is well-documented. Although the results of most of the published studies on oral appliances have shown that they are not as efficacious in normalizing polysomnograms, the results of studies on the newer, adjustable appliances are approaching that of continuous positive airway pressure. In an abstract of preliminary results based on 38 patients by Pancer and Hoffstein,<sup>18</sup> the average respiratory disturbance index was 42 before oral appliance therapy. After therapy, most of the symptoms were eliminated, and the average respiratory disturbance index was 11, with virtually all events being mild hypopneas. An abstract by Roberts, Jamieson, and Becker<sup>19</sup> cites similar results with continued improvement beyond the maximum range of protrusion of the mandible. Loube has shown normalization of polysomnographic parameters with and without an

oral appliance in a patient with upper airway resistance syndrome.<sup>20</sup> More-definitive studies are now under way on oral appliance therapy with upper airway resistance syndrome.

Effectiveness is not the same as efficacy. Effectiveness is efficacy over time to obtain the desired results. Based on this definition, continuous positive airway pressure is highly ineffective for the treatment of sleep-disordered breathing, even obstructive sleep apnea, due to cost, initial rejection of treatment, and compliance. Guilleminault found a 2 percent compliance with continuous positive airway pressure in a large series of patients with upper airway resistance syndrome.<sup>16</sup> Similar results have been shown with the nonapneic snorer. Therefore, continuous positive airway pressure is virtually excluded as a viable therapy in more than 70 percent of the patients with sleep-disordered breathing. A number of studies have also shown the lack of compliance with continuous positive airway pressure in the sleep apnea patient, even those with severe apnea.<sup>21</sup> A seminal study, done by Kribbs and Pack, utilized covert monitoring to determine continuous positive airway pressure use.<sup>22</sup> Of 35 patients, only 16 (46 percent) met the minimum criteria of four hours of use on 70 percent of days monitored. If a conservative criterion of seven hours of sleep based on normative data of middle-aged adults is used, only two of 35 achieved this result at least five of seven days. Their conclusion is that "frequent, long-duration, quality sleep is a relatively rare occurrence in OSAS [obstructive sleep apnea syndrome] patients treated with CPAP [continuous positive airway pressure] ... that actual CPAP use by OSAS patients falls short of providing quality sleep all night, every night."

Another study reviews the diagnostic and treatment process for all patients seen in a major sleep center during an 11-year period.<sup>23</sup> An assumption was made that all the patients who were diagnosed by history to have obstructive sleep apnea were patients with symptoms of sleep-disordered breathing severe enough to warrant a referral to a sleep center. The compliance results of the patients contacted were extrapolated to those patients not contacted. Not only did this reveal that continuous positive airway pressure compliance was a problem, but it also revealed that the diagnostic and treatment paradigm has major shortcomings. Twenty-five percent of the population did not return for a diagnostic night of polysomnogram and 57 percent of the obstructive sleep apnea patients rejected or quit wearing the continuous positive airway pressure. Based on these results, less than 12 percent of this sleep-disordered breathing population is being treated with continuous positive airway pressure. If covert monitoring of the ones who said they were using the continuous positive airway pressure were done, the results would be even more abysmal. Dinges has stated, "Studies that have objectively monitored the nightly duration of CPAP [continuous positive airway pressure] use have consistently produced an average duration that appears to be below the duration of sleep considered essential for alert functioning."<sup>24</sup>

Although no comparable study has been done on oral appliances, logic would point to a much greater use of oral appliances than continuous positive airway pressure. In a follow-up telephone survey done by this author on 208 patients who had worn an oral appliance for more than six months, 81 percent were still wearing it an average of 25 days per month.<sup>25</sup> Twelve patients (6 percent) used the appliance as needed to control snoring only. Factors sighted for discontinued use included 17 (8 percent) who either lost weight or lost their bed partner, eight (4 percent) with pain, and three (1 percent) with no complaint other than difficulty sleeping with the appliance. Certainly, if preference indicates the greater likelihood of increased use, oral appliance therapy would be the clear winner. In a crossover study by Clark,<sup>26</sup> a post-treatment telephone interview revealed an overwhelming 95 percent preference of oral appliances over continuous

positive airway pressure. Only one of 21 patients was using continuous positive airway pressure. Seventeen were using an oral appliance every day, while two were using it intermittently. The preferences were even more notable, considering the fact that continuous positive airway pressure was more efficacious by polysomnogram than the oral appliance. If continuous positive airway pressure is limited to the treatment of the few sleep apneics who will wear it and if most of these would prefer oral appliances, the most logical noninvasive treatment modality for all sleep-disordered breathing patients is the oral appliance. Continuous positive airway pressure should be used only after trial oral appliance therapy fails from noncompliance or lack of symptom improvement. Dr. Perez-Guerra, a pulmonologist and sleep medicine physician, recommends the following similar approach. "(1) Fully asymptomatic snorers without associated co-morbidity (particularly if not overtly obese) are referred for oropharyngeal surgery or a dental appliance without preceding polysomnography; (2) snorers with an Epworth Sleepiness Scale >12, body mass index >28, and who do not desire consideration for nasal CPAP will be referred for oropharyngeal surgery or a dental appliance without preceding polysomnography; (3) patients with suspected severe sleep-disordered breathing, particularly when serious co-morbidity exists, will undergo split-night studies. In the future, most patients likely to require nasal CPAP will have objective documentation of sleep-disordered breathing by the simplest ambulatory monitoring. This will probably consist of the flow/time profile utilizing nasal cannulae with or without simultaneous oximetry; and (4) no nasal CPAP re-titrations will be performed in patients who remain asymptomatic."<sup>27</sup>

Other determining factors of treatment point to oral appliance therapy. The cost of oral appliance therapy is significantly less than continuous positive airway pressure, particularly if the cost of titration of the continuous positive airway pressure with a polysomnogram and the failure rate of compliance is considered. Assessing quality of life, few if any would choose continuous positive airway pressure over an oral appliance unless the oral appliance were ineffective. Responses on questionnaires list the common problems with continuous positive airway pressure as inconvenience, stuffy or runny nose, poor sleep, disturbed sleep, less intimacy with bed partner, claustrophobia, facial irritation, and expense.<sup>28</sup> Although the same questions were not asked in the Pancer, Hoffstein study, 61 percent of respondents said they were very satisfied and 39 percent said they were moderately satisfied with the oral appliance, with no one being moderately dissatisfied.<sup>18</sup> Finally, the prevention of obstructive sleep apnea seems to be tilted in favor of the oral appliance and a dental intervention. As in the treatment of the craniofacial anomaly of the child with the long face syndrome with orthodontics, functional appliances, and/or orthognathic surgery or the early treatment of snoring with oral appliances before obstructive sleep apnea develops, dental therapy seems to hold great promise.

## **A Proposed Standard of Care**

### *Diagnosing Sleep-Disordered Breathing*

If oral appliance therapy is the preferred treatment for the majority of sleep-disordered breathing patients, then the next question is who should diagnose the condition and what diagnostic tests should be used. The answer includes establishing a diagnostic hypothesis, progressively ruling out specific disease (sensitivity), and then confirming a specific disease (specificity). Sleep medicine specialists would require a polysomnogram or equivalent for everyone suspected of obstructive sleep apnea.<sup>29</sup> However, many are

now recommending first applying clinical screening programs to differentiate the likely obstructive sleep apnea patient from the non-obstructive sleep apnea patient to reduce the cost of diagnosis and treatment.<sup>30,31</sup> These screening tests can essentially rule out obstructive sleep apnea while the polysomnogram diagnoses the presence or absence. The same screening program can be used to titrate the adjustable oral appliances and then rule out obstructive sleep apnea if the tests are negative while wearing the appliance. The screening program includes questionnaires for sleepiness such as the Epworth Sleepiness Scale;<sup>2</sup> questions of the bed partner including information on pauses, snoring, or gasps;<sup>33</sup> and overnight pulse oximetry, which can be used to rule out obstructive sleep apnea. If oxyhemoglobin saturation does not fall below 90 percent for more than 1 percent of the night, then the likelihood of obstructive sleep apnea is less than 2 percent.<sup>34,35</sup> If all the tests are negative, obstructive sleep apnea is ruled out. If any are positive with the oral appliance, then a consultation and polysomnogram or other study to determine the respiratory disturbance index is warranted. Although there is criticism of the polysomnogram in the medical community concerning arbitrary cutoff points for normals and obstructive sleep apnea, lack of standardization of testing methods with uncertain validity and reliability, and variable definitions of abnormal breathing events and syndromes,<sup>36</sup> the American Sleep Disorders Association continues to call the polysomnogram the gold standard. Pack has questioned whether "the gold standard (PSG) is really gold. Are we treating a disease or perpetuating an expensive test? Are there other tests that define the disease better?"<sup>37</sup> Although the polysomnogram remains the purview of the sleep specialist, the dentist can be well-prepared to perform all the other requirements of screening, including patient history, physical exam, and overnight pulse oximetry.

### *The Dentist as the Primary Practitioner*

Three factors should be considered before a dentist decides to treat sleep-disordered breathing. These include legal, professional-liability, and ethical issues. The first two are relatively easy to assess. The last requires much more thought, particularly in developing a standard of care for a new therapy.

Legally, the treatment of any disease process or condition is based on both state and federal laws. Under most state laws, the practice of dentistry is related to conditions and diseases that affect the teeth, jaws, temporomandibular joint, or related structures including their function and dysfunction.<sup>38</sup> If sleep-disordered breathing can be treated through dental therapies such as oral appliances and orthognathic surgery, then sleep-disordered breathing is within the scope of dentistry. The overlap of treatment modalities in medicine and dentistry for a particular diagnosis occurs frequently. The treatment given is based on patient complaints, symptoms, severity of the disease, efficacy and effectiveness of the treatment, referral patterns, the specialty and bias of the professional consulted, costs, and insurance coverage. Examples of this dental-medical overlap include diagnosis and treatment of nocturnal bruxism, temporomandibular disorders, myofacial pain, and headaches. A direct correlation can be made between nocturnal bruxism and sleep-disordered breathing. Both are sleep disorders, have symptoms that are confused with or mimic other disorders, are chronic, and need to be managed over time. Both can be effectively managed in the majority of cases with noninvasive oral appliance therapy.

The Food and Drug Administration oversees and regulates the sale of devices for the treatment of conditions such as sleep-disordered breathing. The dental branch of the

FDA, not the medical branch, regulates oral appliances. At a recent FDA conference on oral appliances, consideration was given to making them available over the counter.<sup>39</sup> Although they are still restricted to prescription by a physician or dentist, the possibility exists that they will become an over-the-counter product if data is presented confirming their safety, lack of significant morbidity, and effectiveness.

A second concern for the dentist treating sleep-disordered breathing is whether the practitioner's malpractice insurance will cover this treatment. Statements have been made that dentists are at risk if a patient has a stroke, myocardial infarction, or motor vehicle accident while being treated with an oral appliance. As with any other potential act of malpractice, many factors concerning liability would be considered, including circumstances, informed consent, standard of care in the dental community, and treatment documentation. Three malpractice carriers, AAOMS National Insurance Co. RRG, Fortress Insurance Co.,<sup>40</sup> and CNA<sup>41</sup> do not restrict the treatment of sleep-disordered breathing nor do they charge more for coverage. The sleep specialist treating obstructive sleep apnea would have the same risks as the dentist, particularly since there is known failure of continuous positive airway pressure because of noncompliance. With the improvement of the results with oral appliance therapy, the documented preference of oral appliance therapy over continuous positive airway pressure, and the requirement by the American Sleep Disorders Association that accredited sleep labs have a dental consultant, it is the sleep specialist who faces a real issue in the area of informed consent from patients.

Finally, the ethical issues of sleep-disordered breathing demand three things of the dentist: having adequate and appropriate training, giving adequate information on sleep-disordered breathing, and doing no harm. The dentist has a duty to have enough knowledge and understanding of sleep-disordered breathing to educate the patient on treatment options, morbidity of the treatment, and outcomes. Fortunately for the patient, oral appliance therapy has little morbidity, is reversible, inexpensive, and with the newer adjustable appliances highly effective. It is the overwhelming treatment of choice. Simple questionnaires and testing can quickly determine those patients who are oral appliance therapy treatment failures or are being undertreated. Proper referral of the more severe patient or the patient who may not have sleep-disordered breathing can be effected with little delay in treatment and no harm done to the patient. The potential harm that a dentist can render is not maximizing the benefit of oral appliances for the patient if he or she attempts to treat sleep-disordered breathing with little knowledge, training, and skill. The highly inconsistent results and numerous failures of both dentists and many oral appliances in the past have given oral appliance therapy a poor reputation among many sleep physicians. If a dentist is going to diagnose and treat sleep-disordered breathing, he or she must be able to place the jaw in the most effective treatment position. This necessarily requires home or sleep lab titration of the device utilizing objective measurements of results such as pulse oximetry, home sleep study, or polysomnogram. This also requires the use of adjustable oral appliances, whether they are used as trial devices or treatment appliances. Just as continuous positive airway pressure is adjustable and titrated, so too must oral appliances be adjustable and titrated.<sup>19</sup>

Any patient complaining of sleep-disordered breathing can and should be treated by the dentist if the dentist determines that the patient has the condition and can be helped with an oral appliance. This may include the patient whose chief complaint is snoring; the continuous positive airway pressure failure; the patient who refuses to undergo a polysomnogram; the patient who refuses to wear a continuous positive airway pressure device; the continuous positive airway pressure compliant patient who desires an alternative or a substitute while traveling; the orthognathic, uvulopalatopharyngoplasty or laser-assisted uvulopalatopharyngoplasty surgical candidate; and the surgical failures.



Unlike patients of sleep medicine, which treats obstructive sleep apnea patients only, every patient can receive therapy since oral appliances can manage the occasional mild snorer and the patient with severe obstructive sleep apnea. The oral appliance becomes as much a part of the diagnosis as it does treatment at a fraction of the cost and time of the polysomnogram-continuous positive airway pressure treatment routine. This is analogous to using the "smart CPAPs" to both diagnose and treat obstructive sleep apnea.<sup>42</sup>

The dentist should follow a standard of care for the sleep-disordered breathing patient that will ensure appropriate treatment, especially if the practitioner chooses to treat the patient prior to an assessment by a sleep specialist. The routine evaluation should include sleep questionnaires; medical history; physical examination of the head, neck and pharynx; and overnight pulse oximetry. If pathology of the upper airway is ruled out and the chief complaint is snoring with no symptoms of sleepiness and no oxygen desaturations, then the definitive treatment is the oral appliance. If the patient snores, is sleepy, but has no desaturations then the likely diagnosis is upper airway resistance syndrome and the treatment of choice is an oral appliance. Follow-up questionnaires for sleepiness must be completed after oral appliance therapy, and failures should be referred to their physicians for evaluation. If the patient desaturates greater than 1 percent of the night below 90 percent, then obstructive sleep apnea is a possibility. At this point, a consultation is warranted with the patient's physician with the permission of the patient. Treatment options must be thoroughly explained. If oral appliance therapy is chosen by the patient, then after therapy if desaturation is less than 1 percent of the night below 90 percent, obstructive sleep apnea is practically ruled out, particularly if there are no remaining symptoms. If the patient is still desaturating or continues to have symptoms, then with the patient's understanding and permission, a referral should be made to his or her primary care physician for further analysis and referral to either a maxillofacial surgeon, an otolaryngologist, or a sleep physician.

There is a new standard of care for the sleep community. If the sleep physician is going to offer comprehensive therapy, then he or she must include oral appliances as part of the evaluation and treatment routine,<sup>43</sup> whether this is independent of continuous positive airway pressure, combined with continuous positive airway pressure, or as a substitute when continuous positive airway pressure cannot be worn or is inconvenient to wear. One tenet of the American Sleep Disorders Association is that a "decision on an individual patient regime must combine objective evaluation of severity and patient preference."<sup>44</sup> At least one sleep medicine group has a full-time dentist on staff, and limits the use of oral appliances only because of the lack of insurance coverage or the refusal of the patient to pay for the therapy if insurance does not. The group, Sleep Medicine Associates of Texas, includes three board-certified sleep physicians, including the current president of the American Sleep Disorders Association, Dr. Wolfgang Schmidt-Norwara. Will this lead to physicians becoming the primary source for oral appliance therapy as concern some dentists? It is doubtful. Long-term management of oral appliance therapy requires dental intervention. This is best accomplished by the dental professional, who focuses on periodic recalls, prevention, early intervention, accessibility, affordability, and appropriate referral when warranted. The oral cavity, dentition, and temporomandibular joint must be healthy for the patient to benefit from long-term oral appliance therapy. Until a simpler, more cost-effective and user-friendly treatment is found, patients with sleep-disordered breathing are best served by the dental community.

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