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Somnology 101: A Primer on Sleep Disorders, Their Impact on Society, and a Role for Dentistry

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ABSTRACT Sleep is necessary for our existence. It is one-third of a commitment to health along with nutrition and exercise. While we spend one-third of our lives asleep, studies show one-third of the U.S. population suffers with a significant sleep disorder at some point in their lifetime. This manuscript introduces sleep and sleep disorders, focuses on those sleep disorders within the domain of dentistry, and addresses contributions the dental community can make toward specific sleep problems.

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Sleep is not optional, at least if peak performance is desired, quality health is aspired, and optimum life expectancy is to be achieved. However, studies show lack of professional education with U.S. medical schools devoting only about two hours total education in their four-year MD programs to all sleep-related topics.[1] Additionally, only about 2 percent of content in our standard medical textbooks relates to somnology.[2] Normal sleep is defined as "The cyclic, temporary, and physiologic loss of consciousness that is readily, promptly, and completely reversed with appropriate stimuli." All animals require sleep, starting with the much-studied fruit fly, drosophila melanogaster, used in elucidating molecular mechanisms and functions of sleep.[3]

Sleep requirements range according to species and survival demands. Some animals such as bottlenose dolphins have adapted to deep or slow brain wave sleep (SWS) with half a brain and do not have REM (rapid-eye movement, dream, or paradoxical) sleep.[4] Studies show humans require about seven hours of sleep for the longest potential survival, although extended average sleep time in "long sleepers" of ≥10 hours/day suprisingly increases all cause mortality more significantly than the "short sleeper" group with <5 hours/day.[5] Sleep demands change during our lifetimes and while infants sleep up to 18 hours per day with 50 percent devoted to REM, as we age, the SWS, REM, and total sleep time (TST) often progressively decrease and become more disrupted. Why we sleep is still unknown, although many theories abound and include common sense avoidance of danger in the dark, such as predators or unseen obstacles, like cliffs or crevices underfoot. More recent scientific evidence showed

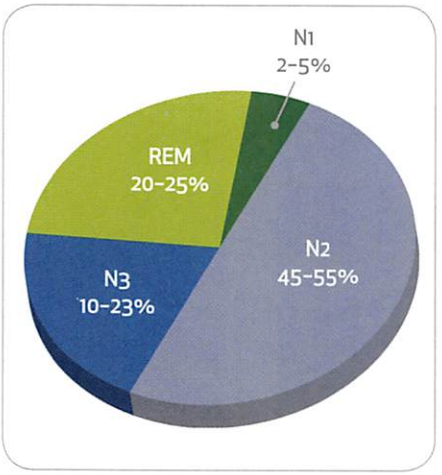


FIGURE 1. Sleep stage proportion in young adults.

TABLE 1

Classification of Sleep Disorders (Refer to Table 2 for Abbreviations)

Diagnosis ICSD-2	Categories	Prevalence	Common Presentation
I. Insomnia	Sleep onset, sleep maintenance, early waking	25%	Sleepy, irritable
II. SRBD Sleep-related breathing disorders	OSA(S), CSA hyperventilation/hypoxemia	M 24% (4%) F 9% (2%) CSA unknown	Sleepy, irritable, BMI≥30 M age 35+ and postmenopausal F
III. Hypersomnias	Narcolepsy +/– cataplexy, idiopathic, recurrent, due to medical condition or meds, etc.	0.05%	Sudden REM sleep onset +/- muscle weakness
IV. Circadian rhythm sleep disorder	Delayed (or advanced) phase shift, jetlag, shift work type, due to meds, etc.	11% (1%)	Altered time pattern of sleep; work-related; teenagers
V. Parasomnias	Sleep-related walking, eating, groaning, enuresis, paralysis, terrors. RBD, confusional arousals, due to drugs or medical conditions, etc.	17% children 4% adults RBD 0.8%	Disorders of arousal from sleep in NREM and REM
VI. SRMD Sleep-related movement disorders	RLS, PLMS, rhythmic movement, leg cramps, bruxism	10% adults 2% children Bruxism 8% adults children 16%	RLS -Need to move limbs. PLMS limb movements in sleep
VII. Isolated symptoms and normal variants	Snoring, long/short sleeper, sleep talking, myoclonus	Snoring M 40% F 24% 10% children	Intermittent snoring caused by alcohol, fatigue, allergic rhinitis, supine position, etc.
VIII. Other sleep disorders	Sleep disorders not classifiable elsewhere, environmental noise, etc.	Undefined	Noisy or moving bed partner. Noisy surroundings

the release of growth hormones during SWS improved learning and memory consolidation with sleep and that sleep is essential for immune homeostasis.[6-8]

Theories of repair, regeneration, and recharging are all reasonable but hard to prove. Rat studies show ill effects of sleep deprivation such as ragged appearance, increased food intake with weight loss, poor homeostasis, and the likelihood of death within two to three weeks with total sleep deprivation.[9,10] Even partial sleep loss and disrupted circadian sleep cycles in humans with development of sleep debt results in reduced neurobehavioral function and contributes to many daily transportation-type crashes, job injuries, and even catastrophic accidents such as those that occurred at Three Mile Island, Chernobyl, Bhopal, and the Alaskan grounding of the Exxon Valdez.[11,12]

Sleep is divided into non-REM (NREM) and REM states. Each state has different but characteristic brain wave patterns. The awake and REM brain wave patterns are very similar in both amplitude and frequency consistent with the notion that the brain is very active during REM sleep. NREM sleep ranges between the lightest stage N1 to the deepest SWS N3 sleep. Early on in the daily sleep cycle there is more SWS implying its relative importance, and following sleep deprivation, there is often SWS rebound recovery.

Each night's sleep is not homogeneous but a cycling up and down through sleep levels and typically a healthy adult will experience about four to six 90-minute sleep cycles interspersed with increasing periods of REM dream sleep. NREM sleep may also include dreams but they lack the depth of storyline and if woken and questioned, subjects recall few details compared to the subject woken to recall their dream during REM sleep (FIGURE 1).

Sleep Disorders, Epidemiology and Their Impact on Society

The 2003 National Heart Lung and Blood Institute report conservatively estimated that 50-70 million in the United States are chronically affected by sleep disorders, and the 2006 landmark report by the Institute of Medicine validated that sleep disorders and sleep deprivation remain an enormous unmet public health problem.[13,14] Sleep deprivation costs the

TABLE 2

Dangers of Drowsy Driving

Important Aspects of Drowsy Driving (DD)	Reference#
57% of MVC with truck driver death attributed to fatigue/sleepiness	57
110,00 injuries, 5,000 fatalities/yr DD involve commercial trucks	58
16-29 y.o. drivers are most likely age group to have fall asleep MVC	59
Sleep-deprived adults drive as poorly as alcohol-challenged	60
10% of drivers report nodding off while driving ≥1-2 days/month	35
60% drivers self-report drowsy driving	61
41% drivers report fallen asleep at the wheel at some point in their lives	62
20% MVC attributable to drowsy driving	63
20% of all serious MVC associated with driver sleepiness	64
OSA w/AHI ≥10 have odds ratio for MVC of 6.3 times normals	65

U.S. economy an estimated $40 billion annually in lost productivity and, across numerous settings, accidents attributable to sleepiness are estimated at $43 billion to $56 billion in 1988 dollars.[15,16] The estimated annual medical cost alone for untreated obstructive sleep apnea (OSA), a subcategory of sleep-related breathing disorders (SRBD), in 1999 was $3.4 billion.[17]

There currently are about 100 different sleep disorders classified into eight categories by the International Classification of Sleep Disorders -Version 2 (ICSD-2)[18] (TABLES 1 AND 2).

Some of the most fascinating sleep disorders are parasomnias such as sleepwalking, sleep eating, sleep terrors, exploding head syndrome, and REM behavior disorder (RBD) where subjects physically act out dream content. However, it is the more common sleep disorders that appear to earn less than their deserved time and attention.[19] The four most common ICSD-2 sleep disorders account for the vast majority of all sleep disorders and are from most to least prevalent: insomnia, SRBD, sleep-related movement disorders (SRMD) and circadian rhythm sleep disorders (CRSD).

Some sleep problems have significant overlap with others. For example 39 percent to 58 percent of patients with OSA report insomnia symptoms, and 29 percent to 67 percent of patients with insomnia have OSA.[20] Startling statistics on sleep disorders include >20 percent of the 146 million U.S. labor force performs some sort of shift work, many never adapt, and about 10 percent of these develop shift work disorder (SWD) with its attendant risk increases in breast cancer, duodenal ulcers, cardiovascular morbidity and mortality.[21-26] Therefore, it is prudent for those health care providers involved in treating one common sleep problem to have more than superficial knowledge of the others.

Dentistry's Connection to Somnology

The two main associations between the fields of dentistry and somnology occur with movement and breathing disorders. SRMDs are a group ranging from sleep-related leg cramps to periodic limb-movement disorder, restless leg syndrome, and also include sleep bruxism (SB). Dentistry has long held the connection to sleep via oromotor activity witnessed often as tooth gnashing sounds during sleep and noted by parents and bed partners. For many years these oral parafunctional habits, which include clenching, grimacing, cheek biting, tongue activity, and tooth grinding have been debated as to cause and relationship to the occlusion and psychophysiologic status of the individual. While SB is noted to be more prevalent in children affecting almost 20 percent under age 11, SB continues in many adults with an overall incidence averaging 8 percent but reducing to 3 percent at age 60.[27,28] SB may be primary/idiopathic or secondarily caused by a myriad of medical/ psychiatric conditions, and/or in response to medications. It can be subdivided into tonic or rhythmic masticatory muscle activity (RMMA). Tonic activity could be viewed as clenching or abnormal jaw posturing whereas RMMA would be reflected in complex movements such as newborn infants suckling or tooth grinding.

SB is now being investigated in its relationship to sleep patterns and some interesting associations are found. SB occurs mainly in stage 1-2 sleep, 10-25 percent in REM sleep with its associated skeletal muscle paralysis/atonia but rarely occurs in deep sleep.[29] In a sample population of bruxers, 74 percent of RMMA and swallowing events were scored in the supine position compared to 23 percent in the lateral decubitus position.[30] SB occurs subsequent to alpha (awakening) EEG brain activity and 60-80 percent of SB episodes are associated with leg muscle activity.[31,32] This suggests that bruxism and other motor activity are connected to the arousal mechanism from sleep. One study concluded that the primary treatment for bruxism, an occlusal splint, is associated with risk of aggravation of SRBD as the apnea hypopnea index (AHI) increased > 50 percent in half the subjects tested.[33] While SRMDs are important and a great deal more information is available elsewhere, this manuscript focuses primarily on sleep-disordered breathing (SDB) as an area where the dental community has the potential for greater impact.

No (never) snoring ► responsive snoring (alcohol, common cold, allergic rhinitis, exhaustion, etc.) ► infrequent (occasional) snoring ► positional snoring ► habitual (≤ 3 wk) snoring ► chronic daily snoring ► loud chronic daily snoring ► snoring with breathing pauses ► snoring with EDS (UARS) ► mild OSA ► mild OSAS ► mild OSA w/medical associations ► moderate OSA ► severe OSA ► mixed OSA ► central sleep apnea

FIGURE 2. Potential snoring progression.

SDB is frequently considered synonymous with SRBD but they are important to distinguish. SDB is a more global term that includes SRBD, upper airway resistance syndrome (UARS), and snoring, making SDB the most prevalent sleep disorder group. Snoring is classified in the ICSD-2 under the heading "isolated symptoms and normal variants," whereas UARS is not specifically classified due to the ongoing question in the medical community as to its existence. UARS was first described in 1993 to help explain unrestful disrupted sleep believed to be caused by respiratory effort-related arousals (RERAs).[34] Both UAR(S) and OSA(S) are termed (S)yndromes when they include symptomatic sleepiness often referred to as excessive daytime somnolence (EDS). Terms "sleepiness" or "drowsiness" while similar, should be distinguished from tiredness or fatigue, which are not readily reversible by sleep.

Snoring

"Laugh and the world laughs with you, snore and you sleep alone," coined by British composer and novelist Anthony Burgess (1917-1993) has never been more apparent. Increased societal snoring manifests in the reported 23 percent of bed partners now sleeping separately.[35] Snoring is attributed to the vibration of soft tissues that may arise from discrete areas of the nose down to the epiglottis. Diagnostic criteria includes a recognizable snoring noise, without specific decibel, waveform or frequency attributes, that is not associated with airflow limitation, arousal from sleep, oxygen desaturation, or dysrhythmia. ICSD-2 snoring terms include benign, simple, habitual snoring (HS), primary snoring (PS), continuous, rhythmic, nonapneic and snoring without sleep apnea. While these terms are not well-dissected and certainly not identical, this ICSD-2 category of isolated symptoms and normal variants appears of less interest to medical somnologists and they are content to defer its management elsewhere.

Epidemiologic studies, however, point to about 50 percent of habitual snorers as having OSA. This 50 percent figure results from juxtapositioning Lugaresi's epidemiologic snoring data that shows approximately 40 percent males and 20 percent females aged 30-60 chronically snore with Young's seminal work on the same age group showing approximately 24 percent males and 9 percent females having OSA.[36,37] This is consistent with Young's additional data showing snoring affecting 40 percent males and 24 percent females. The prevalence of snoring increases with age peaking at 65-70 years old.

While the ICSD-2 snoring category includes the term "benign," there are a number of studies indicating snorers have increased medical comorbidities as compared to nonsnorers including neurocognitive deficits, stroke, dementia, cardiovascular (CV) conditions, myocardial infarct, as well as increased mortality rates.[38-43] Snoring in children has been associated with increased blood pressure in 6- to 13-year-olds and neurobehavioral changes in 5- to 7-year-olds suggesting it takes little time to develop comorbidities.[44-46] The dose-dependent nature of snoring and medical comorbidities has been shown in large population studies.[47] A recent door-to-door survey taken by nurses in Hungary on 12,643 subjects found 60 percent prevalence of PS. This study revealed increasing incidence of CV disease, EDS, motor vehicle crashes (MVC) and workplace accidents occurring from nonsnorers, through habitual snorers, and, most of all, in loud snorers.[48] Another recent study showed intensity/loudness of snoring increased in a dose-dependent fashion with the increased OSA severity and another study found human carotid atherosclerosis increased in a dose-dependent fashion with snoring severity independent of the severity of OSA.[49,50] Carotid atherosclerosis was not matched by femoral artery atherosclerosis and the authors hypothesized that transmitted snoring vibrations led to the nearby carotid vascular endothelial damage and atherogenesis.

Clearly all snoring is not benign but clarity on which type(s) of snoring should be addressed remains to be determined. This is an important issue for dentists treating PS without medical collaboration especially since snoring typically worsens over time. While it is a significant burden on the medical health system for dentists to repeatedly refer the snoring patient for medical consult, and physicians typically do not wish to manage benign snoring, it is challenging for the dental team to determine when to refer. Only a sleep study interpreted ideally by a medical sleep specialist (MSS) in conjunction with a medical exam can rule in or out benign snoring. Increased associated medical comorbidities such as CV or metabolic disorders should however serve as red flags for physician referral (**FIGURE 2**).

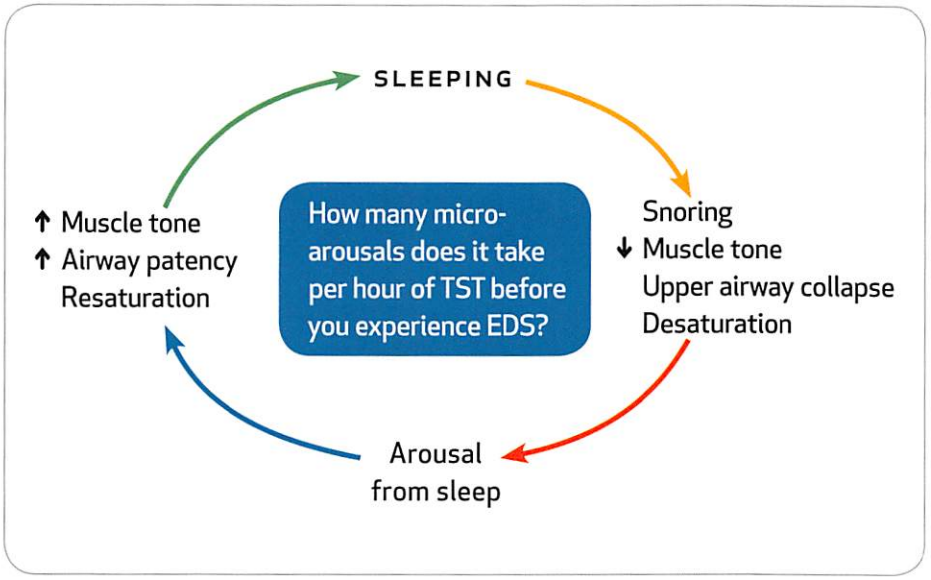


FIGURE 3. Relationship between sleep-disordered breathing and excessive daytime somnolence.

Historical to Current Approaches in Dentistry

The historical connection of dentistry to SDB was first published in 1923 by Pierre Robin, a French stomatologist, who noted micrognathia and glossoptosis problems often included upper airway obstruction and U-shaped cleft palate.[51] Treatment options included suturing the tongue forward to the lower lip, and promoting survival by opening the airway that was otherwise obtunded. While Robin also proposed the first intraoral appliance a "monobloc" in 1902 for the retrognathia, it was not until 1982 that a peer-reviewed publication first validated use of oral appliances in enabling airway patency during sleep.[52] Dentistry has since engaged in proving the positive impact on the sleeper's airway of moving the mandible and/or tongue both surgically, via oral appliance therapy (OAT) and through orthodontic arch development.

The American Academy of Sleep Medicine (AASM) took note of dentists' contribution in managing SDB in their 1995 position paper on OAT.[53] In 2006, the AASM published an updated position paper based upon in-depth review, acknowledging that OAT could be considered the primary alternative treatment to continuous positive airway pressure (CPAP) for managing OSA when provided by trained dentists.[54,55] While CPAP is more universally effective when consistently used, OAT enjoys more patient compliance and in crossover trials where subjects choose CPAP or OAT after using both therapies, OAT was preferred.[56] Patient treatment preference of OAT, along with proof of OAT effectiveness, has supported dentistry's increased interest in treating SDB. Additionally, the proven effectiveness of telegnathic surgical approaches to anteriorize tongue position by maxillofacial surgeons as a "cure-" type therapy has further engaged dentistry in treating SDB conditions. While orthodontic approaches to increasing the airway are a reasonable consideration, validated long-term research is lacking.

Understanding Measures of SDB

Sleep studies reflect defined sleep disruption events such as where breathing difficulties may cause microarousals from sleep and/or desaturations (SaO_2) of oxygen in the blood stream. Events may include prolonged apneas, or breathing lapses in excess of a minute, that are quite perplexing to an observer. Not all microarousals are attributed to obstructed breathing. Other causes may include SRMD activity or an extrinsic event like an infant briefly crying. Apneas, defined as breathing cessation (>70 percent reduction of airflow) of ≥10 seconds duration, are tabulated and averaged per hour as the apnea index (AI). Hypopneas, or reduced breathing, are defined by ICSD-2 as a sudden decrease in SaO_2 by >4 percent along with >30 percent diminished airflow or amplitude of thoracoabdominal movement, often in conjunction with an arousal. Combined, the apneas and hypopneas are averaged per hour over the TST becoming the AHI. An AHI of less than 5 is normal, ≥5<15 mild, ≥15<30 moderate, and ≥30 is severe OSA.

The respiratory disturbance index (RDI), is another common measure which adds RERAs to the AHIs and may reflect more sleep disruptions. Some patients are more resistant to the ravages of disrupted sleep and therefore a high index may not reflect pathology. Sleep indexes are also typically higher when limited to time periods spent supine or during REM sleep with its attendant muscle atonia. Outcomes of sleep studies therefore depend on the amount of REM sleep, recent events such as sleep deprivation, alcohol or medication intake, body position, level of sleepiness, depression, cardiac issues, and many other factors. Indexes can reflect differences with the first night of a multinight study or in a split night study where a portion of the study is devoted to testing an intervention such as CPAP or OAT. It is therefore important for a MSS to interpret sleep study findings in context of a medical and sleep history (**FIGURE 3**).

TABLE 3

Brief Comparison of Drunk and Drowsy Driving

Drunk Driving	Drowsy Driving
.05 – .08 BAC	NO standard measure
Compromised judgment	Little → No judgment
Delayed reaction time	Delayed → No reaction time
Poor avoidance strategy	Little → No avoidance strategy
Variable severity crashes	Highest severity crashes
15,000 deaths/year	1,500 deaths/year? (x5-10)
Serious legal consequences	No? Legal consequences
Ubiquitous education	No → minimal education
MADD since 1981	DADD ? Since 2008

AADSM promotes Dentists Against Drowsy Driving (DADD).

Understanding the Effects of Poor Sleep From SDB

There are many medical associations seen with SDB sleep, which are addressed in another paper in this journal. Social consequences of SDB may range from sleeping alone to national catastrophes. However, work accidents and transportation crashes may be preventable with appropriate dissemination of information about the importance of restful sleep. For example the National Traffic and Highway Safety Association (NHTSA) estimates that drowsy driving is the cause of 100,000 motor vehicle crashes (MVCs) and 1,500 fatalities every year. However, this is probably a gross underestimate as it accounts for only about 2-3 percent of all MVCs. Other developed countries average about 20 percent of all MVCs attributable to drowsy driving (DD) and landmark studies, such as the 2005 Virginia Tech Transportation Institute ground-breaking 100-car naturalistic study, confirm the 20 percent attribution of all MVCs to drowsiness. A few important facts on drowsy driving are listed in **TABLE 3**.

Subjects driving after 24 hours awake display equally poor reaction time and judgment to driving with a blood-alcohol count of 1.0 ppm, which is above the legal limit of .08 percent blood-alcohol content in all U.S. states. New Jersey passed General Assembly Bill 74-4, known as Maggie's Law, on Aug. 5, 2003, as a result of, and six years following, the untimely death of Maggie McDonnell. She was a 20-year-old driver killed by a drowsy driver awake for 30 hours. Due to lack of drowsy driving laws at that time, the drowsy driver received the same minimal penalty as if he hit a tree.

Essentially, Maggie's Law made choosing to drive when drowsy the same reckless behavior as choosing to drive drunk. Unfortunately, there still does not exist a precise measure for drowsiness to be used by law enforcement at such crashes, and, to further complicate matters, the combination of a little alcohol with drowsiness is dramatically worse than either individually. Focusing on reducing MVCs, two grass roots campaigns developed in the early 1980s and expanded over time with national to global impact. These include Mothers Against Drunk Driving (MADD) and Students Against Destructive Decisions (SADD). Both campaigns changed the attitudes of society resulting in improved road safety. Dentists now have started a small measure in this direction and, while proposed by the AADSM, the concept of Dentists Against Drowsy Driving (DADD) is in its infancy and has yet to realize its potential.

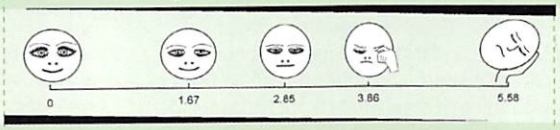
Approaches by the Dental Community to the Patient With SDB

Two main approaches to the SDB patient by the dental field relate to screening and co-treatment with physician colleagues. While all dental offices would ideally screen for SDB as with high blood pressure and oral cancer, SDB treatment requires medical collaboration. Those interested in somnology must invest the time and effort in developing the necessary expertise. Given >2,500 AADSM members in 2011 among perhaps 5,000 U.S. dentists routinely treating SDB for the conservatively 40 million affected; there is a need for more treating dentists. This is a rewarding field for those committed to providing excellent care but the journey to expertise may take several years.

Integration of sleep disorders into a dental practice can be done stepwise and could begin by including: 1) subjective information through a few screening questions verbally or added to health history forms. The questions are simple such as "Do you snore frequently or loudly?" "Do you have pauses in breathing during sleep?" and "Do you have daytime sleepiness?" Bed partners often give more accurate answers and, if complaints of the snoring noises preceded moving to another room, it may give some useful insights. For the dental office wanting to include more detailed screening, there are many validated sleep questionnaires, some shown in **TABLE 4**. 2) Objective morphometric information can be added as part of the oral cancer exam. Data to consider collecting at the time of screening include neck circumference, modified Mallampati or Friedman scoring of upper airway patency, and documenting if the uvula, tonsils, tongue, pharyngeal tissues or soft palate crowd the airway. If considering treating SDB, a more in-depth history and exam

TABLE 4

Some Standardized Sleep Questionnaires

Questionnaire	Number and Type of Questions	Use or Advantage
Epworth (ESS)	8 subjective score 0-24 (≥10 = sleepy)	Standard drowsiness survey
STOP	3 subj 1 objective score 0-4 (≥2) high risk	Anesthesiology based – quick
STOP-bang	3 subj 5 objective score 0-8 (≥3) high risk	Quick + high accuracy
ARES	ESS + 18 subjective 2 objective	Fits well with ARES Home Test
Apnea score "Kapuniai"	2 subjective – stops breathing + loud snoring	V. Quick – minimal
Karolinska & Stanford	Subjective 1 Range K(0-9) S (0-7)	Research use scales - higher # = more sleepy
Pictorial		For children
VAS	Just about asleep -> As wide awake as can be I----------10 cm line----------I	Visual analogue scale
Berlin	9 subjective 1 objective put into 3 categories	Category scoring grid
Pittsburg quality index	19 subjective questions	Quality of sleep previous month
Sleep 50	50 subjective	Screens most sleep disorders

is indicated prior to generating a medical report and collaborating with the patient's physician. On average, a typical dental office would note a frequency of significant SDB of > 1 in 6 adult patients seen.

The dental team interested in treating SDB with OAT requires a different mindset and model to the typical surgical-based dental practice. Other than a potential cure from some telegnathic surgical procedures such as the mandibular and maxillary advancement (MMA) or possible preventive approaches with orthodontics, SDB patients are managed rather than cured. This is most similar to periodontal disease where continued diligence, monitoring, and ongoing care are indicated. Dental practitioners must be prepared for higher failure rates than experienced with routine dental procedures, and, until better prognostic information is available, the failure rate for OSA single therapy with OAT may be as high as 70 percent with severe OSA. The success rate may, however, exceed 80 percent in milder presentations of SDB.

Future Challenges

1) At this time, Medicare has refused payment when dentists prescribe or administer sleep testing and other insurance companies may follow suit. This is not in the best interest of patients who may go undiagnosed until significant medical comorbidities are present.

2) Sleep is a much overlooked aspect of health and requires more focused attention by health professionals. Dentists could actively engage their patients in the topic of sleep, employ sleep health questionnaires, view the upper airway, and ask questions to better help serve their patients health.

3) Dentists could investigate sleep organizations and credible websites (TABLE 5), take an active role in societal aspects of sleep disorders and thereby contribute to greater public safety.

4) Dentistry should encourage additional research in the sleep field and the early manifestations of the SDB continuum. This would include dissecting out truly benign from nonbenign snoring, validating effects of OAT in slowing the progression of SDB, and determining which populations are most and least likely to benefit from OAT and other dental interventions.

Conclusion

Learn to Look and Look to Learn

Dentists should incorporate active viewing of the mouth not only for decay and periodontal disease but also to rule out the life-threatening issues such as lesions and airway crowding. By visualizing the upper airway, the dental team can learn about the patient's potential difficulty with SDB. A few questions can open the conversation to further discovery. It is only with such unified focus that dentistry can significantly impact our epidemic of sleep disorders. It is therefore incumbent on dentists as health care professionals, positioned as sentries to the gateway of the upper airway, to keep a look out for potential problems. This is good for the patients we serve and it promotes the field of dentistry

TABLE 5

A Few Sleep Organizations and Credible Web Sources of Information

aadsm.org	American Academy of Dental Sleep Medicine. More than 2,500 members
aasmnet.org	American Academy of Sleep Medicine. More than 9,000 members
nhlbi.nih.gov/about/nesdr	The U.S. National Center on Sleep Disorders Research of the NIH. Coordinates government-supported sleep research training and education to improve health
sleepapnea.org	American Sleep Apnea Association. Dedicated to reducing injury, disability and death from sleep apnea through education, awareness, and research. Also promotes voluntary support groups.
sleepfoundation.org	The U.S. National Sleep Foundation –independent nonprofit organization dedicated to improving public health and safety by achieving understanding of sleep and sleep disorders. It supports education and sleep-related research and advocacy.

in a positive collaborative manner with other health providers. Dentists can make an enormous difference in society and serve the public in a meaningful way by catching SDB early on in the continuum and co-treating with physician colleagues. We can save more than a tooth. We may even save a life. ■■■■

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