Sleep Medicine—Time for a Change

Peretz Lavie, Ph.D.

Abstract: The growing awareness of obstructive sleep apnea and its profound impact on patients’ quality of life and health has resulted in an unprecedented growth in sleep medicine in the last 2 decades. The present paper argues that, based on recently accumulated knowledge about the pathophysiology of cardiovascular morbidity in sleep apnea, the practice of sleep medicine must be changed in order to improve patients’ care. The diagnosis of sleep apnea should be performed when patients are aged 25 to 30 years, far younger than the approximately 50 years of age, which is when most patients usually receive a diagnosis now, and programs of regular follow-up visits to assess patients’ condition and compliance with treatment should be incorporated into the everyday practice of sleep specialists. Because of the wide gap between the number of sleep specialists and sleep clinics and the prevalence of sleep apnea in the general population, an alliance between sleep medicine and family practitioners is necessary to ensure such changes. A proposal for such an alliance is presented.

Keywords: Sleep medicine, sleep apnea, diagnosis, family medicine, treatment

Citation: Lavie P. Sleep medicine—Time for a change. J Clin Sleep Med 2006;2(2):207-211.

Sleep Medicine—Unprecedented Growth Since the 1980s

Sleep medicine has seen an unprecedented growth in the last 2 decades. It is estimated that, throughout the United States in 1292 sleep clinics, at least 1.17 million people were examined during 2001. This number may have doubled since then, and other countries have seen a similar growth in the field of sleep medicine. This dramatic increase in sleep clinics and the number of polysomnographic recordings is undoubtedly explained by the growing awareness of obstructive sleep apnea syndrome and its profound impact on patients’ quality of life and health. At least 85% of patients are referred to a sleep examination in a laboratory because of suspected sleep apnea, which affects, in at least moderate form, 1 in 10 men and 1 in 25 women. For people over 60 years of age and in certain high-risk populations, such as obese people or habitual snorers, there are more people with breathing disorders during sleep than without. The fact that the field of sleep medicine is overwhelming centered on a single disorder, sleep apnea, explains why sleep medicine has become almost a subspecialty of pulmonary medicine in the last few years and why more than 50% of diagnostic sleep laboratory directors are pulmonologists. This is a complete turnaround from the 1970s and 1980s when the vast majority of sleep specialists were neurologists, psychiatrists, and psychologists. This may be changed, however, as a result of the decision of the Accreditation Council for Graduate Medical Education to approve the sleep medicine fellowship training programs that may open sleep medicine to other medical specialties.

Sleep Medicine—Practiced Now as 20 Years Ago

The focus of sleep medicine on a single disorder and the dominance of pulmonologists in this field have not affected the practice of sleep medicine in any major way. Examinations to diagnose breathing disorders in sleep are carried out in more or less the same way as they were done 20 or 30 years ago by sleep specialists who mostly examined patients complaining of insomnia or suspected sufferers of narcolepsy. There has been, however, impressive progress in data-acquisition and data-storage technologies. Electrophysiologic recordings have moved from analog to digital, and data are no longer stored on miles and miles of recording paper but on compact, miniature, digital, storage media. Also, more detailed and focused guidelines have been developed to quantify respiratory events during sleep that were not given much clinical importance just 20 years ago.

Thus, a person suspected of having sleep apnea is referred to a sleep clinic, and the night there connected to electrophysiologic recordings that monitor electroencephalography, electrooculography, electromyography, respiratory effort, airflow, body position, and arterial oxygen saturation level, all of which provide the necessary information for a diagnosis. Presenting symptoms and medical history are also taken into consideration in the diagnostic process and treatment recommendation. To save the patients’ time and the insurance companies’ money, many of the diagnostic sleep recordings performed nowadays are based on only half of the night (the so-called split-night procedure). If the pa...
tient is judged by the attending technician to suffer from breathing disorders in sleep that are above a threshold severity, the second half of the night is used to determine the appropriate air pressure for nasal continuous positive airway pressure (CPAP) treatment. This is the treatment of choice for the vast majority of patients with moderate to severe forms of breathing disorders in sleep.

Unfortunately, in many cases, the only encounter the patient has with the sleep laboratory is a single night for diagnostic or diagnostic-plus-titration purposes, as the prescribed CPAP treatment is administered elsewhere; seldom is there a posttreatment sleep evaluation or other regular follow-up, a situation that is worst in minority-serving institutions. In this paper, I argue that the time is ripe for a major change in the way sleep medicine is practiced and that this change is crucial to improve the quality of care for patients suffering from breathing disorders in sleep and to prevent cardiovascular morbidity. My position stems from the newly acquired understanding of the pathophysiology of cardiovascular morbidity in patients with sleep apnea syndrome and from the resultant need to improve quality of care for these patients.

Significance of Early Diagnosis

The association of breathing disorders in sleep with cardiovascular morbidity has been a major impetus in the medical community for increased awareness about the significance of breathing disorders in sleep. At the time of a sleep apnea diagnosis, it is commonly found that more than half of the people diagnosed with the disorder also suffer from hypertension. In a patient population numbering 118,000 who were diagnosed with sleep apnea through the United States Department of Veteran Affairs health administration system, 60.1% suffered from hypertension, 32.9% diabetes mellitus, 27.6% cardiovascular disease including myocardial infarction and angina, 13.5% heart failure, and 5.7% had endured a cerebrovascular accident. Conversely, among patients with cardiovascular diseases, breathing disorders in sleep are a prevalent finding. These cross-sectional data on the association between cardiovascular morbidity and breathing disorders in sleep are supported by large population-based studies demonstrating that this association is independent of all possible confounding cardiovascular risk factors and, at least for hypertension, follows a dose-related relationship. A canine model of sleep apnea, as well as intervention and prospective studies, provide further support that breathing disorders in sleep are causally related to hypertension.

The association between breathing disorders in sleep and cardiovascular morbidity has been attributed to increased sympathetic activation; to swings in intrathoracic pressure; and, in recent years, to acceleration of atherogenic processes that are uniquely triggered by the apnea-related intermittent hypoxia and resultant oxidative stress. This latter explanation provides a better understanding of the natural evolution of cardiovascular morbidities in patients with breathing disorders in sleep and has major implications regarding the diagnosis and treatment of sleep apnea.

In light of the recent observations on oxidative stress in sleep apnea, the following chain of events has been proposed. Breathing disorders in sleep are associated with repeated occurrence of hypoxia/reoxygenation events that, similar to the effect of restoration of blood circulation to ischemic tissue, result in increased production of oxygen reactive species. Once produced, oxidant molecules inflict injury on surrounding tissues and activate specific "redox sensitive" transcription factors that encode proinflammatory cytokines. This results in activation of endothelial cells, leukocytes, and platelets and in increased production of adhesion molecules that lead to endothelial cell-leukocyte interaction and adhesion and increased toxicity of lymphocytes against endothelial cells, processes resulting in endothelial dysfunction. Indeed, a state of endothelial dysfunction, considered prognostic of future cardiovascular morbidity, has been demonstrated in patients with sleep apnea who are free from any overt cardiovascular diseases in several studies. Findings that relatively young patients with sleep apnea, free of any overt cardiovascular disease, display early signs of atherosclerosis, such as increased carotid artery wall thickness, increased arterial stiffness, and atheromas, as well as findings that sleep-apnea severity significantly and independently correlate with these early atherosclerotic markers, further support this concept.

Atherogenic processes start early in life, most likely during the first or second decades, and progress over decades and are affected by obesity, hyperlipidemia, hypertension, and diabetes that also affect the transformation of atherogenic processes to overt cardiovascular morbidity. Recent research, however, has shown that oxidative stress, inflammation, and endothelial dysfunction also play a role in atherosclerosis. Immune mechanisms interact with metabolic risk factors to initiate, propagate, and activate lesions in the arterial tree. Many of the factors demonstrated in sleep apnea, such as oxidative stress, inflammation, increased production of adhesion molecules, and increased adhesion between endothelial cells and leucocytes, have also been implicated in atherosclerosis. Thus, it can be safely assumed that breathing disorders in sleep accelerate atherogenic processes. This process most probably starts to accrue during the very first nights that hypoxic events appear, regardless of the patient’s symptoms, and from that time on, night after night, the patient’s blood vessels and heart are exposed to the aggression of oxygen reactive species that are formed with the ebb and flow of arterial oxygen level. Patients, however, are generally referred to a sleep clinic for diagnosis only when the characteristic symptoms of snoring or excessive daytime sleepiness start bothering them or their bed partners, generally around the age of 50. Although there are no well-controlled studies on the natural evolution of sleep apnea, there is evidence that apneas are already prevalent in the third decade of life. Based on the Wisconsin study, 17% of men aged 30 to 39 have a form of sleep apnea classified as mild or beyond, and 6.2% have sleep apneas classified as moderate or beyond. Furthermore, it can be safely assumed that the rates in this younger age group are much higher in specific high-risk populations such as the obese and habitual snorers. Thus, a diagnosis of sleep apnea at the age of 50 may be delayed by 10 to 20 years from the time patients first display breathing disorders in sleep. This delay may be crucial because, during that time, there is an accumulated damage to the cardiovascular system. To prevent this damage, the diagnosis and treatment of breathing disorders in sleep should be done at the earliest age possible. Thus, there is an urgent need to lower the age of diagnosis from age 50 to between 25 and 30.

This conclusion is further supported by the results of mortality studies of patients with breathing disorders in sleep. Without exception, all studies have demonstrated an age-decline trend in mortality in comparison with the general population, with the highest risk of mortality in patients younger than 50. Furthermore, in a recently published paper Yaggi et al reported that...
sleep apnea was associated with increased mortality irrespective of treatment administered. Thus, delaying diagnosis and treatment to the age of 50 may be too late for many of the patients who are at maximal risk of dying and who have already developed cardiovascular morbidity.

**Improving Treatment**

A second aspect of sleep medicine that needs a change is treatment administration and management for patients with breathing disorders in sleep. Even though treatment with nasal CPAP has been proven time and again to effectively control the apneas and to reduce morbidity, compliance with treatment is poor and varies from 46% to 80%.[45,46] One of the possible reasons for the poor compliance is the lack of continuity of care in sleep medicine. While diagnosis of sleep apnea is done in the sleep clinic by a sleep specialist, nasal CPAP treatment is administered outside the sleep laboratory by people who are not sleep specialists. The lack of continuity of care manifests itself not only in the people who administer treatment, but also in the follow-up of treated patients. Few of the patients who are administered nasal CPAP devices receive regular follow-up in order to verify efficacy of treatment or to determine if there is a need to consider different treatment modalities. Follow-up of a patient’s condition, regardless of the level of treatment, almost goes without saying in medicine. Patients who have been diagnosed with diabetes, hypertension, or depression are not left to fend themselves after their condition has been diagnosed and treatment prescribed for it. The sleep specialist’s role should not end with signing the diagnosis and recommending treatment; this must be followed by regular meetings with the patients to allow assessment of the patient’s condition and to evaluate changes in the severity of the syndrome and in the degree of risk to the patient. The practice of sleep medicine must be changed to ensure an improvement in patients’ care.

**A New Model for Sleep Medicine**

What changes should be instituted to facilitate the diagnosis and treatment of sleep apnea in patients in their 20s and 30s as opposed to common practice today, when diagnosis and treatment usually begin when the patient is 50 year of age? How can compliance with treatment and quality of care be improved? Given the prevalence of breathing disorders in sleep, particularly in specific high-risk populations, it will be very difficult to achieve these goals by relying on sleep specialists alone, whose role in many cases is completed once the diagnosis letter is signed. Earlier diagnosis and treatment, along with improved compliance and quality of care, call for a structured and well-planned alliance between sleep medicine and family medicine or primary-care medicine. In the proposed model, sleep clinics will become allied with several clinics of primary-care or family-medicine practitioners within a defined geographic area that will take on some of the sleep clinic responsibilities, particularly those of early diagnosis of sleep apnea, supervising nasal CPAP treatment, and conducting regular patients follow-up. This is similar to the guidelines of the American Academy of Sleep Medicine that recognizes 2 levels of sleep facilities: the comprehensive sleep center and the sleep-related breathing laboratory, a facility that focuses on breathing disorders in sleep. Thus, I suggest expanding the concept of a secondary sleep-related breathing laboratory to selected clinics of family practitioners that will be allied with and supported by supervising comprehensive sleep centers.

To put this alliance into action, in each family practitioner’s clinic, a team of representative clinicians and nurses will be trained in the essentials of sleep medicine, particularly in sleep apnea and in its treatment. The team will be trained to identify people with a high likelihood of having sleep-disordered breathing, in performing ambulatory home monitoring tests to diagnose sleep apnea, and in reaching a decision regarding treatment for some of the patients. I am well aware that a joint task force of the American Thoracic Society, the American College of Chest Physicians, and the American Academy of Sleep Medicine did not recommend the use of ambulatory monitoring for the diagnosis of sleep apnea.[49,50] However, in a recent editorial entitled “Pulmonary physicians in the practice of sleep medicine,” the presidents of the 3 societies declared that “discussion is underway to develop practical guidelines for the utilization of portable monitoring for specific indications.”[51] Thus, given the rapid progress in the development of ambulatory diagnostic technologies, the increased economic burden of sleep-apnea diagnosis, and the need to change the practice of sleep medicine, a formal endorsement of ambulatory monitoring by the professional societies, particularly in patients with high likelihood of having disease,[52] may be forthcoming. Cases involving other sleep disorders, or associated with complex comorbidities or when diagnosis is in doubt, will be referred to the supervising sleep clinic. To ensure continuity of care, a program of supervising nasal CPAP treatment, including regular follow-up visits and follow-up sleep studies, will be developed in each primary-care or family-medicine practice in collaboration with the supervising sleep clinic.

Although such an alliance is also possible with other generalists like internists or with specialists like otolaryngologists, the advantage of primary-care or family-medicine physicians in this context is that knowing their patients on a more personal level, they are better positioned to achieve the goals of such a program. Being more familiar with the patients, family practitioners will be able to identify younger people who have a high risk for sleep apnea and examine them. Using patient-friendly ambulatory monitoring devices, diagnosis will be simplified and the economic burden of diagnostic sleep recordings will be considerably reduced. The role of generalists and subspecialties in providing healthcare has long debated. A large number of studies have examined how physician specialty affects measure of care and clinical outcomes in diseases such as hypertension, non–insulin-dependent diabetes, asthma, rheumatoid arthritis, and coronary artery disease and chronic heart failure (see a review in reference 53). However, in a manner different from the practice in which patients are treated by either a generalists or by a specialist, the proposed model for sleep medicine is of a joint collaborative program with close communication between the generalist and specialist. Thus, an efficient communication between the primary-care or family-medicine physicians and sleep specialists, which is generally considered to be suboptimal in the “either-or” model,[54] is essential for the success of such a program. This can be based on sharing data and medical information via the Internet, conducting periodic joint clinical meetings, and providing real-time telephone or Internet consultations whenever the need arise.

To ensure the widespread success of such an alliance, family-medicine or primary-care practitioners should be educated in sleep medicine. Because the time dedicated to sleep medicine in the curricula of medical schools is a meager few hours in 4
in order to achieve better patient care and implement more-effective treatments to prevent cardiovascular morbidity in patients with sleep apnea. A well-planned alliance with family medicine will achieve these goals with minimum investment and maximum efficacy.

REFERENCES

52. Douglas NJ. Home diagnosis of the obstructive sleep apnoea/hy-