

Diagnosis of Sleep Apnea

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ABSTRACT

Rapidly accumulating evidence shows that sleep apnea is a major factor influencing personal health and public safety. Diagnosis and treatment of this syndrome may well result in significant preventive medicine outcomes. The prevalence of sleep apnea is so high that evaluation and treatment must become the province of the primary care physician. Accurate, appropriate history, physical assessment and clinical management are the mainstays of care, with the judicious application of technology. A history of snoring, particularly when it is intermittent, interrupted by snorts, and accompanied by restless sleep or daytime sleepiness suggests the need for further evaluation. When co-morbid conditions such as hypertension, cardiovascular disease or type 2 diabetes are present, formal evaluation and consideration of treatment are needed. If initial evaluation reveals severe obstructive sleep apnea with observed apneas, together with excessive daytime sleepiness, clinical management with empirical application of continuous positive airway pressure (CPAP) may suffice in experienced hands.

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Why do we need to look for sleep apnea? *What* exactly are we looking for? *How* do we most efficiently and cost effectively evaluate a patient for this problem? Our time with patients is limited, and health care resources are strained. We need to be convinced that management of sleep apnea is an important and necessary component of our care-giving efforts before we allocate time and resources.

The *Why* is becoming easier to answer. Evidence linking sleep apnea to hypertension, heart disease, stroke, type 2 diabetes, and public safety is now very convincing.^{1,2} Peker, et al recently published a study

with remarkable significance for the practice of medicine. They conclude "...the risk of developing cardiovascular disease is increased in middle-aged obstructive sleep apnea subjects independently of age, body mass index, systolic blood pressure, diastolic blood pressure, and smoking. Furthermore, efficient treatment of obstructive sleep apnea reduces the excess cardiovascular disease risk and may be considered also in relatively mild obstructive sleep apnea without regard to daytime sleepiness."³ Gozal, et al recently reported that snoring in early childhood can result in long-term "learning debts," apparent in the early teens, that are not completely reversible.⁴ Also, sleep apnea may cause or exacerbate gastro-esophageal reflux, an extremely common disorder. Overnight positive pressure breathing eliminates reflux symptoms even during daytime hours in a high percentage of patients.⁵ The yearly cost of medications to control reflux symptoms is high enough to offset significantly the cost of diagnosis and treatment of sleep apnea.

The *What* is much more difficult to answer. For the purposes of this discussion, the term "sleep apnea" will be used for both obstructive sleep apnea (intermittent, discrete episodes of severely decreased or absent airflow with continued breathing effort) and upper airway resistance syndrome (increased resistance to airflow in the upper airway with arousals from sleep). In the early days of sleep medicine practice, it was considered necessary to arbitrarily define sleep apnea and assign severity based on these assumptions. Thus, the length and amount of airflow reduction and the degree of arterial oxygen desaturation required to score an apnea were established. In recent years, through experience and carefully controlled studies, it has become possible to define evidence-based parameters for sleep apnea.⁶ Recent evidence indicates that sleep apnea should be treated even when it is "mild," with scorable apneas or hypopneas as low as 5 per hour, especially if there is a co-morbid condition such as hypertension or heart disease present, or if the subject has excessive daytime

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Table 1. Adverse outcomes of untreated sleep apnea

Hypertension
Coronary heart disease
Stroke
Congestive heart failure
Insulin resistance
Gastro-esophageal reflux
Obesity
Excessive daytime sleepiness
Vehicular accidents
Occupational accidents
Poor school performance
Social and relationship disruption

sleepiness not otherwise explained. In fact, it is likely that not even “simple” snoring without apparent apneas can be ignored.⁷ Data from the Wisconsin Cohort Study suggest that the history of snoring alone may indicate an increased risk for cardiovascular disease.⁸ Christian Guilleminault demonstrated that treatment of snoring in selected patients (those with alpha EEG arousals associated with snores during polysomnographic evaluation) could lead to a significant improvement in daytime alertness.⁹ From this and other studies, and from accumulating clinical experience, it is clear that absolute criteria for diagnosis of clinically significant sleep apnea are not yet available. Each case must be considered individually. No degree of upper airway obstruction during sleep can be automatically ignored, and decision for treatment must always be based on the individual patient’s symptoms, the presence of comorbid conditions, and the response to treatment.

Finally, excessive daytime sleepiness, for which untreated sleep apnea is a leading cause, is a significant risk factor for individual and occupational accidents.¹⁰ *The New York Times* recently reported (November 19, 2002) that a freight train accident on November 15, 2001 was determined by the National Transportation Safety Board to be due to inadequately treated sleep apnea in both members of a two-man crew. The crewmembers survived but were both asleep when the accident occurred, killing two crewmembers of an oncoming train that had the right of way.

DIAGNOSING SLEEP APNEA

How do we diagnose significant sleep apnea? The history and physical exam are the most essential components. Input from the spouse, significant other or other close associates of the patient is essential to arrive at an accurate assessment. A history of snoring is always potentially important, especially if the snoring is loud, in-

termittent, or associated with snorts and movement, pauses in breathing, choking, gasping, generally restless sleep, or nocturia. If the patient is not restored after what should have been sufficient sleep, there is a very strong probability that treatment for sleep apnea would be beneficial. The history of daytime sleepiness may be difficult because in our culture it is common to deny sleepiness or to consider it a “badge of honor,” since it is a sign that we don’t “waste” productive time sleeping. Also, it may be necessary to question the patient about specific situations since many in society consider sleeping at certain times normal. Such times might include sitting quietly, listening to a long lecture, or reading a boring book. The fact is boredom and sedentary pursuits do not cause sleepiness, but can *uncover* a condition of sleepiness. The Epworth Sleepiness Scale (ESS) has been widely recommended as a tool for more objectively quantifying sleepiness. However, our research has indicated that only the significant other’s assessment of patient sleepiness, using the ESS, corresponded with sleepiness as measured by the multiple sleep latency test (MSLT), in a blinded, prospective study.¹¹ The subject’s ESS corresponded with neither the MSLT scores nor the probability of significant sleep apnea. Studies have shown that when the patient describes sleepy episodes when driving, risk for accidents is increased.¹² Thus, all patients should be asked about such episodes.

Physical exam may yield important clues relating to the probability of significant sleep apnea. Obesity and large neck circumference have been mentioned as significant risk factors. A neck circumference greater than 16 inches in women or 17 inches in men is associated with increased risk for sleep apnea.¹³ Conditions associated with obstruction to airflow in the upper airway, such as nasal polyps, nasal septal deviation, mucosal congestion, hypertrophy of the turbinates, enlarged tonsils, and large tongue volume may cause increased airflow resistance and result in snoring or sleep apnea. Some of our most severe cases of sleep apnea have been seen in thin, young patients with small jaws (micrognathia), with or without overbite or underbite. Valuable clues to the presence of significant micrognathia are the finding of crowded teeth on exam or the history of tooth removal to make room for straightened teeth after orthodonture. Another clue, which has not received general attention, is the tendency of a patient with small pharyngeal space to snort when laughing, which may represent the waking equivalent of apnea when asleep.

The most valuable laboratory test for confirming the

presence of sleep apnea has been the overnight sleep study (polysomnogram, or PSG). This study measures sleep stages, oxygen saturation, electrocardiographic heart rhythm, breathing effort, airflow, arousals and body movements. It is particularly helpful if the history or exam suggests heart failure, since Cheyne-Stokes breathing can be recognized, which may require specialized treatment. The apneas associated with upper airway obstruction are not the only form of sleep apnea. Although uncommon, true central apnea may be found, especially in patients with a history of head trauma. This can only be confirmed by a full overnight polysomnogram, whereas Cheyne-Stokes breathing may be seen during wakefulness as well. If the patient does not have the severity of sleep apnea expected but does show daytime sleepiness on multiple sleep latency testing the next day, diagnosis of other conditions such as periodic limb movements of sleep or narcolepsy is possible. For maximal diagnostic power and accuracy, it is important that formal overnight sleep studies be performed in laboratories that adhere to high standards, such as those advocated by the American Academy of Sleep Medicine. The overnight session in the laboratory with an experienced technician will increase the likelihood of patient acceptance and successful application of positive pressure breathing (CPAP) when indicated.

Screening studies using only a few channels (breathing effort, airflow, and oxygen saturation), which are often performed at home without attendance by technicians, may be helpful for follow-up of treatment. They are not a substitute for in-laboratory all night diagnostic studies and often add cost, since they frequently lead to further evaluation in a more formal setting. Such screening studies should be used only by the most experienced clinicians, since significant sleep disorders may be missed if the clinical assessment has not been meticulous. Our research has shown that clinically severe obstructive sleep apnea, without other complicating sleep conditions, can be evaluated and treated using an abbreviated sleep laboratory protocol. This method relies on appropriate circadian timing, the observations of an experienced sleep technician and the measurement of oxygen saturation alone. Treatments prescribed after these abbreviated studies were shown to be predictably related to the treatment prescribed after full diagnostic and CPAP (continuous positive airway pressure) titrations overnight in a blinded protocol.¹⁴

In sleep apnea, and in all clinically significant sleep/wake disorders, an assessment of daytime alertness is essential. It is the best single guide to the significance of possible sleep/wake disorders, and best indicates re-

sponse to treatment. A useful objective tool, cost effective and available for any office with a basic model of personal computer, is the Steer-Clear driving simulator. Results of this test have correlated with the likelihood of sleep disorders including sleep apnea and have predictive value for the risk of automobile accidents.¹⁵

At the present time, when the practice of medicine has become increasingly technical, there has been a tendency to leave many of the diagnostic and treatment decisions to specialists. In the case of sleep apnea, the potential caseload would overwhelm the availability of specialty evaluation and formal sleep studies. The landmark Wisconsin Cohort Study, directed by Dr. Terry Young, has shown the incidence of sleep apnea diagnosed by overnight polysomnography to be extremely high, 9% in women and 24% in men, in a large population of healthy, employed subjects.¹⁶

Widely-applicable and cost-effective solutions must be found if appropriate treatment of the sleep apnea population is to be possible. The essential function of determining when specialty referral is necessary or when more empirical treatment approaches may be appropriate must reside with the primary care physician.

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