Controversies in Sleep Disorders Medicine*

Pulmonologists Respond!

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**Purpose:** Herein we report the results of an informal survey of approximately 350 physicians attending the American College of Chest Physicians meeting in October 1995.

**Methods:** With response computer technology, we polled session participants about sleep and sleep disorders. The responses to the questions were instantaneously displayed and recorded and are presented herein.

**Results:** We found considerable expertise and experience in our audience; 65% were board certified in pulmonary medicine and 12% in sleep disorders medicine. There was not agreement about expectations upon referral of a patient to a sleep center or about the definitions of either sleep apnea or hypopnea. Most sleep centers perform split-night polysomnography but there is not a single clear indication for this procedure and there is uncertainty about the efficacy of split-night studies. Most laboratories represented recognize the diagnosis of upper airways resistance syndrome, and respondents seemed well versed in the definition of this entity. There was not uniform agreement of the treatment effects of mild or positional obstructive sleep apnea.

**Conclusions:** Pulmonologists appear to be interested in and knowledgeable about sleep disorders. There are several basic areas of controversy, emphasizing the need for clinical research in the area of sleep-disordered breathing.

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**Key words:** credentialing; hypopnea; polysomnography; snoring; uvulopalatopharyngoplasty

**Abbreviations:** AHI=apnea hypopnea index; AI=apnea index; CPAP=continuous positive airway pressure; EMG=electromyogram; MSLT=multiple sleep latency test; OSA=obstructive sleep apnea; SaO2=arterial oxygen saturation; UARS=upper airways resistance syndrome

In the last decade, the field of sleep disorders medicine has attracted pulmonologists because of the obvious clinical importance of sleep apnea. As is true of most developing fields, sleep disorders medicine is marked by considerable controversy, particularly in the areas of diagnosis and treatment.

At the American College of Chests Physicians meeting on October 30, 1995, we conducted an interactive session entitled “Diagnostic Strategies in Sleep Medicine.” The purpose of this article is to present the responses of this audience of pulmonologists interested in sleep disorders to questions in controversial areas of sleep disorders medicine.

**Materials and Methods**

This session was conducted with computer technology that enables the audience to respond to questions projected on a screen by pressing a key pad to designate their choice of answers. Instantaneous presentation of the responses to the questions then appears, followed by discussion of the question and responses. Approximately 400 pulmonologists were in attendance. Although we do not know how many responded to each question, there were 375 response devices available, and we believe almost all of these were in use. This survey could be described as an informal anonymous poll of at least 350 practitioners. Questions were developed to explore controversial or uncertain areas of sleep disorders medicine. Questions 1 and 2 elicited information about the respondents, and questions 3 and 4 explored reimbursement and referral issues. Questions 5 and 6 focused on definitional aspects of sleep-disordered breathing. Questions 7 through 10 concerned split-night polysomnography. Questions 11 and 12 dealt with the upper airways resistance syndrome (UARS). The last two questions were about treatment of mild sleep-disordered breathing.

**Results**

Audience responses to questions were as follows:

1. Your involvement with sleep center(s) is:
   A. Medical director 26%
   B. Medical staff member or consultant 44%
   C. Referring physician 26%
   D. Patient 0%
   E. None 4%

2. Your certification/training is:
   A. Board certified in pulmonary medicine 65%
3. In your state, a significant number of insurance companies reimburse for sleep studies only if they are done in an accredited laboratory or center:
   A. Yes 20%
   B. No 38%
   C. Don’t know 35%
   D. Don’t care 7%

4. When you refer a patient for sleep evaluation you:
   A. Prefer to receive a report only, and do not wish to have your patients evaluated, counseled or treated by the center specialist—NO MATTER WHAT 22%
   B. Prefer to have the center specialist evaluate your patients before and/or after sleep study; prefer to initiate treatment yourself 18%
   C. Prefer to have the center specialist evaluate, counsel, prescribe and/or initiate therapy (eg, continuous positive airway pressure [CPAP]) 34%
   D. Prefer to have the center specialist evaluate/treat patient only if sleep apnea is suspected or diagnosed (eg, narcolepsy, periodic limb movements during sleep) 8%
   E. Not applicable to your practice 18%

5. Sleep apnea is:
   A. An apnea-hypopnea index (AHI) of 5 or more and self-reported hypersomnolence 17%
   B. More than five obstructive apneas, greater than 10 s in duration, per hour of sleep and one or more of the following: frequent arousals; bradycardia; arterial oxygen desaturation in association with apneas; a multiple sleep latency test (MSLT) with a latency of less than 10 min 45%
   C. An apnea index (AI) of 20 or more 6%
   D. An AHI of 10 or more 21%
   E. GOK (God only knows) 11%

6. Hypopnea is:
   A. Any reduction in airflow 13%
   B. 50% reduction in airflow plus any fall in arterial oxygen saturation (SaO2) 13%
   C. 50% reduction in airflow plus a 4% fall in SaO2 22%
   D. Any reduction in airflow plus oxygen desaturation and/or arousal 22%
   E. 50% reduction in airflow plus 4% fall in SaO2 and/or arousal 29%

7. Does your sleep laboratory perform split-night polysomnography?
   A. Routinely 19%
   B. In selected patients 46%
   C. Never 16%
   D. Don’t know 19%

8. Split-night polysomnograms are clearly indicated for the diagnosis and treatment of obstructive sleep apnea (OSA) in:
   A. All patients with complaints of excessive daytime sleepiness 16%
   B. Only in patients in whom treatment needs to be urgently initiated 38%
   C. All health maintenance organization patients 9%
   D. None of the above 38%

9. Which of the following statements about the diagnostic portion of split-night studies is false?
   A. A positive study rules in a diagnosis of OSA 4%
   B. There is no significant difference between split-night polysomnography and full-night polysomnography when patients have AHIs of 20 or more 13%
   C. A negative split-night study rules out a diagnosis of OSA 63%
   D. There is currently uncertainty regarding the degree of sleep-disordered breathing at which a trial of CPAP should be introduced 20%

10. Which of the following statements regarding the therapeutic portion of the split-night polysomnogram is false?
    A. An accurate positive pressure prescription can be obtained in virtually all patients 69%
    B. An accurate positive pressure prescription can be obtained 62% of the time 7%
    C. CPAP prescriptions may be less accurate in patients with AHIS less than 20 11%
    D. Acceptance and compliance with positive pressure may be adversely affected 13%

11. In [the] sleep laboratory I work with, UARS:
    A. is not diagnosed 30%
    B. is presumptively diagnosed using noninvasive equipment 53%
    C. is diagnosed utilizing esophageal pressure monitoring 8%

12. Defining arousals as alpha EEG bursts lasting 3 s or more; at what level would you consider the arousal index pathologic?
    A. AHI=10 per hour 54%
    B. AHI=20 per hour 36%
    C. AHI=30 per hour 7%
    D. AHI=40 per hour 2%
    E. AHI=50 per hour 1%

13. A patient is diagnosed as having mild OSA (polysomnography reveals AHI=9 events per hour; lowest SaO2=84%); he is overweight. He is tried on a regimen of nasal CPAP but cannot tolerate it because of claustrophobia. Which of the following options is the least likely to improve his complaints of daytime sleepiness?
    A. Uvulopalatopharyngoplasty 9%
    B. Nasal oxygen 49%
    C. An oral appliance 10%
    D. Weight loss of >10 kg 11%
    E. Daily methylphenidate (Ritalin) 25%

14. A patient is referred for disruptive snoring; his wife will not sleep with him. He also notes occasional am headaches and difficulty staying alert during long-distance driving; he denies daytime sleepiness. His polysomnogram shows AHI=3 events per hour, an arousal index=30/h, his lowest SaO2=90%; his snoring is noted to be most severe when supine. What management strategy would you use for this patient?
    A. Position adjustment 63%
    B. Use of a decongestant prior to sleeping 3%
    C. Weight loss 10%
    D. Nasal CPAP 16%
    E. An oral appliance 5%

**DISCUSSION**

The responses to the first two questions indicated that this audience was fairly sophisticated and well trained in sleep disorders. Over one quarter of the participants were medical directors of sleep centers and nearly half were medical staff members or consultants. Almost two thirds of the participants were
board certified in pulmonary medicine and 12% were board certified in sleep medicine. Although this survey was very informal, it does represent the polling of pulmonary practitioners with significant interest and training in the area of sleep disorders medicine.

It is currently unknown how many insurance companies require board certification or sleep laboratory accreditation for reimbursement of sleep studies. In this informal poll, fully one fifth of the participants believed that accreditation was important for insurance reimbursement (question 3).

Medical directors of sleep centers are often confronted with the dilemma of how much to participate in the care of patients referred, particularly if they are referred by other pulmonologists. The responses to question 4 indicate that pulmonologists are divided on this issue. Approximately one third prefer to have the sleep center specialist evaluate, counsel, and begin treatment. Another one third prefer to use the sleep center as a diagnostic test only and follow up personally. We do not have any way of knowing how this breaks down along sleep training lines.

Questions 5 and 6 indicate ongoing uncertainty about definitional issues in sleep disorders medicine. Nearly half of the participants selected the Standard American Sleep Disorders definition of OSA as the working definition of sleep apnea. However, approximately one fifth chose the more simple definition of an AHI of at least 10 events per hour. This definition has been used by investigators in the field who were evaluating outcomes of sleep-disordered breathing. A higher cut point than 5 events per hour has been advocated, particularly in the elderly, who may have a 30% prevalence of sleep apneas using the American Sleep Disorders Association definition. Seventeen respondents endorsed an index of more than 5 events per hour plus a symptom of hypersomnolence, which was the working definition employed in a seminal study by Young and colleagues, that demonstrated prevalence rates of 2% and 4% for middle-aged women and men, respectively. A relatively small number (6%) of the audience believed that sleep apnea is an AI of over 20. This definition is the one best correlated with an adverse outcome; He et al demonstrated increased mortality in untreated sleep apnea patients with an AI over 20 events per hour. Finally, over one tenth of respondents responded, “God only knows.”

The issue of hypopnea is even murkier; participants were divided on what constitutes a hypopnea in this survey. The largest segment of respondents (29%) endorsed the strictest criteria: 50% reduction in airflow plus 4% fall in SaO2 and/or arousal. On the other end of the spectrum, 13% believe that any reduction in airflow constitutes a hypopnea. The respondents’ confusion mirrors that found in the literature. All of the definitions included in this list have been reported in the literature, and our survey of American Sleep Disorders Association-accredited laboratories demonstrated similar confusion. The recently published National Institutes of Health publication proposed the following definition for hypopnea: “a reduction in airflow associated with a decrease in oxygen saturation.” Such a definition might be hard to apply to an actual polysomnographic tracing; perhaps the approach used by some investigators, recording the highly reproducible variable of 4% oxygen desaturations coupled with an arousal index, is the most consistent approach. In the meantime, readers of the literature ought to evaluate the definition of hypopnea used in published reports in light of their own biases.

Questions 7 through 10 dealt with split-night studies, in which both diagnostic testing and CPAP titration are done in a single night.

The audience indicated that split-night sleep studies are performed routinely in 19% of the laboratories with which they are affiliated, whereas 46% of the respondents reported only selected patients were studied with split-night polysomnography (question 7). Sixteen percent of the participants indicated that their sleep laboratories never perform split-night studies while 19% did not know if their laboratories perform split-night studies.

The response to question 8 demonstrated that there was divided opinion regarding when split-night studies are indicated. The respondents indicated that split-night polysomnograms are clearly indicated in all patients with complaints of excessive daytime sleepiness (16%), only in patients in whom treatment needed to be urgently initiated (38%), and in all health maintenance organization patients (9%). Slightly more than a third (38%) of the respondents indicated that there are no clear indications for split-night polysomnography.

There is no definite guidance in the literature with regard to the indications for split-night polysomnography. A number of laboratories have adopted policies that all patients referred for polysomnography or those who are at “high risk” for sleep apnea should undergo split-night polysomnography. There is currently uncertainty as to how split-night polysomnography impacts on establishing a diagnosis of sleep apnea, providing a proper positive pressure prescription, or acceptance and compliance.

In question 9, 63 percent of the respondents correctly indicated that a negative diagnostic portion of a split-night study does not rule out sleep apnea, much as a negative full-night polysomnogram may not rule out a diagnosis of sleep apnea.

With regard to the therapeutic portion of the split-night study (question 10), 69% of the respondents correctly indicated that an accurate positive pressure
prescription can be obtained in virtually all patients. Sanders et al.\textsuperscript{13} demonstrated that in 50 consecutive high-risk patients who underwent split-night studies followed by full-night studies, 62% of the time a proper CPAP prescription could be written. This study differed from Iber et al.\textsuperscript{14} in which 78% of the patients were provided with an effective CPAP prescription. The differences between the two studies were as follows: (1) the positive pressure prescription was not verified on a second night of study in the Iber et al study; (2) the Iber et al study did not address interface or modality (CPAP to bi-level or the reverse); and (3) objective compliance was not examined in either study.

A recent study by Yamashiro and Kryger\textsuperscript{15} found that in 107 patients undergoing a split-night positive pressure titration followed by a full-night positive pressure titration, patients with AHIs of more than 20 did better with a split-night protocol than patients with AHIs less than 20. In the AH1 group of less than 20, 26% (18/69) differed by more than 3 cm H\textsubscript{2}O in pressure on the 2 studies and 7% (5/69) required a change in the positive pressure device (CPAP to bi-level pressure). In the AH1 group of more than 20, 16% (6/38) differed by more than 3 cm H\textsubscript{2}O in pressure on the two studies and 8% (3/38) required a change in the positive pressure device (CPAP to bi-level pressure).

With regards to answer D in question 10, Fleury et al.\textsuperscript{16} have reported an uncontrolled case series of 31 patients with moderate to severe sleep apnea (mean AHI, 66±23) who underwent split-night polysomnography. In the 68% (21/31) of the patients who accepted therapy, 52% (16/31) continued therapy past 1 month, with the mean daily use in hours of 6.7±1.5 h. While the average hourly compliance was quite good in the patients who accepted therapy, the overall acceptance was less than previously reported acceptance rates that have ranged from 71 to 92%.\textsuperscript{17-21}

To sum up the findings about split-night studies (questions 7 through 10), it appears that a positive pressure prescription can be obtained in patients who have a significant amount of sleep apnea AHI greater than 20 when an adequate amount of time for titration is provided (>3 h).\textsuperscript{15} although even this group will occasionally require repeated studies to determine a proper positive pressure prescription. The issue of how split-night polysomnography impacts on acceptance and long-term compliance with therapy is less clear. Until larger controlled studies are performed, it is difficult to determine the true effect of split-night polysomnography on acceptance and long-term compliance with positive pressure therapy.

In response to question 11, the audience was asked whether UARS was diagnosed in their sleep laboratory. In 60% of the responders, UARS was diagnosed but very few of those were diagnosed utilizing an esophageal balloon (8%).

The term upper airways resistance syndrome (UARS) was first described by Dr. Guilleminault and colleagues\textsuperscript{22} in 1993. In this syndrome, transient, repetitive alpha EEG arousals secondary to increased upper airway resistance led to significant sleep fragmentation and resultant daytime sleepiness. The diagnosis was made in the original study utilizing an esophageal balloon and a pneumotachometer. Increased upper airway resistance was believed to be present when increasingly negative esophageal pressure accompanied decreased airflow. When this combination ended with an EEG arousal in a repetitive fashion, UARS syndrome was believed to be present.

Although Dr. Guilleminault suggested that this was the only way to accurately diagnose UARS, the following features may be observed that are suggestive of UARS without utilizing an esophageal balloon: decreased airflow, increasing respiratory effort on pneumography, paradoxical ventilation, progressively increasing intercostal electromyographic (EMG) activity, crescendo snoring—these or any combination ending with an EEG arousal. Interestingly, in Guilleminault’s original article, snoring was not always seen; 2 of 15 patients did not snore.

Arousal from sleep has been defined in many ways. In question 12, we asked what was an “abnormal” arousal index, defining arousal as a 3-s alpha EEG burst. The answer for this was taken from a study performed by Drs. Mathur and Douglas\textsuperscript{23} in which they performed overnight polysomnography on a group of unselected patients followed up in a general practice clinic. They analyzed these records for EEG arousals utilizing three separate definitions of arousal: (1) a shift to alpha or theta waves for a least 3 s during nonrapid eye movement sleep or accompanied by a concurrent 3-s increase in submental EMG amplitude during rapid eye movement sleep; (2) the same definition as No. 1 except the changes in the EEG/EMG last only for 1.5 s; or (3) any change in the EEG frequency to alpha or theta for at least 1.5 s, associated with a rise in submental EMG, however brief.\textsuperscript{24} They found the mean number of arousals by each definition was No. 1: 21 (7-56); No. 2: 26 (5-67); No. 3: 14 (3-55), therefore the correct answer to our question was believed to be answer B: more than 20 arousals per hour (36% of respondents). Additionally it was noted in their article the number of arousals increased with age and the means did not change significantly when they excluded patients with complaints of snoring, daytime sleepiness, or witnessed apneas.

The vignette in question 13 describes a patient with mild OSA who cannot tolerate nasal CPAP. Several options are given for alternative treatment and the
audience was asked which one was the least likely to improve his sleepiness complaints. The most correct answer is nasal oxygen. In a study by Phillips et al, 25 8 patients with mild OSA were treated with oxygen or air in a randomized order for 1 month. Before and after each treatment, they underwent an overnight polysomnography followed by an MSLT. They found that although low-flow oxygen did improve oxygenation and decrease the number of hypopneas, it did not improve the number of apneas or improve daytime sleepiness as measured by the MSLT. This study therefore suggested that oxygen would not improve this patient’s daytime sleepiness complaint.

Three of the other alternatives have all been shown to have some benefit in OSA (uvulopalatopharyngoplasty, oral devices, and weight loss). There are currently 87 articles on uvulopalatopharyngoplasty in the literature. 26 In those articles, there are very little objective data, such as postoperative MSLTs, to assess the degree of daytime sleepiness, but most do suggest significant subjective improvement in daytime sleepiness in most patients who undergo that procedure. This is also the case in the articles assessing the efficacy of oral devices in the treatment of OSA, which suggest subjective improvement in daytime sleepiness but little objective data. 27 Weight loss has likewise been shown to improve OSA and both objective and subjective measures of daytime sleepiness. 28 Methylphenidate, the only answer that is not routinely used to treat OSA, would likely improve daytime sleepiness by virtue of its biochemical properties.

The final question depicts a patient who does not have OSA but does have significant sleep disruption presumably related to UARS and snoring. Most responders (63%) believed that the best treatment for this patient was to have him modify his sleep position as treatment. In an article by Braver et al, 29 20 snorers underwent overnight polysomnography following treatment with a decongestant nasal spray, maintenance of a sleep position other than supine, and a combination of both treatments. The amount of snoring was not improved with either condition alone or in combination. Braver et al 29 also analyzed the same group of patients to see if weight loss added to the decongestant nasal spray and nonsupine sleep position improved snoring. Only the combination of the three modalities improved snoring with weight loss being the most significant contributor.

Nasal CPAP in this patient would most likely improve his symptoms, assuming they were related to UARS as shown in the Guillemaintault et al 22 study. However, it is often hard to get patients to be compliant with CPAP and many insurance companies will not reimburse for its use unless a patient has OSA, which the patient described did not. Therefore, the correct answer was an oral appliance. It has been suggested that these are indicated in patients with primary snoring or mild OSA 30 and results are quite promising in those patient populations.

**Conclusions**

Our informal survey indicated considerable interest and controversy among pulmonologists about sleep disorders medicine. This well-trained group does not agree on the definitions of apnea or hypopnea or about their expectations upon referral of patients to sleep centers. Split-night polysomnography is frequently performed, but there is some controversy about its indications. UARS is diagnosed in most sleep laboratories represented by our respondents using noninvasive equipment. There is no uniform agreement about treatment effects in patients with mild or positional sleep apnea.

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