Indications for Positive Airway Pressure Treatment of Adult Obstructive Sleep Apnea Patients*

A Consensus Statement

Daniel I. Loube, MD, FCCP; Peter C. Gay, MD, FCCP; Kingman P. Strohl, MD, FCCP; Allan I. Pack, MD, PhD; David P. White, MD, FCCP; and Nancy A. Collop, MD, FCCP

We developed a short-length document that clearly delineates a prudent approach to and criteria for reimbursement of positive airway pressure (PAP) costs for the treatment of obstructive sleep apnea (OSA). Treatment modalities for OSA with PAP include continuous positive airway pressure, bilevel or variable PAP, and autotitrating PAP. This guidance on the appropriate criteria for PAP use in OSA is based on widely acknowledged peer-reviewed studies and widely accepted clinical practice. These criteria reflect current opinion on the appropriate clinical management of OSA in lieu of data pending from the Sleep Heart Health Study and upcoming outcome studies. This document is not intended to provide a complete review and analysis of the OSA clinical literature. The key to the success of this document is to foster consensus within and outside the clinical sleep community by providing a common sense and easily understood approach to the treatment of OSA with PAP.

(CHEST 1999; 115:863–866)

Key words: continuous positive airway pressure; obstructive sleep apnea

Abbreviations: CPAP = continuous positive airway pressure; EMG = electromyogram; EOG = electro-oculogram; NPSG = nocturnal polysomnography; OSA = obstructive sleep apnea; PAP = positive airway pressure; RDI = respiratory disturbance index; RERA = respiratory effort-related arousal

I. Accepted Diagnostic Techniques

A. Standard Diagnostic Nocturnal Polysomnography (NPSG)

Based on the 1997 American Sleep Disorders Association Indications for Polysomnography Task Force Report1:

- Indicated for the diagnosis of possible obstructive sleep apnea (OSA).
- Includes recording and analysis of the following parameters: EEG, electro-oculogram (EOG), electromyogram (EMG), oronasal airflow, chest wall effort, body position, snore microphone, ECG, and oxyhemoglobin saturation. The duration of a diagnostic NPSG is at least 6 h (with the
exception of the diagnostic portion of a split-night study, which is at least 2 h in duration; refer to section IB).

- 6-h minimum duration of a diagnostic NPSG is preferred, which allows for the assessment of variability related to sleep stage and position with respect to the frequency of obstructive respiratory events and the occurrence of other types of nocturnal events such as periodic limb movements.

- Standard diagnostic NPSG may be performed in a health-care facility or in the patient’s home with a trained technologist in attendance. The use of unattended, standard diagnostic NPSG in the patient’s home is not a validated clinical technique. Diagnostic NPSG must be interpreted by a physician trained in the evaluation and treatment of OSA patients.

B. Split-Night Study NPSG

Based on the 1997 American Sleep Disorders Association Indications for Polysomnography Task Force Report:

- Patients with a respiratory disturbance index (RDI) > 40 events per hour during the first 2 h of a diagnostic NPSG receive a split-night study NPSG, of which the final portion of the NPSG is used to titrate continuous positive airway pressure (CPAP).

- Split-night studies may be considered for patients with an RDI of 20 to 40 events per hour, based on clinical observations, such as the occurrence of obstructive respiratory events with a prolonged duration or in association with severe oxygen desaturation.

- A minimum of 3 h of sleep is preferred to adequately titrate CPAP after this treatment is initiated.

- Split-night studies require the recording and analysis of the same parameters as a standard diagnostic NPSG.

- On occasion, an additional full-night CPAP titration NPSG may be required, if the split-night study did not allow for the abolishment of the vast majority of obstructive respiratory events or prescribed CPAP treatment does not control clinical symptoms.

C. Limited-Channel Diagnostic NPSG

- May be indicated for patients with a high pretest probability of OSA based on validated screening algorithms such as those investigated by Maislin et al. and Kushida et al.

- Limited-channel diagnostic NPSG should include the following minimum parameters: oronasal airflow, chest wall effort, ECG, and oxyhemoglobin saturation.

- Limited-channel NPSG is not effective in distinguishing sleep from wake or determining sleep stage.

- Limited-channel NPSG is less accurate than a standard NPSG in determining the number of obstructive respiratory events and does not detect non-OSA sleep disorders that may coexist with OSA.

II. Diagnostic Criteria (Employing the Previously Specified Techniques)

Based on the American Sleep Disorders Association Criteria for Measurements, Definitions, and Severity Ratings of the Sleep Related Breathing Disorders Task Force Report:

- Apnea is defined as the cessation of airflow ≥10 s.

- Hypopnea is defined as a recognizable, transient reduction, but not a complete cessation of, breathing ≥10 s. A ≥50% decrease in the amplitude of a validated measure of breathing or a <50% amplitude reduction that is associated with either an oxygen desaturation of ≥3% or an arousal must be evident.

- Obstructive apneas and hypopneas are typically distinguished from central events by the detection of respiratory efforts during the event.

- A respiratory effort-related arousal (RERA) is an event characterized by increasing respiratory effort for ≥10 s leading to an arousal from sleep but which does not fulfill the criteria for a hypopnea or apnea. A RERA is detected with nocturnal esophageal catheter pressure measurement, which demonstrates a pattern of progressive negative esophageal pressures terminated by a change in pressure to a less negative pressure level associated with an arousal. Novel techniques are available that may allow for increased technical ease in the detection of RERAs.

- The RDI is defined as the number of obstructive apneas, hypopneas, and RERAs per hour averaged over the course of at least 2 h of sleep as determined by NPSG.

III. Treatment Criteria

- CPAP treatment is indicated for all OSA patients with an RDI ≥30 events per hour, regardless of symptoms, based on the increased risk of hypertension evident from the Wisconsin sleep cohort data.

- Treatment with CPAP is indicated for patients with an RDI of 5 to 30 events per hour accom-
panied by symptoms of excessive daytime sleepiness, impaired cognition, mood disorders, insomnia, or documented cardiovascular diseases to include hypertension, ischemic heart disease, or stroke. The use of an RDI of 5 events per hour as the minimal threshold value for CPAP treatment of symptomatic OSA patients is supported by the studies of Redline et al and Engleman et al that demonstrated improvements in symptoms and daytime function.

- Treatment with CPAP is not indicated for asymptomatic patients without cardiovascular diseases who demonstrate mild OSA on diagnostic NPSG.
- Only physicians trained in the evaluation and treatment of OSA patients shall prescribe CPAP for this indication.

IV. CPAP Titration

- On a subsequent night following a diagnostic NPSG or following the diagnostic portion of a split-night study, OSA patients receive CPAP titration to specify the lowest CPAP level, which abolishes obstructive apneas, hypopneas, RERAs, and snoring in all sleep positions and sleep stages.
- Minimum parameters to be monitored and analyzed with CPAP titration NPSG include the following: EEG, EOG, EMG, oronasal airflow, chest wall effort, body position, snore microphone, ECG, and oxyhemoglobin saturation. Inclusion of EEG, EOG, and EMG in CPAP titration NPSG parameters allows for detection of arousals and avoids possible undertitration due to otherwise unrecognized episodes of wakefulness and detection of various sleep stages to allow for the optimization of manually specified pressure requirements.

V. Bilevel Positive Airway Pressure

- Bilevel positive airway pressure (PAP) allows for independent adjustment of inspiratory and expiratory pressures. A timed, back-up rate capability is not required for OSA treatment.
- A trial of bilevel PAP may be indicated for OSA patients who cannot tolerate CPAP due to persistent massive nasal mask air leakage or discomfort exhaling against positive pressure.
- A trial of bilevel PAP may be indicated for OSA patients with concomitant nocturnal breathing disorders to include restrictive thoracic disorders, COPD, and nocturnal hypventilation.
- Although initial acceptance of PAP treatment is increased with the availability of bilevel PAP, it may not be routinely indicated as an alternative to CPAP in OSA patients because there may not be an increase in the hours of use.
- An additional NPSG may be required to titrate bilevel PAP if CPAP failure occurs.

VI. Autotitrating PAP

- Autotitrating PAP allows for the titration of CPAP without the immediate involvement of a technologist.
- Recent studies suggest that some autotitrating PAP systems are effective in determining the optimal CPAP setting for most OSA patients.
- Treatment with autotitrating PAP systems in some studies shows slight increases in adherence as compared with CPAP.
- An additional NPSG may be required to titrate CPAP if autotitrating PAP treatment failure occurs.

VII. Repeat NPSG

- Indications for repeat NPSG are persistence of symptoms despite adherence to PAP treatment and assessment of treatment response to upper airway surgical procedures, oral appliances, or significant sustained weight change.

VIII. Adherence to PAP Treatment

- Efforts directed at OSA patient education are warranted for at least the first month of PAP treatment to promote effective long-term adherence with treatment. This education may be provided by physicians, specially trained technologists, or nurses.
- To enhance and ensure PAP adherence and equipment maintenance, follow-up with a physician or a designated surrogate should occur at least once after the initiation of PAP treatment, and thereafter on at least a yearly basis.
- Adjustments or changes in the PAP-patient interface are not uncommon and may be indicated, due to difficulties with mask fit leading to skin abrasion, massive air leak, or to mask, tubing, or rebreathing valve breakage.
- Adequate adherence to PAP is defined as > 4.5 h of PAP use per night on a routine basis.
- Maximal improvement in neurocognitive symptoms can require as long as 2 months of PAP treatment.

REFERENCES

1 Standards of Practice Committee of the American Sleep Disorders Association. Practice parameters for the indications...
for polysomnography and related procedures. Sleep 1997; 20:406–422
10 American Sleep Disorders Association Task Force. The Chicago criteria for measurements, definitions, and severity of sleep related breathing disorders in adults. Presented at the Association of Professional Sleep Societies Conference; June 20, 1998; New Orleans, LA