

# Practice Parameters for the Indications for Polysomnography and Related Procedures

*An American Sleep Disorders Association Report*

*Standards of Practice Committee of the American Sleep Disorders Association*

Andrew L. Chesson, Jr., MD<sup>1</sup>, Richard A. Ferber, MD<sup>2</sup>, June M. Fry, MD, PhD<sup>3</sup>, Madeleine Grigg-Damberger, MD<sup>4</sup>, Kristyna M. Hartse, PhD<sup>5</sup>, Thomas D. Hurwitz, MD<sup>6</sup>, Stephen Johnson, MD, MBA<sup>7</sup>, Michael Littner, MD<sup>8</sup>, Gihan A. Kader, MD<sup>9</sup>, Gerald Rosen, MD<sup>10</sup>, R. Bart Sangal, MD<sup>11</sup>, Wolfgang Schmidt-Nowara, MD<sup>12</sup>, Aaron Sher, MD<sup>13</sup>

<sup>1</sup>LSUMC Sleep Disorders Center, Shreveport, LA, <sup>2</sup>Center for Pediatric Sleep Disorders, Children's Hospital, Boston, MA, <sup>3</sup>Division of Somnology and Professor of Neurology, Allegheny University of the Health Sciences, Philadelphia, PA, <sup>4</sup>Consulting Neurologist and Sleep Specialist, Presbyterian Hospital and Neurology Consultants, Ltd., Albuquerque, NM, <sup>5</sup>Sleep Disorders Center/Neurosciences Program, Columbia Spring Branch Medical Center, Houston, TX, <sup>6</sup>Minneapolis VA Medical Center, Minneapolis, MN, <sup>7</sup>St. Patrick Hospital Sleep Center, Missoula, MT, <sup>8</sup>Pulmonary, Critical Care and Sleep Medicine, VA Medical Center, Sepulveda, CA, <sup>9</sup>St. Luke's Hospital Sleep Medicine and Research Center, St. Louis, MO, <sup>10</sup>Hennepin County Medical Center, Minneapolis, MN, <sup>11</sup>Sleep Disorders Institute, Troy, MI, <sup>12</sup>Pulmonary Division, Department of Medicine, University of New Mexico, Albuquerque, NM, <sup>13</sup>Capital Region Sleep Wake Disorders Center of Albany Medical Center and St. Peter's Hospital, Albany, NY

**Summary:** These clinical guidelines, which have been reviewed and approved by the Board of Directors of the American Sleep Disorders Association, provide recommendations for the practice of sleep medicine in North America regarding the indications for polysomnography in the diagnosis of sleep disorders. Diagnostic categories that are considered include the following: sleep-related breathing disorders; neuromuscular disorders and sleep-related symptoms; chronic lung disease; narcolepsy; parasomnias; sleep-related epilepsy; restless legs syndrome; periodic limb movement disorder; depression with insomnia; and circadian rhythm sleep disorders. Whenever possible, conclusions are based on evidence from review of the literature. Where scientific data are absent, insufficient, or inconclusive, recommendations are based on consensus of opinion. The Standards of Practice Committee of the American Sleep Disorders Association appointed a task force to review the topic, the indications for polysomnography and related procedures. Based on the review and on consultation with specialists, the subsequent recommendations were developed by the Standards of Practice Committee and approved by the Board of Directors of the American Sleep Disorders Association. Polysomnography is routinely indicated for the diagnosis of sleep-related breathing disorders; for continuous positive airway pressure (CPAP) titration in patients with sleep-related breathing disorders; for documenting the presence of obstructive sleep apnea in patients prior to laser-assisted uvulopalatopharyngoplasty; for the assessment of treatment results in some cases; with a multiple sleep latency test in the evaluation of suspected narcolepsy; in evaluating sleep-related behaviors that are violent or otherwise potentially injurious to the patient or others; and in certain atypical or unusual parasomnias. Polysomnography may be indicated in patients with neuromuscular disorders and sleep-related symptoms; to assist in with the diagnosis of paroxysmal arousals or other sleep disruptions thought to be seizure-related; in a presumed parasomnia or sleep-related epilepsy that does not respond to conventional therapy; or when there is a strong clinical suspicion of periodic limb movement disorder. Polysomnography is not routinely indicated to diagnose chronic lung disease; in cases of typical, uncomplicated, and noninjurious parasomnias when the diagnosis is clearly delineated; for patients with epilepsy who have no specific complaints consistent with a sleep disorder; to diagnose or treat restless legs syndrome; for the diagnosis of circadian rhythm sleep disorders; or to establish a diagnosis of depression.

**Key Words:** Practice parameters; Practice guidelines; Standards of practice; Polysomnography; Sleep apnea syndrome; Sleep disorders; Narcolepsy; Parasomnias; Restless legs syndrome; Periodic limb movement disorder; Insomnia; Circadian rhythm disorders.

[This position paper is referenced by square-bracketed numbers to the relevant sections in the accompanying background paper. <sup>(2)</sup>]

## 1.0 INTRODUCTION

According to the National Commission on Sleep Disorders Research, sleep disorders affect approximately 40 million people in the United States <sup>(1)</sup>. Sleep disorders can cause daytime sleepiness, lead to a decreased quality of life, and impose a medical risk to patients, thereby resulting in increased expenditure of health care dollars. The accurate diagnosis of sleep disorders is therefore of paramount importance from social and economic standpoints. When performed injudiciously, however, sleep testing procedures may lead to unnecessary increases in health care cost.

Although remarkable strides have been made since the 1970s in diagnosing sleep disorders by polysomnographic evaluation, guidelines for the most appropriate and cost-effective use of sleep testing procedures have not always been clear or consistent. What began as limited electroencephalographic measurements during sleep has evolved into a variety of sleep medicine procedures. These procedures typically involve the measurement of multiple channels of physiologic parameters, including - but not limited to - electroencephalography (EEG), electro-oculography (EOG), electromyography (EMG), electrocardiography (ECG) or heart rate, respiratory effort, air flow, and oxygen saturation. Additional recording channels may be added in selected situations. The purpose of this paper is to present evidence-based recommendations, based on peer-reviewed literature, for the use of polysomnography (and, in some cases, related sleep medicine procedures such as cardiorespiratory sleep studies and multiple sleep latency and maintenance of wakefulness tests) for the diagnosis of common sleep disorders.

## 2.0 METHODS

The Standards of Practice Committee of the American Sleep Disorders Association, in conjunction with experts, was appointed as a task force to review the indications for polysomnography in the diagnosis of commonly encountered sleep disorders in adults. The indications for study in pediatric patients may be different. On the basis of the accompanying background paper <sup>(2)</sup>, the task force developed the recommendations included in this paper. In most cases, the conclusions are based on evidence from studies published in peer-reviewed journals. However, where scientific data are absent, insufficient, or inconclusive, recommendations are based upon task force consensus.

The Board of Directors of the American Sleep Disorders Association approved these recommendations. All members of the task force and the Board of Directors complet-

ed detailed conflict-of-interest statements. The participants in this process were directors or members of sleep disorders centers and recognize that they participate in sleep-center-based studies. However, many additionally have substantial experience with the use of ambulatory equipment for sleep studies. Otherwise, conflicts-of-interest with regard to the actions of the task force and the Board were not felt to be present.

These practice parameters define principles of practice that should meet the needs of most adult patients in most situations. These guidelines should not be considered inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific care must be made by the clinician in light of the individual circumstances presented by the patient and the availability of diagnostic and treatment options and resources.

The American Sleep Disorders Association expects these guidelines to have a positive impact upon the practice of sleep medicine, patient outcomes, and health care costs. These practice parameters reflect the state of knowledge at publication and will be reviewed, updated, and revised as new information becomes available.

## 3.0 BACKGROUND

In its 1992 assessment of polysomnography, the Agency for Health Care Policy and Research concluded that all polysomnographic testing may not require the in-laboratory measurement of every one of the typical parameters <sup>(3)</sup>. Because it did not have sufficient peer-reviewed evidence to recommend tests other than standard polysomnography, however, the agency suggested that further research would be necessary to elucidate any situations in which testing other than in-laboratory standard polysomnography would be appropriate. The American Sleep Disorders Association's Board of Directors charged its task force with reviewing the evidence that was published both before and after the Agency for Health Care Policy and Research recommendations were made and with formulating recommendations based upon that evidence.

The four subsequent sections of this paper present recommendations and highlight limitations and areas in need of further study. Section 4.0 (Diagnosis-Based Recommendations) summarizes the evidence-based indications for polysomnography in various clinical conditions. General evaluation procedures, additional validated stratification factors, clinical indications for the use of sleep testing procedures, alternative tools, and specific technical considerations for sleep medicine procedures are presented for each disorder. Section 5.0 (Symptom-Based Approach) begins with the principal symptomatic complaints that the physician typically hears from patients. Section 6.0 (Limits of Evidence-Based Clinical and Economic Analysis) dis-

cusses issues related to the cost effectiveness of diagnostic and therapeutic interventions. Finally, Section 7.0 (Procedure Coding) provides links between sleep medicine procedures and the available procedure codes <sup>(4)</sup>. The task force did not attempt to specifically validate the codes with an evidence-based approach but, rather, suggested a reasonable link between the minimum number of recorded channels required for a particular diagnosis (as defined in Section 4.0) and the closest fit among the available codes.

#### 4.0 DIAGNOSIS-BASED RECOMMENDATIONS

Unless otherwise specified, these recommendations refer to *attended* polysomnography and *attended* cardiorespiratory sleep studies.

##### 4.1 Sleep-related breathing disorders

Disordered breathing during sleep consists of apnea, defined as a cessation or near cessation of respiration for a minimum of 10 seconds; hypopnea, defined as a reduction in airflow for a minimum of 10 seconds; and episodes of increased respiratory effort due to partial upper-airway obstruction. Disordered breathing during sleep is often associated with sleep fragmentation. The total number of apneas and hypopneas per hour of sleep is the apnea-hypopnea index, also referred to as the respiratory disturbance index. The total number of arousals per hour of sleep from apneas, hypopneas, and periodic increases in respiratory effort is the respiratory-arousal index.

In obstructive sleep apnea and the upper-airway resistance syndrome, an increase in respiratory effort occurs as patients attempt to breathe against the obstruction of the upper airway. This increased effort can be identified by measuring an intrathoracic pressure that is more negative than is the pressure measured during unobstructed breathing. In central sleep apnea, no respiratory effort and, therefore, no airflow occurs for a minimum of 10 seconds. Central apneas rarely occur in isolation, and patients typically have both central and obstructive apneas. Distinctions may be difficult to make among obstructive, mixed, and central apneas or hypopneas, and therapy directed at treating sleep-related breathing disorders is usually effective regardless of the classification, except in rare cases when apneas are almost exclusively central.

##### 4.1.1 General evaluation

The evaluation should include a clinical history and physical examination that are especially targeted toward the evaluation and assessment of the severity of sleep-related breathing disorders. The clinical history should include bedpartner observations, if available, with a specific emphasis on snoring, breathing pauses, choking or gasping,

and restless sleep, as well as reports of excessive daytime sleepiness.

##### 4.1.2 Additional validated stratification factors

Patients can be placed in stratification groups based on the presence of the following factors: habitual snoring, excessive daytime sleepiness, a body mass index greater than 35, and observed apneas [4.3.2.1]. Patients with all four of these factors are deemed to have a high probability of having sleep apnea and can be placed in a high-risk group (defined in the referenced literature for stratification purposes as having a 70% likelihood of having an apnea-hypopnea index of at least 10 per hour [4.3.2.2]).

##### 4.1.3 Clinical indications for polysomnography and other sleep medicine procedures

The terms "polysomnography" and "cardiorespiratory sleep study" continue to refer to attended studies, unless specifically stated otherwise in the indication.

###### 4.1.3.1 Polysomnography is routinely indicated for the diagnosis of sleep-related breathing disorders.

1) For most patients, full-night polysomnography is recommended for the diagnosis of sleep-related breathing disorders [4.3.2.3.3].

2) For patients in the high-pretest-probability stratification group, a cardiorespiratory sleep study may be an acceptable alternative to full-night polysomnography, provided that repeat testing with full-night polysomnography is permitted for symptomatic patients who have a negative cardiorespiratory sleep study. (By using a cardiorespiratory sleep study to test only those patients who are in the high-pretest-probability group, the clinician will reduce the probability of false-negative studies so that the need for polysomnography is lessened and costs may be lessened as well [4.3.2.2, 4.3.2.3.5.1]).

###### 4.1.3.2 Polysomnography is indicated for continuous positive airway pressure (CPAP) titration in patients with sleep-related breathing disorders.

1) A full night of polysomnography with CPAP titration is recommended for patients with a documented diagnosis of a sleep-related breathing disorder for whom CPAP is warranted [4.1, 4.3.2.1.2, 4.3.2.3.3, 4.3.2.3.5.1, 4.3.3].

2) Polysomnography with CPAP titration is appropriate for patients with any of the following polysomnographic results:

a) An apnea index (AI) of at least 20 per hour or an apnea-hypopnea (AHI) of at least 30 per hour, regardless of the patient's symptoms [4.1]

b) AHI of at least 10 per hour in a patient with excessive daytime sleepiness [4.3.2.1.2, 4.3.2.2]

c) A respiratory arousal index of at least 10 per hour in a patient with excessive daytime sleepiness [4.3.2.1.2]

3) A cardiorespiratory sleep study without EEG recording is not recommended for CPAP titration. CPAP titration should include the ability to perform sleep staging [including documenting rapid eye movement (REM) sleep] and to identify and treat arousals. Even when apnea is eradicated by CPAP, residual hypopneas and upper-airway resistance syndrome with arousals may require additional titration to determine optimal therapeutic pressures. These additional adjustments require EEG recording.

4) For CPAP titration, a split-night study (initial diagnostic polysomnogram followed by CPAP titration during polysomnography on the same night) is an alternative to one full night of diagnostic polysomnography followed by a second night of titration if the following four criteria are met:

a) An AHI of at least 40 is documented during a minimum of 2 hours of diagnostic polysomnography [4.3.2.3.3]. Split-night studies may sometimes be considered at an AHI of 20 to 40, based on clinical judgment (e.g. if there are also repetitive long obstructions and major desaturations). However, at AHI values below 40, determination of CPAP pressure requirements, based on split-night studies, may be less accurate than in full-night calibrations.

b) CPAP titration is carried out for more than 3 hours (because respiratory events can worsen as the night progresses) [4.3.2.3.3].

c) Polysomnography documents that CPAP eliminates or nearly eliminates the respiratory events during REM and non-REM (NREM) sleep, including REM sleep with the patient in the supine position [4.3.2.3.3].

d) A second full night of polysomnography for CPAP titration is performed if the diagnosis of a sleep-related breathing disorder is confirmed but criteria b and c are not met [4.3.2.3.3].

**4.1.3.3 A preoperative clinical evaluation that includes polysomnography or a cardiorespiratory sleep study is routinely indicated to evaluate for the presence of obstructive sleep apnea in patients before they undergo laser-assisted uvulopalatopharyngoplasty <sup>(5)</sup>.**

**4.1.3.4 Follow-up polysomnography or a cardiorespiratory sleep study is routinely indicated for the assessment of treatment results in the following circumstances:**

1) After good clinical response to oral appliance treatment in patients with moderate to severe obstructive sleep apnea, to ensure therapeutic benefit <sup>(6)</sup>

2) After surgical treatment of patients with moderate to severe obstructive sleep apnea, to ensure satisfactory response <sup>(7)</sup>

3) After surgical treatment of patients with sleep apnea whose symptoms return despite a good initial response to treatment <sup>(7)</sup>

**4.1.3.5 Follow-up polysomnography is routinely indicated for the assessment of treatment results in the following circumstances:**

1) After substantial weight loss has occurred in patients on CPAP for treatment of sleep-related breathing disorders to ascertain whether CPAP is still needed at the previously titrated pressure [4.3.2.1.3]

2) After substantial weight gain has occurred in patients previously treated with CPAP successfully, who are again symptomatic despite the continued use of CPAP, to ascertain whether pressure adjustments are needed [4.3.2.1.3]

3) When clinical response is insufficient or when symptoms return despite a good initial response to treatment with CPAP [4.3.2.1.3]

**4.1.3.6 Follow-up polysomnography or a cardiorespiratory sleep study is not routinely indicated in patients treated with CPAP whose symptoms continue to be resolved with CPAP treatment.**

**4.1.3.7 A multiple sleep latency test is not routinely indicated for most patients with sleep-related breathing disorders. A subjective assessment of excessive daytime sleepiness should be obtained routinely. When an objective measure of daytime sleepiness is also required, previously published practice parameters, as well as information presented in this document on the use of the multiple sleep latency test, should be consulted <sup>(8)</sup>.**

#### 4.1.4 Technical considerations

**4.1.4.1 The use of polysomnography for evaluating sleep-related breathing disorders requires a minimum of the following channels: EEG, EOG, chin EMG, air-flow, arterial oxygen saturation, respiratory effort, and ECG or heart rate. Anterior tibialis EMG is useful to assist in detecting movement arousals and may have the added benefit of assessing periodic limb movements, which coexist with sleep-related breathing disorders in many patients <sup>(9)</sup>.**

**4.1.4.2 A cardiorespiratory sleep study requires a minimum of the following four channels: respiratory effort, airflow, arterial oxygen saturation, and ECG or heart rate.**

**4.1.4.3 An attended study requires the constant presence of a trained individual who can monitor for technical adequacy, patient compliance, and relevant patient behavior.**

#### 4.1.5 Alternative tools

4.1.5.1 Oximetry lacks the specificity and sensitivity to be used as an alternative to polysomnography or a cardiorespiratory sleep study for diagnosing sleep-related breathing disorders [4.3.2.4.4].

4.1.5.2 In-laboratory studies have validated the use of attended cardiorespiratory sleep studies for the diagnosis of sleep-related breathing disorders. However, only a few peer-reviewed articles specifically examined unattended cardiorespiratory sleep studies. In selected circumstances—for example, for patients with severe symptoms of obstructive sleep apnea and when initiation of treatment is urgent and an attended study is not available—an unattended study may be an alternative based on prior recommendations<sup>(10)</sup>. However, the routine use of unattended cardiorespiratory studies (or even unattended polysomnography) cannot be supported, at least until there has been clear validation of such studies conducted without a technologist providing ongoing observations and interventions to ensure accurate recording and interpretation. Further research is needed to clarify this issue [4.3.2.3.5.1, 4.3.2.3.5.2].

#### 4.2 Other respiratory disorders

This diagnostic category includes breathing disorders that are not principally defined by obstructive or central apnea or the upper-airway resistance syndrome.

##### 4.2.1 General evaluation

A clinical history and physical evaluation should be performed to establish the presence and severity of the underlying medical disorder.

##### 4.2.2 Additional validated stratification factors

There are no additional validated stratification factors.

##### 4.2.3 Clinical indications for the use of polysomnography

4.2.3.1 For patients with neuromuscular disorders and sleep-related symptoms, polysomnography is routinely indicated to evaluate symptoms of sleep disorders that are not adequately diagnosed by obtaining a sleep history, assessing sleep hygiene, and reviewing sleep diaries [5.3.4].

4.2.3.2 Polysomnography is not indicated to diagnose chronic lung disease [5.3]. Nocturnal hypoxemia in patients with chronic obstructive, restrictive, or reactive lung disease is usually adequately evaluated by oximetry and does not

require polysomnography [5.3.1, 5.3.3]. However, if the patient's symptoms suggest a diagnosis of obstructive sleep apnea or periodic limb movement disorder, indications for polysomnography are the same as for those disorders in patients without chronic lung disease. [4.3.2, 5.3.1, 8.3.2].

##### 4.2.4 Technical considerations

Polysomnographic recording for evaluating breathing disorders requires a minimum of EEG, EOG, chin EMG, airflow, arterial oxygen saturation, respiratory effort, and heart rate or ECG channels. Measurement of end-tidal carbon dioxide is often very important in clarifying the patient's respiratory adequacy. Anterior tibialis EMG is useful to assist in detecting movement arousals and may also allow for the assessment of periodic limb movement disorder, which may coexist with respiratory disorders in many patients.

##### 4.2.5 Alternative tools

4.2.5.1 Nocturnal oximetry may be helpful or sufficient in assessing a disorder in which the only or principal clinical issue is the level of hypoxemia and when determining sleep stages or assessing sleep apnea is not necessary [5.3.1].

4.2.5.2 Pulmonary function tests and arterial blood gases also may be used to help assess the patient's level of respiratory dysfunction.

#### 4.3 Narcolepsy

Narcolepsy is a neurologic disorder characterized predominantly by abnormalities of REM sleep, some abnormalities of non-REM (NREM) sleep, and the presence of excessive daytime sleepiness. The classic tetrad of narcolepsy symptoms includes hypersomnolence, cataplexy, sleep paralysis, and hypnagogic hallucinations, although 30-50% of patients with narcolepsy do not have all of these symptoms [6.1]. Narcoleptic patients often report disrupted sleep, and polysomnography often confirms fragmented sleep patterns. Polysomnography and the multiple sleep latency or maintenance of wakefulness test performed on patients with narcolepsy typically reveal short sleep latencies. The polysomnogram may show an early sleep-onset REM episode, i.e. short REM latency. The multiple sleep latency test typically shows at least two sleep-onset REM periods. However, up to 15% of patients may not have two sleep-onset REM periods in a given study [6.1].

##### 4.3.1 General evaluation

A clinical history and a sleep diary are the most power-

ful general evaluation tools. In addition, the diagnosis of narcolepsy requires the following measurements: polysomnographic assessment of the quality and quantity of nighttime sleep and determination of the latency to the first REM epoch and multiple sleep latency test assessment of the level of daytime sleepiness and the presence of REM-sleep epochs <sup>(8)</sup>.

#### 4.3.2 Additional validated stratification factors

There are no additional validated stratification factors.

#### 4.3.3 Clinical indications for the use of polysomnography and other sleep medicine procedures

**Polysomnography and a multiple sleep latency test performed on the day after the polysomnographic evaluation are routinely indicated in the evaluation of suspected narcolepsy [6.3] <sup>(8)</sup>.**

#### 4.3.4 Technical considerations

4.3.4.1 The minimum channels required for the diagnosis of narcolepsy include EEG, EOG, and chin EMG.

4.3.4.2 Additional cardiorespiratory channels and anterior tibialis recording are recommended because obstructive sleep apnea, upper-airway resistance syndrome, and periodic limb movements are common co-existing conditions in patients with narcolepsy or may be independent causes of sleep fragmentation that lead to short sleep latencies and sleep-onset REM periods. The diagnosis of narcolepsy (or idiopathic hypersomnolence) requires documentation of the absence of other untreated significant disorders that cause excessive daytime sleepiness [6.1.2, 6.3].

4.3.4.3 Standard multiple sleep latency test protocols, including the use of a sound-attenuated room, must be strictly followed [6.3] <sup>(8)</sup>.

4.3.4.4 The use of, or acute withdrawal from, any of numerous medications and illicit drugs can affect the results of polysomnography and the multiple sleep latency test <sup>(8)</sup>. Ideally, patients should be drug-free before sleep testing. The length of the drug effect period is dependent upon the specific pharmacologic agent, but 2 to 4 weeks without medication is often sufficient. Urine toxicology screens may be helpful in selected cases to determine the presence or absence of medication.

4.3.4.5 Initial polysomnography and multiple sleep latency testing occasionally fail to identify narcolepsy. Repeat test-

ing is necessary when the initial results are negative or ambiguous and the clinical history strongly indicates a diagnosis of narcolepsy.

#### 4.3.5 Alternative tools

4.3.5.1 No alternatives to the polysomnogram and multiple sleep latency test have been validated for making the diagnosis of narcolepsy. Although the maintenance of wakefulness test may be useful in assessing treatment adequacy (by measuring the ability to stay awake), it has not been shown to be as valid as the multiple sleep latency test for confirmation of excessive daytime sleepiness and the demonstration of sleep-onset REM periods.

4.3.5.2 HLA (human leukocyte antigen) typing is not routinely indicated as a replacement for polysomnography and the multiple sleep latency test because HLA typing lacks specificity in the diagnosis of narcolepsy. Its use in providing supplementary information depends on the clinical setting.

#### 4.4 Parasomnias and sleep-related epilepsy

Parasomnias are undesirable physiologic phenomena that occur predominantly during sleep. These sleep-related events can be injurious to the patient and others and can produce a serious disruption of sleep-wake schedules and family functioning. Parasomnias may reflect, or be associated or confused with, several diagnoses, including disorders of arousal from NREM sleep (confusional arousals, sleepwalking, sleep terrors), REM-sleep behavior disorder, sleep-related epilepsy, and sleep-related psychiatric disorders [7.1].

Epilepsy is a chronic condition characterized by the occurrence of paroxysmal electrical discharges in the brain and manifested by changes in consciousness, motor control, or sensory function. Seizures and epilepsy can be categorized into many clinical types and epileptic syndromes, often requiring different yet specific approaches to diagnosis and treatment. In 15-20% of patients with epilepsy, seizures occur mostly or exclusively during sleep (sleep-related epilepsy) [7.1]. In the largest reported case series of difficult-to-diagnose paroxysmal nocturnal behaviors, approximately 50% of patients were ultimately diagnosed with sleep-related epilepsy [7.3.2].

#### 4.4.1 General evaluation

4.4.1.1 A clinical history of any parasomnia must include as precise a description as possible of the characteristics and frequency of the sleep-related behavioral spells.

4.4.1.2 Common, uncomplicated, noninjurious parasomnias, such as typical disorders of arousal, nightmares, enuresis, somniloquy, and bruxism, can usually be diagnosed by clinical evaluation alone [7.3.1, 7.3.3].

4.4.1.3 A clinical history, neurologic examination, and a routine EEG obtained while the patient is awake and asleep are often sufficient to establish the diagnosis and permit the appropriate treatment of sleep-related epilepsy. The need for a routine EEG should be based on clinical judgment and the likelihood that the patient has epilepsy.

#### 4.4.2 Additional validated stratification factors

There are no additional validated stratification factors.

#### 4.4.3 Clinical indications

4.4.3.1 Polysomnography, including video recording and additional EEG channels in an extended bilateral montage, is routinely indicated to assist with the diagnosis of paroxysmal arousals or other sleep disruptions that are thought to be seizure related when the initial clinical evaluation and results of a standard EEG are inconclusive [7.3.1, 7.3.3].

4.4.3.2 Polysomnography is indicated in evaluating sleep-related behaviors that are violent or otherwise potentially injurious to the patient or others [7.3.1].

4.4.3.3 Polysomnography is indicated when evaluating patients with sleep behaviors suggestive of parasomnias that are unusual or atypical because of the patient's age at onset; the time, duration, or frequency of occurrence of the behavior; or the specifics of the particular motor patterns in question (e.g. stereotypical, repetitive, or focal) [7.3.1].

4.4.3.4 Polysomnography may be indicated in situations with forensic considerations, (e.g. if onset follows trauma or if the events themselves have been associated with personal injury) [7.3.1].

4.4.3.5 Polysomnography may be indicated when the presumed parasomnia or sleep-related epilepsy does not respond to conventional therapy [7.3.2].

4.4.3.6 Polysomnography is not routinely indicated in cases of typical, uncomplicated, and non-injurious parasomnias when the diagnosis is clearly delineated [7.3.1].

4.4.3.7 Polysomnography is not routinely indicated for

patients with epilepsy who have no specific complaints consistent with a sleep disorder [7.3.2, 7.3.5].

#### 4.4.4 Technical considerations

4.4.4.1 The minimum channels required for the diagnosis of parasomnias or sleep-related epilepsy include sleep-scoring channels (EEG, EOG, chin EMG); EEG using an expanded bilateral montage; and EMG for body movements (anterior tibialis or extensor digitorum). Audiovisual recording and documented technologist observations during the period of study are also essential [7.3.4].

4.4.4.2 Interpretation of polysomnography with video and extended EEG montage requires skills in both sleep medicine and seizure recognition. Polysomnographers and electroencephalographers who are not experienced or trained in recognizing and interpreting both polysomnographic and electroencephalographic abnormalities should seek appropriate consultation or should refer patients to a center where this expertise is available [7.3.4].

4.4.4.3 A paper speed of at least 15 mm/second and preferably 30 mm/second is recommended to enhance the recognition of seizure activity. In digital EEG recordings, the sampling rate must be adequate to identify brief paroxysmal discharges; this sampling rate is approximately 200 Hz [7.3.4].

#### 4.4.5 Alternative tools

The diagnosis of sleep-related epilepsy can often be made with EEG or video EEG recording alone. There is no alternative to polysomnography for the electrophysiologic diagnosis of the parasomnias noted in Sections 4.4.3.2 and 4.4.3.3, e.g. sleep-related behaviors that are violent or otherwise potentially injurious to the patient or others and parasomnias that are unusual or atypical because of the patient's age at onset; the time, duration, or frequency of occurrence of the behavior; or the specifics of the particular motor patterns in question.

#### 4.5 Restless legs syndrome and periodic limb movement disorder

Restless legs syndrome is a neurologic disorder characterized by disagreeable leg sensations that usually occur at rest or before sleep and are alleviated by motor activity. Periodic limb movements are involuntary, stereotypic, repetitive limb movements that may occur during sleep and usually involve the legs and, occasionally, the arms. Periodic limb movements during sleep often accompany restless legs syndrome. Periodic limb movement disorder is

a sleep disorder characterized by periodic limb movements that cause frequent arousals and lead to insomnia or excessive daytime sleepiness.

The results of polysomnographic studies from patients with severe restless legs syndrome often show prolonged sleep latencies, decreased sleep efficiency, increased number of awakenings, significant reductions in total sleep time, and decreased amounts of slow-wave sleep [8.3.1]. Patients with periodic limb movement disorder often have frequent periodic limb movements that are associated with arousals and awakenings, reduced total sleep time, and decreased sleep efficiency [8.3.2].

#### 4.5.1 General evaluation

The evaluation should include a clinical history; physical examination; and, in circumstances when indicated, complete blood count, urinalysis, and screening chemistries with particular focus on the signs, symptoms, and findings of restless legs syndrome, periodic limb movement disorder, and the various medical syndromes (such as anemia, uremia, diabetes, and medication use or withdrawal) that may be associated with the syndromes. The clinical history should include bedpartner observation, if possible, with special emphasis on complaints of leg discomfort, the occurrence of leg or body jerks and restless sleep, and reports of insomnia or excessive daytime sleepiness.

#### 4.5.2 Additional stratification factors

There are no additional stratification factors.

#### 4.5.3 Clinical indications for the use of polysomnography

**4.5.3.1 Polysomnography is indicated when a diagnosis of periodic limb movement disorder is considered because of complaints by the patient or an observer of repetitive limb movements during sleep and frequent awakenings, fragmented sleep, difficulty maintaining sleep, or excessive daytime sleepiness [8.3.2].**

The diagnosis of periodic limb movement disorder can be established only by polysomnography. The diagnosis of periodic limb movement disorder requires quantification of periodic limb movements and periodic limb movement-related arousals, assessment of the impact of the movements upon sleep architecture, and identification and exclusion of other sleep disorders.

**4.5.3.2 Polysomnography is not routinely indicated to diagnose or treat restless legs syndrome [8.3.1].**

#### 4.5.4 Technical considerations

**4.5.4.1 The minimum channels required for the evaluation of periodic limb movements and related arousals include EEG, EOG, chin EMG, and left and right anterior tibialis surface EMG. Respiratory effort, airflow, and oximetry should be used simultaneously if sleep apnea or upper-airway resistance syndrome is suspected to allow a distinction to be made between inherent periodic limb movements and those limb movements associated with respiratory events [8.3.3].**

**4.5.4.2 Intra-individual night-to-night variability exists in patients with periodic limb movement disorder, and a single study might not be adequate to establish this diagnosis [8.3.2].**

#### 4.5.5 Alternative tools

There are no alternative tools.

### 4.6 Depression with insomnia

Depression with insomnia is characterized by the complaint of difficulty with sleep associated with a psychiatric diagnosis of unipolar or bipolar illness. Difficulty with sleep maintenance, difficulty with sleep onset, and early morning awakenings may all be present. Daytime fatigue may also be present, although there is little evidence to suggest that true physiologic sleepiness is present, except in depression with hypersomnia (seasonal affective disorder or bipolar depression). During the manic phase of a bipolar disorder, sleep may be markedly reduced in amount without the patient having a concurrent complaint of insomnia. Most studies on sleep in depression focus on patients with unipolar depression or patients in the depressed phase of bipolar illness.

#### 4.6.1 General evaluation

A clinical history is essential in establishing the characteristics of the patient's insomnia. A psychiatric evaluation provides information for the diagnosis of depression. Previously published practice parameters address the use of polysomnography in the evaluation of insomnia <sup>(11)</sup>.

#### 4.6.2 Additional validated stratification factors

Structured psychiatric interviews as well as paper-and-pencil tests, including the Beck Depression Inventory and the Hamilton Rating Scale for Depression, establish the diagnosis of depression.

#### 4.6.3 Clinical indications for the use of polysomnography

**Neither a polysomnogram nor a multiple sleep latency test is routinely indicated in establishing the diagnosis of depression [9.4.2].**

No characteristics of sleep architecture are specific for the diagnosis of depression. A diagnosis of depression does not in and of itself preclude polysomnographic evaluation if the patient's symptoms and history are indicative of a diagnosis that requires polysomnographic evaluation. Other common sleep disorders can also produce fatigue, tiredness, or sleepiness, symptoms that may suggest depression.

#### 4.6.4 Technical considerations

4.6.4.1 A number of pharmacologic agents used to treat depression can affect sleep [9.4.2]. The clinician must consider these effects when interpreting a polysomnogram or multiple sleep latency test performed on a patient who takes these medications.

4.6.4.2 Except for those patients who are being evaluated for narcolepsy, patients who have depression and are being evaluated for a coexisting sleep disorder, e.g. sleep-related breathing disorder, usually do not need to stop taking antidepressant medications. Because the diagnosis of narcolepsy is dependent upon the observation of pathologic alterations in REM sleep, however, the outcome of the evaluation may be inaccurate if polysomnography is performed while the patient is taking these REM-altering medications. Although antidepressants can affect sleep architecture in other sleep disorders and may affect the occurrence of parasomnias and periodic limb movements, patients may face significant risks in controlling depression if antidepressant medications are discontinued. In addition, because patients with depression often require the use of antidepressant medications for a long period of time, the results of a study performed with the patient off medications may not be representative of the patient's usual circumstances and sleep symptoms.

#### 4.6.5 Alternative tools

For the diagnosis of depression, with or without insomnia, a variety of other diagnostic psychiatric tests exist.

### 4.7 Circadian rhythm sleep disorders

Circadian rhythm sleep disorders result from a mismatch between an individual's sleep pattern and the timing and amount of sleep that the person desires, needs, requires, or expects. The six types of rhythm disorders are time zone change (jet lag) disorder, shift-work disorder, irregular sleep-wake patterns, delayed sleep-phase syndrome, advanced sleep-phase syndrome, and non-24-hour sleep-wake disorder [10.1].

#### 4.7.1 General evaluation

A clinical history in conjunction with a multiweek sleep diary should be obtained to assess the consistency and patterns of sleep and to identify details suggesting other etiologies.

#### 4.7.2 Additional validated stratification factors

There are no additional validated stratification factors.

#### 4.7.3 Clinical indications

**Polysomnography is not routinely indicated for the diagnosis of circadian rhythm sleep disorders [10.3].**

#### 4.7.4 Technical considerations

There are no technical considerations.

#### 4.7.5 Alternative tools

Actigraphy may be a useful adjunct to a clinical history, physical examination, and subjective sleep diary in the evaluation of circadian rhythm disorders in select circumstances <sup>(12)</sup>.

### 5.0 SYMPTOM-BASED APPROACH

In Section 4, the indications for polysomnography and other sleep-testing procedures were categorized according to specific disorders. This approach was selected because most of the peer-reviewed medical literature is organized and indexed by diseases and disorders. However, patients present to their physicians with signs and symptoms, not diagnoses. The physician must first establish a differential diagnosis based on information provided by the clinical history and physical examination, and then select diagnostic tests that confirm the diagnosis in a cost-effective manner, avoid overlooking a treatable disorder, and minimize the risk and inconvenience of diagnostic testing.

Obtaining an accurate, historic description of sleep-related behavior is often limited by the patient's reduced awareness during sleep. Moreover, the cardinal symptoms of excessive daytime sleepiness, insomnia, and unrefreshing sleep lack diagnostic specificity. Polysomnography can be inconvenient and expensive but presents minimal, if any, risk to the patient. Attempts to select polysomnography for some, but not all, patients who present sleep-related complaints are limited by the lack of a precise correlation between levels of disease severity and adverse consequences if the disorders remain untreated.

Patients present signs and symptoms, not diagnoses; therefore, the task force created a set of algorithms based upon the evidence-based analysis from Section 4 (Diagnosis-Based Recommendations) to help the clinician identify logical and useful indications for polysomnogra-

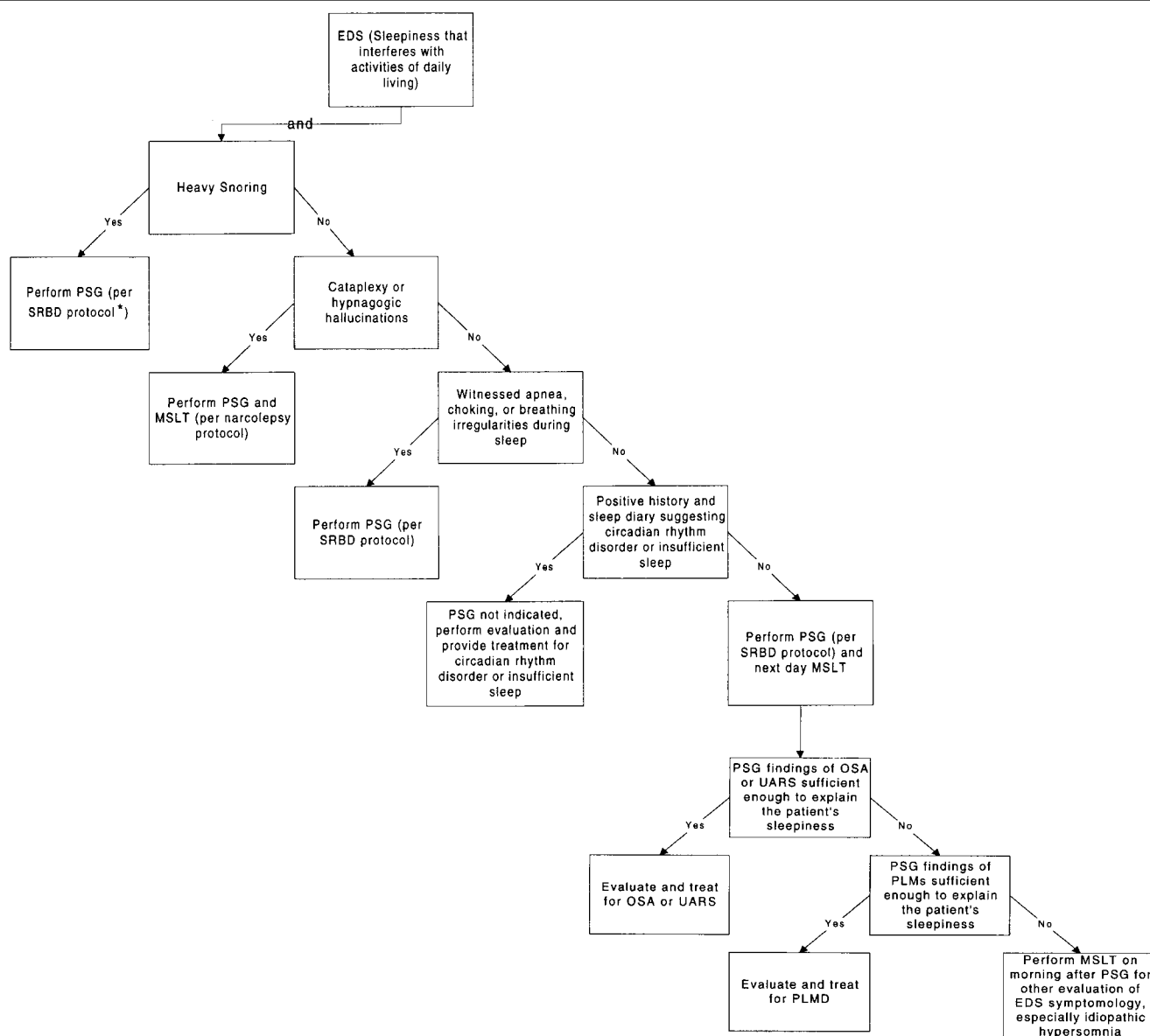
phy. These algorithms clarify the indications for various types of sleep medicine procedures in some of the most common patient presentations. Clinical situations are too diverse to provide precise algorithms for every situation; instead, the algorithms provide a systematic way for the practitioner to evaluate the three most common clinical problems for which a sleep medicine procedure is usually considered--excessive daytime sleepiness, abnormal behavior or activity during sleep, and snoring (Figs. 1-3). The aim is to start from one of the common presenting symptoms and end with one or more diagnoses. It is not simply to decide if a single disorder is present or absent.

The recommendations in this paper and the algorithms in this section are presented to practitioners as guidelines. In clinical practice, it will often be necessary to generalize to the actual conditions with which patients present, including

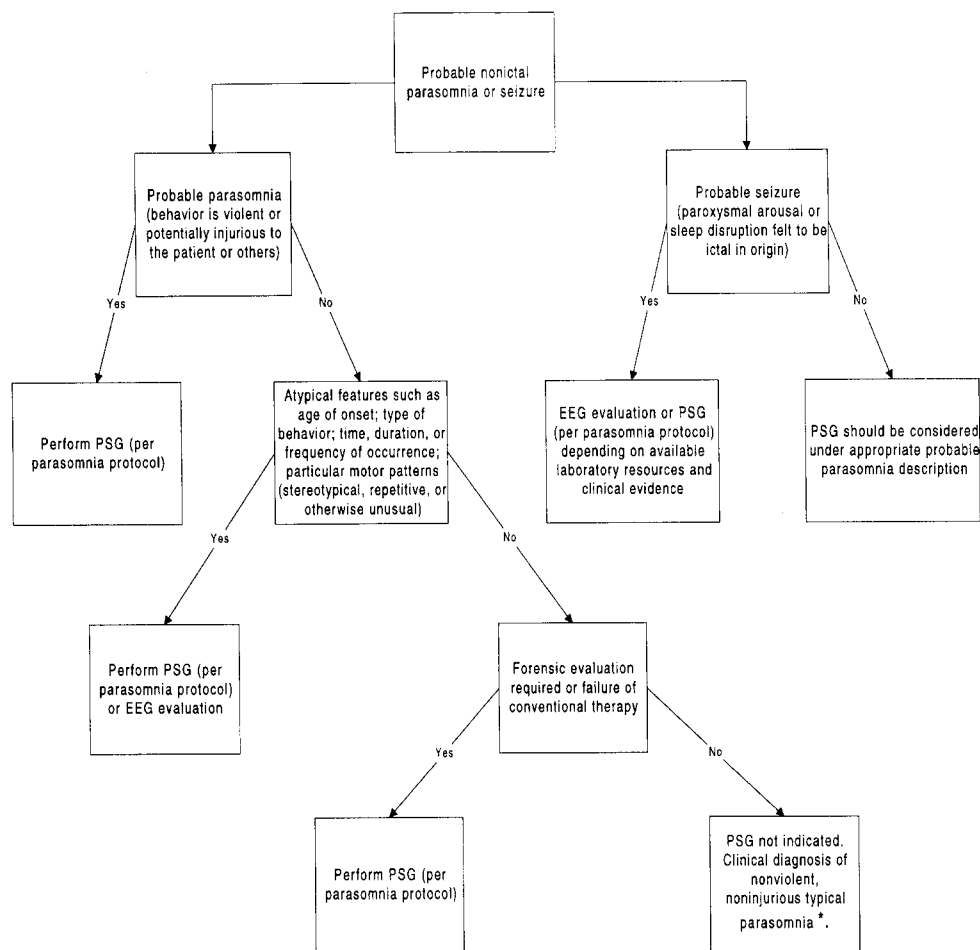
situations not described in this paper. These guidelines and algorithms should not take the place of clinical judgment. Thus, a patient with severe oxygen desaturations and arrhythmias associated with REM sleep may need CPAP treatment even if the actual frequency of recorded apneic events, averaged across the night, is low. In atypical clinical presentations, careful documentation of the clinician's reasoning provides the best rationale for decisions concerning appropriate testing.

## 6.0 LIMITS OF EVIDENCE-BASED CLINICAL AND ECONOMIC ANALYSIS

Polysomnographic testing is time consuming and labor intensive. Patients, physicians, and health care system administrators are increasingly concerned with the cost



**Figure 1.** Evaluation of excessive daytime sleepiness. Description of the use of specific protocols is described in Section 4. (Diagnosis-Based Recommendations). EDS, excessive daytime sleepiness; PSG, polysomnography; SRBD, sleep-related breathing disorder; MSLT, multiple sleep latency test; UARS, upper-airway resistance syndrome; PLMs, periodic limb movements; PLMD, periodic limb movement disorder. \*In certain patients with a high probability of having sleep apnea, other sleep medicine procedures could be an alternative to polysomnography in this pathway.



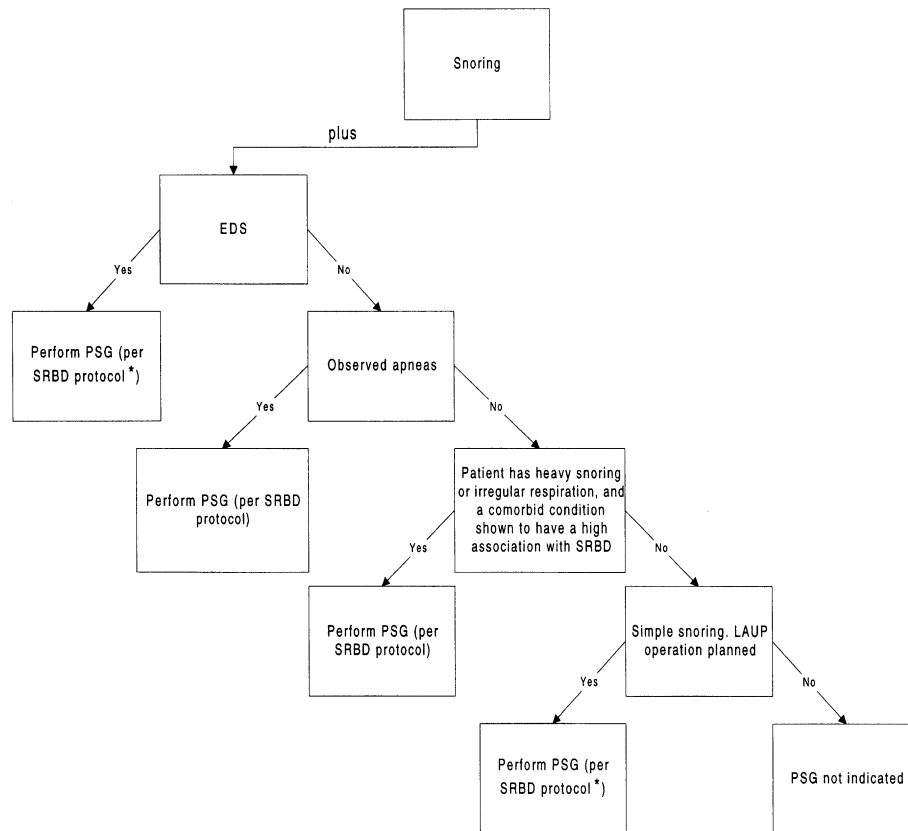
**Figure 2.** Evaluation of abnormal behavior or activity during sleep. Description of the use of specific protocols is provided in Section 4 (Diagnostic-Based Recommendations). PSG, polysomnography; EEG, electroencephalography. \*Typical parasomnias usually include confusional arousal, nightmare, enuresis, sleep-walking, sleep terrors, or bruxism.

effectiveness of all diagnostic testing. Randomized controlled trials and outcome studies can establish the cost effectiveness of diagnostic and therapeutic interventions. By measuring resource use and risk in a well-designed outcome study, clinical researchers can calculate the ratio of effectiveness to cost. Based on this evidence, the patient, the physician, or a health-care system administrator will be able to select a point in the ratio at which an intervention is deemed to be beneficial. For sleep-testing procedures, however, such studies and direct evidence are not yet available.

Several underlying factors can confound cost-effective polysomnographic testing. The cost of recording, scoring, and interpreting polysomnography often increases with the number of physiologic parameters (channels) recorded and with the need to have a technologist present throughout the recording. Although some patients may be well served by choosing more convenient, simpler, less expensive methods of sleep testing, others will not. Patients, physicians, and third-party payers need to consider several caveats.

Peer-reviewed evidence in the medical literature con-

firms that cardiorespiratory sleep studies (which limit the number of recording channels to airflow, respiratory effort, oxygen saturation, and ECG or snoring) can produce false-negative results in patients with mild to moderate apnea and should be reserved for patients for whom the probability of having moderate to severe obstructive sleep apnea is high [4.3.2.2]. A patient who continues to have excessive daytime sleepiness but a negative cardiorespiratory sleep study usually requires further testing with a full polysomnographic study to determine other etiologies, such as upper-airway resistance syndrome, narcolepsy, idiopathic hypersomnia, or periodic limb movement disorder. The marginal savings created by using cardiorespiratory sleep studies in some patients may be lost when the need arises to repeat studies in nondiagnosed patients. When the probability of sleep apnea as the cause of the patient's excessive daytime sleepiness is less certain, an initial full polysomnographic study appears to be the more cost-effective test. Cardiorespiratory sleep studies, if used, should be limited to patients for whom the diagnosis of obstructive sleep apnea is highly probable or as a follow-up tool in



**Figure 3.** Evaluation of snoring. Description of the use of specific protocols is provided in Section 4 (Diagnostic-Based Recommendations). EDS, excessive daytime sleepiness; PSG, polysomnography; SRBD, sleep-related breathing disorder; LAUP, laser-assisted uvulopalatoplasty. \*In certain patients with a high probability of having sleep apnea, other sleep medicine procedures could be an alternative to polysomnography.

selected circumstances [4.3.2.2].

Sampling errors can affect the diagnostic accuracy of polysomnography. There are patients with sleep apnea, upper-airway resistance syndrome, periodic limb movement disorder, or parasomnias for whom a single night of polysomnography does not confirm the diagnosis.

Examples of clinical and economic situations involving sleep-testing procedures for which direct evidence is inadequate include the following: when decisions must be made concerning where on the continuum of sleep test results (e.g. apnea-hypopnea index or level of desaturation) specific abnormal physiologic consequences typically occur; occasions when benefits of increasing the number of channels of data (to improve diagnostic abilities in difficult cases) must be weighed against the associated increases in cost; situations in which polysomnography is used to help identify relative contributions of interrelated conditions in a given patient (e.g. asthma, coronary artery disease, and obstructive sleep apnea); and, finally, cases where clinicians help patients decide whether quality of life will be improved by a particular intervention (compared with applying the time, money, and energy in a different way).

## 7.0 PROCEDURE CODING

This section links sleep medicine procedures in the American Medical Association's Current Procedural Terminology (CPT) manual with diagnoses and indications for which the respective codes are likely to be useful (4). The associations presented are based on judgments concerning the best matches between those codes available for use in the CPT and the information contained in sections 4 and 5 and with best matches between the CPT codes and recommendations made in previously published practice parameters. Physicians should use their clinical judgment. Third-party payers should be alert to problems that may arise from inflexible application of these suggestions.

Sleep medicine procedures (or "sleep testing procedures", as they are generically referred to in the CPT), include polysomnography, cardiopulmonary sleep studies, and the multiple sleep latency test. The maintenance of wakefulness test and CPAP testing will be added to the CPT in 1998. The preamble to the CPT sleep-testing subsection states:

*Sleep studies and polysomnography refer to the continuous and simultaneous monitoring and recording of various*

*physiological and pathophysiological parameters of sleep for six or more hours with physician review, interpretation and report. The studies are performed to diagnose a variety of sleep disorders and to evaluate a patient's response to therapies such as nasal continuous positive airway pressure (NCPAP). Polysomnography is distinguished from sleep studies by inclusion of sleep staging, which is defined to include a 1-4 lead electroencephalogram (EEG), electro-ocu-logram (EOG), and a submental electromyogram (EMG). Additional parameters of sleep include: 1) ECG; 2) airflow; 3) ventilation and respiratory effort; 4) gas exchange by oximetry, transcutaneous monitoring, or end tidal gas analysis; 5) extremity muscle activity, motor activity-movement, 6) extended EEG monitoring; 7) penile tumescence; 8) gastroesophageal reflux; 9) continuous blood pressure monitoring; 10) snoring; 11) body positions; etc.*

*For a study to be reported as polysomnography, sleep must be recorded and staged. (Report with a -52 modifier if less than 6 hours of recording or in other case of reduced services as appropriate).*

The sleep medicine procedures currently in the CPT include the procedures listed in Sections 7.1 through 7.4 below. In 1996, the American Sleep Disorders Association proposed to the American Medical Association a revision of two existing CPT codes and recommended the addition of two new CPT codes. The revised and new CPT codes are scheduled to become effective January 1, 1998, and are listed as revisions in Sections 7.3 through 7.4 and as new codes in Sections 7.5 and 7.6 below.

*Note:* In clinical practice, respiratory monitoring is usually performed not only when a sleep-related breathing disorder (SRBD) is the primary suspected diagnosis (i.e. most of those listed under 95810), but also in most of the situations where other etiologies may be more likely but some features suspicious for SRBDs exist (especially EDS), because SRBDs (primarily apnea or UARS) are in the differential and—even if an infrequent or occasional finding—the consequences of a misdiagnosis are potentially high. If sleep apnea is well excluded by history and bed-partner information, then 95808 could be indicated, as noted in Section 7.2.1 below.

### **7.1 Polysomnography, sleep staging with four or more additional parameters of sleep, attended by a technologist (CPT code 95810)**

Polysomnography, as identified here, includes recording from one to four leads of EEG, chin EMG, and EOG for the determination of sleep stage. Additional parameters usually recorded include airflow to determine the presence of apneas, respiratory effort to determine the type of apneas, oximetry to determine desaturation with apneas, and ECG to determine the presence of arrhythmias with apneas.

Other parameters may be recorded as needed. Possible additional parameters are detailed in Section 1.0 (Introduction).

### **7.1.1 Task force recommendations for use of CPT code 95810**

#### **7.1.1.1 Indicated**

1) With medical features of sleep apnea syndrome, as suggested by the presence of snoring and excessive daytime sleepiness

2) With medical features of sleep apnea syndrome, as suggested by the presence of observed apneas or nocturnal choking or gasping

3) When abnormal behavior in sleep is atypical or has violent features and the patient has features suspicious for a sleep related breathing disorder

4) When sleep is interrupted and limb movements in sleep are observed and the patient has features suspicious for a sleep-related breathing disorder

5) Preceding a multiple sleep latency test for the diagnosis of disorders of excessive daytime sleepiness when the patient has features suspicious for a sleep-related breathing disorder (for MSLT indications, see Section 7.4)

#### **7.1.1.2 May be indicated, depending on clinical justification**

1) For follow-up studies, when a diagnosis of sleep apnea has been established by prior sleep testing and therapy has been initiated, to evaluate response to therapy

2) For the evaluation of suspected sleep-related seizures or atypical parasomnias and the patient has features suspicious for a sleep-related breathing disorder

3) For the evaluation of daytime sleepiness that interferes with performance of routine daily tasks when the patient has no clinical features of cataplexy, hypnagogic hallucinations, or sleep apnea

4) For the evaluation of surgical candidates for laser-assisted uvulopalatoplasty in order to rule out sleep apnea

#### **7.1.1.3 This test may be particularly useful in diagnosing sleep apnea, which includes the following ICD-9-CM diagnoses:**

1) Insomnia with sleep apnea (ICD-9-CM code 780.51)

2) Hypersomnia with sleep apnea (ICD-9-CM code 780.53)

3) Other and unspecified sleep apnea (ICD-9-CM code 780.57)

#### **7.1.1.4 Polysomnography (either 95810 or 95808) is not routinely indicated**

1) When abnormal behavior in sleep characteristic of typical arousal disorders (see Fig. 2 in Section 5) or

2) For the initial evaluation of insomnia in patients without observed limb movements or other clinical features of sleep apnea

3) For the evaluation of snoring in patients without other clinical features of sleep apnea

## **7.2 Polysomnography, sleep staging with one to three additional parameters of sleep, attended by a technologist (CPT code 95808)**

Polysomnography, as identified here, includes recording from one to four leads of EEG, chin EMG, and EOG for the determination of sleep stage. One to three additional parameters, depending on the reason for the study, would also be recorded. For the evaluation of periodic limb movement disorder or dysfunctions associated with sleep stages or arousal from sleep, one additional parameter would typically be the muscle activity of one to four limbs. In the case of sleep-related epilepsy, another additional parameter may be an extended bilateral EEG montage.

### **7.2.1 Task force recommendations for clinical indications for the use of CPT code 95808**

#### **7.2.1.1 Indicated**

1) When abnormal behavior in sleep is atypical or has violent features and the patient does not have features suspicious for a sleep-related breathing disorder

2) When sleep is interrupted, limb movements in sleep are observed, and the patient does not have other features suspicious for a sleep related breathing disorder

3) For the evaluation of suspected sleep-related seizures or atypical parasomnias and the patient does not have features suspicious for a sleep-related breathing disorder

4) Preceding a multiple sleep latency test for the diagnosis of disorders of excessive daytime sleepiness, when the patient does not have features suspicious for a sleep-related breathing disorder (for MSLT indications, see Section 7.4)

#### **7.2.1.2 May be indicated depending on clinical justification**

1) Preceding a multiple sleep latency test for follow-up studies to evaluate the response to therapy when prior sleep testing has established the diagnosis of a disorder of excessive sleepiness other than a sleep-related breathing disorder

2) When a follow-up study is clinically justified, and prior sleep testing has established the diagnosis of a disorder of excessive sleepiness other than a sleep-related breathing disorder

3) For the evaluation of chronic persistent insomnia that does not respond to initial treatment and the patient does not have features suspicious for a sleep-related breathing disorder

### **7.2.1.3 This test may be particularly useful in diagnosing the following conditions:**

1) Narcolepsy (ICD-9-CM code 347)

2) Idiopathic CNS hypersomnia (ICD-9-CM code 780.54)

3) Other insomnia (ICD-9-CM code 780.52)

4) Periodic limb movement disorder (ICD-9-CM code 780.54)

5) Dysfunctions associated with sleep stages or arousal from sleep (ICD-9-CM code 780.56) for example, REM-sleep behavior disorder, nocturnal paroxysmal dystonia, sleep-related epilepsy

### **7.2.1.4 Polysomnography (either 95810 or 95808) is not routinely indicated**

1) When abnormal behavior in sleep characteristic of typical arousal disorders (see Fig. 2 in Section 5)

2) For the initial evaluation of insomnia in patients without observed limb movements or other clinical features of sleep apnea

3) For the evaluation of snoring in patients without other clinical features of sleep apnea

## **7.3 Sleep study, three or more parameters of sleep other than sleep staging, attended by a technologist (CPT code 95807)**

This procedure will be revised effective January 1, 1998, and is expected to read as follows: Sleep study, simultaneous recording of ventilation, respiratory effort, ECG or heart rate, and oxygen saturation, attended by a technologist.

A sleep study occurs during presumed sleep. However, it does not electroencephalographically determine at any given time whether the patient is awake or asleep and in stage 1, 2, 3, 4, or REM sleep. Usual data calculations based on sleep (including, but not limited to, apnea-hypopnea index and respiratory disturbance index) cannot be made. Attendance by a technologist allows a mechanism to ensure adequate quality of data collection during the recording.

### **7.3.1 Task force recommendations for clinical indications for the use of CPT code 95807**

#### **7.3.1.1 Indicated**

When the patient can be placed in the stratification group that has a high risk of having moderate to severe sleep apnea, as suggested by the simultaneous presence of snoring, excessive daytime sleepiness, obesity, and observed apneas or nocturnal choking or gasping, and when follow-up policies exist to address false-negative results (see Section 4.1).

### 7.3.1.2 May be indicated, depending on clinical justification

1) For follow-up studies, when a diagnosis of sleep apnea has been established by sleep testing and therapy has been initiated, to evaluate response to therapy when an assessment of sleep is not needed

2) To assess patients before they undergo laser-assisted uvulopalatopharyngoplasty if an assessment of sleep is not needed

### 7.3.1.3 Not routinely indicated

For the initial evaluation of sleep apnea when the patient is not in the stratification group that has a high risk of having moderate to severe sleep apnea or if a negative study will not be further assessed as a potential false negative. In these situations, refer to CPT code 95810.

### 7.3.1.4 This test may be particularly useful in diagnosing sleep apnea, which includes the following ICD-9-CM diagnoses, if the patient has first been stratified to a group at high risk for having sleep apnea

- 1) Insomnia with sleep apnea (ICD-9-CM code 780.51)
- 2) Hypersomnia with sleep apnea (ICD-9-CM code 780.53)
- 3) Other and unspecified sleep apnea (ICD-9-CM code 780.57)

## 7.4 Multiple sleep latency testing (MSLT), recording, analysis, and interpretation of physiological measurements of sleep during multiple nap opportunities (CPT code 95805)

This procedure will be revised effective January 1, 1998, and is expected to read as follows: Multiple sleep latency or maintenance of wakefulness testing, recording, analysis and interpretation of physiological measurements of sleep during multiple trials to assess sleepiness.

These tests involve multiple trials during the day to objectively assess sleep tendency by measuring the number of minutes it takes the patient to fall asleep. The patient may be instructed to lie down in a dark room, with permission or a suggestion given to sleep (multiple sleep latency test) or to sit up in a dimly lit room and try to stay awake (maintenance of wakefulness test). The multiple sleep latency test is the better test for demonstration of sleep-onset REM periods, a determination that is important in establishing the diagnosis of narcolepsy. Parameters necessary for sleep staging (including one to four channels of EEG, EOG, and chin EMG) are recorded.

### 7.4.1 Task force recommendations for clinical indications for the use of CPT code 95805

### 7.4.1.1 Indicated

1) When excessive daytime sleepiness interferes with the performance of routine daily tasks and clinical features do not suggest a diagnosis of sleep apnea

2) When the multiple sleep latency test is needed to demonstrate sleep-onset REM periods for the diagnosis of narcolepsy

### 7.4.1.2 May be indicated, depending on clinical justification

1) When excessive daytime sleepiness interferes with the performance of routine daily tasks and when clinical features of sleep apnea are present and an objective assessment of sleepiness is needed

2) For follow-up studies to evaluate response to therapy when a diagnosis of moderate to severe daytime sleepiness has been previously established by sleep testing

### 7.4.1.3 Not routinely indicated

- 1) When sleepiness is due to voluntary sleep restriction
- 2) When sleepiness is not sufficient to interfere with performance of routine daily tasks

### 7.4.1.4 These tests may be particularly useful in disorders of excessive sleepiness, which include the following ICD-9-CM diagnoses:

- 1) Narcolepsy (ICD-9-CM code 347)
- 2) Hypersomnia with sleep apnea (ICD-9-CM code 780.53)
- 3) Other hypersomnia (ICD-9-CM code 780.54), for example, idiopathic hypersomnia and post-traumatic hypersomnia

Two new procedures are scheduled to be added to the CPT effective January 1, 1998. The CPT codes have not been assigned, but they are expected to read as follows:

## 7.5 Polysomnography, sleep staging with four or more additional parameters of sleep, with initiation of continuous positive airway pressure therapy or bilevel ventilation, attended by a technologist (CPT code 958xx)

Polysomnography—with recording from one to four leads of EEG, chin EMG, and EOG to determine the sleep stage, airflow to determine the presence of apneas, respiratory effort to determine type of apneas, oximetry to determine desaturation with apneas, and ECG to determine the presence of arrhythmias with apneas—is used during the initiation of CPAP therapy or bi-level ventilation to determine the correct pressure settings to use in patients with symptomatic sleep apnea that has been documented by previous sleep testing.

## 7.5.1 Task force recommendations for clinical indications for the future use of this CPT code

### 7.5.1.1 Indicated

In those patients for whom the titration of CPAP is indicated

### 7.5.1.2 Not routinely indicated

- 1) For the treatment of snoring without sleep apnea
- 2) For the treatment of excessive daytime sleepiness without sleep apnea or upper-airway resistance syndrome

## 7.5.2 This test may be particularly useful in determining treatment for sleep apnea, which includes the following ICD-9-CM diagnoses:

- 1) Insomnia with sleep apnea (ICD-9-CM code 780.51)
- 2) Hypersomnia with sleep apnea (ICD-9-CM code 780.53)
- 3) Other and unspecified sleep apnea (ICD-9-CM code 780.57)

## 7.6 Sleep study, simultaneous recording of ventilation, respiratory effort, ECG, or heart rate, and oxygen saturation, unattended by a technologist (CPT code 958yy)

A sleep study occurs during presumed sleep, but this test does not electroencephalographically determine at any given time whether the patient is awake or asleep (and in stage 1, 2, 3, 4, or REM sleep). Usual data calculations based on sleep (including, but not limited to, apnea-hypopnea index and respiratory disturbance index) cannot be made. The lack of attendance by a technologist means that no mechanisms exist to intervene and ensure adequate quality of data collection during the recording.

## 7.6.1 Task force recommendations for clinical indications for the future use of this CPT code

### 7.6.1.1 Indicated

For the evaluation of nonambulatory patients, or medically unstable inpatients who cannot be moved to another hospital location, who likely have sleep apnea.

### 7.6.1.2 May be indicated, depending on clinical justification

For follow-up studies, when a diagnosis of sleep apnea has been established by standard polysomnography and therapy has been initiated, to evaluate response to therapy when an assessment of sleep is not needed.

### 7.6.1.3 Not routinely needed

As the initial diagnostic test in an ambulatory patient with medical features of sleep apnea syndrome.

## 7.6.1.4 This test may be particularly useful in diagnosing sleep apnea, which includes the following ICD-9-CM diagnoses:

- 1) Insomnia with sleep apnea (ICD-9-CM code 780.51)
- 2) Hypersomnia with sleep apnea (ICD-9-CM code 780.53)
- 3) Other and unspecified sleep apnea (ICD-9-CM code 780.57)

## REFERENCES

1. National Commission on Sleep Disorders Research. A report of the National Commission on Sleep Disorders Research. Wake up America: a national sleep alert, vol. 2. Washington, DC: U.S. Government Printing Office 1995:10.
2. Polysomnography Task Force, Chesson AL, Chairman. American Sleep Disorders Association. The indications for polysomnography. Sleep 1997;20:423-487.
3. Agency for Health Care Policy and Research. Polysomnography and sleep disorder centers. AHCPR Publications No. 92-0027. Health Technol Assess Rep 1991;4:1-22.
4. American Medical Association. Physicians' current procedural terminology, 4th ed. Chicago: American Medical Association, 1994;625-9.
5. American Sleep Disorders Association. Practice parameters for the use of laser-assisted uvulopalatoplasty. Sleep 1994;17:744-8.
6. American Sleep Disorders Association. Practice parameters for the treatment of snoring and obstructive sleep apnea with oral appliances. Sleep 1995;18:511-3.
7. American Sleep Disorders Association. Practice parameters for the treatment of obstructive sleep apnea in adults: the efficacy of surgical modifications of the upper airway. Sleep 1996;19:152-5.
8. American Sleep Disorders Association. The clinical use of the multiple sleep latency test. Sleep 1992;15:268-76.
9. Sleep Disorders Atlas Task Force. EEG arousals: scoring rules and examples. Sleep 1992;15:173-84.
10. American Sleep Disorders Association. Practice parameters for the use of portable recording in the assessment of obstructive sleep apnea. Sleep 1994;17:372-7.
11. American Sleep Disorders Association. Practice parameters for the use of polysomnography in the evaluation of insomnia. Sleep 1995;18:55-7.
12. American Sleep Disorders Association. Practice parameters for the use of actigraphy in the clinical assessment of sleep disorders. Sleep 1995;18:285-7.

### Reprinted from *SLEEP*

Chesson et al. Practice Parameters for the Indications for Polysomnography and Related Procedures. *SLEEP* 1997; 20:406-422.