

Evaluation of Excessive Daytime Sleepiness

Kevin Ruggles, MD; Nancy Hausman, MD

ABSTRACT

Excessive Daytime Sleepiness (EDS) is a difficult clinical problem, which is often indicative of a serious underlying physiologic condition. EDS is associated with automobile accidents, work-related injury, and increased use of the health care system, but it appears to be under-appreciated despite its common occurrence. There are many causes of EDS, ranging from insufficient sleep or inadequate sleep hygiene to drug effects and serious medical conditions. Assessment of EDS should begin with a detailed clinical history, and may also include self-rated instruments and ultimately physiologic tests to measure propensity to fall asleep or stay awake. Ultimately, evaluation in the sleep laboratory is often required in order to arrive at an accurate diagnosis and an appropriate therapeutic recommendation.

INTRODUCTION

Excessive Daytime Sleepiness (EDS) is defined in the *International Classification of Sleep Disorders (ICSD)* based on the behavior of falling asleep, including difficulty maintaining alertness or wakefulness and unintentionally falling asleep.¹

In clinical practice, the complaint of sleepiness is commonly interpreted to include drowsiness, low vitality, and tiredness, as well as uncontrolled sleepiness.² A difficult clinical problem is separating true EDS from generalized fatigue or lassitude. The former is a specific symptom complex, usually indicative of a significant potentially serious physiologic condition, whereas the latter is often vague and nonspecific and may be associated with a wide array of medical or psychological conditions.

The prevalence and clinical significance of EDS of all causes is difficult to quantify. Reports of prevalence of

daytime hypersomnolence in various studies ranges from around 3% in randomly selected drivers³ to 20% in an elderly cohort,⁴ and as high as 22.6% in a study of EDS and risk of occupational injuries in non-shift daytime workers.⁵ Multiple studies have suggested that EDS, whether or not it is associated with sleep apnea, is a significant risk factor for automobile accidents, work-related injury, and increased use of the health care system.^{3,5-8} In Wisconsin, the recommendation has been made to consider restrictions for drivers with documented EDS until accurate diagnosis and treatment has been accomplished and reversal of EDS is demonstrated by objective neurophysiological testing.⁹ Despite all of this, there is evidence in the literature that EDS disorders continue to be under-diagnosed and consequently under-treated.^{10,11}

There are many causes of EDS, ranging from insufficient sleep or inadequate sleep hygiene to drug effects and serious medical conditions.¹² Sleep apnea is commonly touted as the most common cause of EDS in adults, and in a Wisconsin cohort of working-age adults, the sleep apnea syndrome (apnea-hypopnea score of 5 or higher and daytime hypersomnolence) was estimated to affect 2% of women and 4% of men.¹³ While sleep apnea is clearly one of the most medically significant sleep disorders, some of the studies cited above suggest that other causes of EDS may be under-appreciated.

At least 65 distinct primary sleep disorders have been noted to cause EDS, and only a few of the more common ones will be briefly mentioned here.¹² In addition to the large number of primary sleep disorders noted, EDS can be a symptom of a myriad of medical, psychological, and neuropsychiatric conditions.¹⁴

ASSESSMENT OF EDS

Assessment of EDS should begin with a detailed clinical history, and may also include self-rated instruments and ultimately physiologic tests to measure propensity to fall asleep or stay awake. Clinical history should aim

Doctor Ruggles is Division Medical Director and Head, Section of Epilepsy and Sleep Disorders, Marshfield Clinic. Doctor Hausman is Director, Marshfield Clinic Sleep Disorders Center.

Table 1. The Epworth Sleepiness Scale

The Epworth Sleepiness Scale score is calculated by totaling the tabulated sub-scores. (0 = would never doze; 1 = slight chance of dozing; 2 = moderate chance of dozing; 3 = high chance of dozing)

Activity	Score
<ul style="list-style-type: none"> • Sitting and reading • Watching TV • Sitting, inactive in a public place (e.g. a theater or a meeting) • As a passenger in a car for an hour without a break • Lying down to rest in the afternoon when circumstances permit • Sitting and talking to someone • Sitting quietly after a lunch without alcohol • In a car, while stopped for a few minutes in the traffic 	
Total	

to identify the problem and attempt to determine whether symptoms suggest true EDS or merely non-specific fatigue. If a patient presents with a complaint of possible EDS or if a suspicion of EDS emerges during an evaluation for another problem, the initial task is to determine the severity and potential significance of the problem. Unfortunately, there is no established reference standard for subjective measures of sleepiness. Therefore, sleepiness identified by any method may be clinically important. Once it is determined that EDS may be present, a detailed sleep history must be obtained in addition to a comprehensive evaluation to exclude potential medical, pharmacological, or psychiatric causes. The sleep history should include sleep schedule, unusual behaviors during sleep, risk factors for sleep disordered breathing or narcolepsy, and a family history of sleep disorders. Much of this may be obtained efficiently by using a sleep questionnaire, which may be obtained by contacting a local accredited sleep program.

The next step may be to employ self-rated instruments that attempt to measure perception of sleepiness. Some instruments attempt to assess the presence of current sleepiness, e.g. Stanford Sleepiness Scale (SSS),¹⁵ whereas others attempt to measure “usual” sleepiness, or that which is sustained over longer periods of time, e.g. Epworth Sleepiness Scale (ESS). Even though the ESS has not been validated in a large number of patients, it is commonly used because it is brief, simple to use and interpret, and can easily be incorporated into a

diagnostic sleep questionnaire (Table 1). If the subjective nature of this tool, and the potential for both false positive and false negative results is understood, the ESS can be a useful adjunct in the evaluation of these patients. Scores of 9 to 10 or greater suggest the possibility of disorders of hypersomnolence (Table 2).¹⁶

DIAGNOSTIC AND THERAPEUTIC CONSIDERATIONS

If the initial evaluation suggests significant EDS and there is not evidence of a behavioral reason, sleep disordered breathing, or a medical, pharmacological, or neuropsychiatric etiology, then a primary disorder of daytime hypersomnolence should be considered. The most important primary sleep disorders that require further evaluation and treatment are narcolepsy, idiopathic central nervous system hypersomnia, and restless legs syndrome (RLS)/periodic limb movements of sleep (PLMS).

Narcolepsy is a central nervous system disorder characterized by excessive sleepiness, cataplexy, and other rapid eye movement (REM) sleep-related phenomena including sleep paralysis and hypnagogic hallucinations. Narcolepsy is clearly among the most distinctive primary sleep disorders, and its genetic basis has been extensively investigated.¹⁷ The mainstay of treatment has been stimulant medications and, more recently, modafinil.^{18,19} Idiopathic central nervous system hypersomnia is less well understood than narcolepsy and probably represents a variety of yet-to-be-defined entities. It is characterized by recurrent daytime sleepiness without the abrupt sleep attacks classically seen in narcolepsy. It does not have the auxiliary REM sleep-related symptoms seen in narcolepsy.²⁰ It also needs to be differentiated from subtle sleep disordered breathing including the upper airway resistance syndrome. Treatments are similar to those used for the hypersomnia of narcolepsy.¹⁸

RLS is an awake phenomenon characterized by an intense irresistible urge to move the legs, usually associated with sensory complaints at rest and relieved (temporary) with movement and increased severity at night. The prevalence of RLS is reported to be as low as 2% and as high as 15%. PLMS is a sleep condition characterized by episodes of repetitive stereotyped limb movements during sleep. Approximately 80% of patients with RLS have PLMS; consequently some PLMS patients are asymptomatic and come to attention because the movements are noted by a sleep partner. The diagnosis of RLS is clinical and the diagnosis of PLMS requires polysomnographic documentation.

Table 2.

Groups of experimental subjects, their ages, and Epworth Sleepiness Scores.¹⁶ Note the low number of subjects and wide range of results, suggesting the potential for significant false positive and false negative results.

Subjects/DX	Total # (M/F)	Age (mean +/- SD)	ESS Scores (mean +/- SD)	Range
Normal controls	30 (14/16)	36.4 +/- 9.9	5.9 +/- 2.2	2-10
Primary snoring	32 (29/3)	45.7 +/- 10.7	6.5 +/- 3.0	0-11
OSA	55 (53/2)	48.4 +/- 10.7	11.7 +/- 4.6	4-23
Narcolepsy	13 (8/5)	46.6 +/- 12.0	17.5 +/- 3.5	13-23
Idiopathic hypersomnia	14 (8/6)	41.4 +/- 14.0	17.9 +/- 3.1	12-24
Insomnia	16 (6/12)	40.3 +/- 14.6	2.2 +/- 2.0	0-6
PLMS	18 (16/2)	52.5 +/- 10.3	9.2 +/- 4.0	2-16

Iron deficiency and end stage renal disease are important co-morbid conditions, which may be associated and should be treated if possible. A wide variety of pharmacologic symptomatic treatments have demonstrated efficacy in the treatment of RLS/PLMS, including levodopa/carbidopa, dopamine agonists, anticonvulsants, oxycodone, and clonidine. Levodopa/carbidopa is generally recommended as the initial therapy of choice,²¹ however, there is increasing recent research and clinical experience using cabergoline, ropinirole, and selegiline.²²⁻²⁴

Other categories of sleep disorders, including parasomnias and circadian rhythm disturbances, may also lead to EDS. Some of those are discussed elsewhere in this issue and will not be further addressed here. The use of light therapy in the treatment of a variety of circadian rhythm disorders has been addressed in practice parameters published by the American Academy of Sleep Medicine (AASM).²⁵

SLEEP LABORATORY EVALUATION

The most objective tools for EDS measurement and documentation are physiological tests performed in a sleep laboratory, and such an evaluation is required for final diagnostic confirmation of the primary disorders of daytime sleepiness. The initial study performed is the all night polysomnogram (PSG), which may confirm sleep-related breathing disorders and PLMS. The reference standard is a monitored study in a fully-equipped sleep laboratory.²⁶ Although portable studies are available for the evaluation of sleep disordered breathing, they should be viewed cautiously and only when the specific technique in question has been properly validated, and then only if standard PSG is not available, if the patient cannot travel to the sleep lab, or for follow-up studies when the diagnosis has been established by monitored PSG.²⁷

The two objective tests that have come into common use for evaluation of daytime sleepiness are the multiple sleep latency test (MSLT) and the maintenance of wakefulness test (MWT). The 1992 AASM guidelines cite the MSLT as the means of establishing a diagnosis of specific sleep disorders or to determine the severity of sleepiness. It should be performed the day after an all night PSG to exclude sleep deprivation as a confounding factor in interpretation of results. The PSG may also assist in the determination of the etiology of EDS, particularly in establishing a diagnosis of sleep apnea or periodic limb movements of sleep. The MSLT has been extensively validated and normative data has been established.²⁸ The ICSD, published in 1997 by the AASM, defines severe sleepiness as a MSLT score 5 or less (average sleep latency of 4 or 5 nap trials = 5 minutes or less) and moderate sleepiness as a score between 5 and 10.¹ The MSLT is the reference standard in the diagnosis of narcolepsy. The MWT may be thought of as the converse of the MSLT in that it involves similar test conditions, however the instructions to the patient are to attempt to maintain wakefulness rather than to try to fall asleep. It was designed to measure the ability to remain awake and has been used to assess efficacy of therapy.²⁹ Some data suggests that the MSLT and MWT measure different dimensions of sleepiness, however both measures produced similar findings in a multicenter trial of modafinil.^{19,30}

CONCLUSION

There is extensive evidence suggesting that EDS is a common condition, which results in a significant public health burden. Patients suffering from EDS are at increased risk for automobile accidents and work-related injury in addition to the increased risk of medical conditions associated with sleep apnea. There is also evidence that sleep disorders in general, and EDS in particular, are under-diagnosed and therefore under-treated.

An appropriate clinical evaluation can be effectively and efficiently performed in the primary care office. If a treatable cause is not apparent, patients with clinically suspected EDS should be referred to a sleep disorders center for a specialized evaluation.

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