http://dx.doi.org/10.5665/sleep.2190

Practice Parameters for the Non-Respiratory Indications for Polysomnography and Multiple Sleep Latency Testing for Children

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Background: Although a level 1 nocturnal polysomnogram (PSG) is often used to evaluate children with non-respiratory sleep disorders, there are no published evidence-based practice parameters focused on the pediatric age group. In this report, we present practice parameters for the indications of polysomnography and the multiple sleep latency test (MSLT) in the assessment of non-respiratory sleep disorders in children. These practice parameters were reviewed and approved by the Board of Directors of the American Academy of Sleep Medicine (AASM).

Methods: A task force of content experts was appointed by the AASM to review the literature and grade the evidence according to the American Academy of Neurology grading system.

Recommendations For PSG and MSLT Use:

1. PSG is indicated for children suspected of having periodic limb movement disorder (PLMD) for diagnosing PLMD. (STANDARD)
2. The MSLT, preceded by nocturnal PSG, is indicated in children as part of the evaluation for suspected narcolepsy. (STANDARD)
3. Children with frequent NREM parasomnias, epilepsy, or nocturnal enuresis should be clinically screened for the presence of comorbid sleep disorders and polysomnography should be performed if there is a suspicion for sleep-disordered breathing or periodic limb movement disorder. (GUIDELINE)
4. The MSLT, preceded by nocturnal PSG, is indicated in children suspected of having hypersomnia from causes other than narcolepsy to assess excessive sleepiness and to aid in differentiation from narcolepsy. (OPTION)
5. The polysomnogram using an expanded EEG montage is indicated in children to confirm the diagnosis of an atypical or potentially injurious parasomnia or differentiate a parasomnia from sleep-related epilepsy (OPTION)
6. Polysomnography is indicated in children suspected of having restless legs syndrome (RLS) who require supportive data for diagnosing RLS. (OPTION)

Recommendations Against PSG Use:

1. Polysomnography is not routinely indicated for evaluation of children with sleep-related bruxism. (STANDARD)

Conclusions: The nocturnal polysomnogram and MSLT are useful clinical tools for evaluating pediatric non-respiratory sleep disorders when integrated with the clinical evaluation.

Keywords: Polysomnography, pediatric, indications, clinical utility, non-respiratory disorders

Citation: Aurora RN; Lamm CI; Zak RS; Kristo DA; Bista SR; Rowley JA; Casey KR. Practice parameters for the non-respiratory indications for polysomnography and multiple sleep latency testing for children. *SLEEP* 2012;35(11):1467-1473.

1.0 INTRODUCTION

A level 1 comprehensive nocturnal polysomnogram (PSG) is commonly used to evaluate children with sleep-disordered breathing (SDB). The PSG, however, is also used in evaluations for non-respiratory issues, such as sleep-related movements or behaviors, and is used in conjunction with a multiple sleep latency test (MSLT) for hypersomnia. Previously published practice parameters concerning the pediatric PSG have focused solely on sleep-related respiratory disorders.[1-5] In 2005, the AASM published practice parameters for the indications for PSG[6] and the clinical use of the MSLT and the maintenance of wakefulness test (MWT)[7]; both discuss non-respiratory disorders but do not provide specific recommendations for children.

To assess the indications for PSG in children, the AASM in 2007 commissioned a task force to review the evidence and develop practice parameters for the indications of PSG in children. Because of the large number of studies identified, the project was divided into 3 separate sections to be published separately: (1) the respiratory indications for PSG in children—published in March 2011[8,9]; (2) the non-respiratory indications for PSG in children—this report; and (3) the potential role for PSG in children with attention-deficit/hyperactivity disorder—to be published in the future. Based on a review of over 70 publications, the following practice parameters were developed for the diagnostic indications for polysomnographic monitoring in non-respiratory disorders of children. This report highlights the role of the PSG and the MSLT as part of the clinical evaluation for hypersomnia, parasomnias, and sleep-related movement disorders.

2.0 METHODS

The Standards of Practice Committee of the AASM, in conjunction with specialists and other interested parties, developed these practice parameters based on the accompanying review paper.[10] A task force of content experts was appointed by the AASM in 2007 to review and grade evidence in the

Submitted for publication June, 2012
Accepted for publication June, 2012
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Table 1—Levels of Evidence[12]

Level	Description
1	Evidence provided by a **prospective** study in a **broad spectrum** of persons with the suspected condition, using a **reference (gold) standard** for case definition, where test is applied in a **blinded fashion**, and enabling the assessment of appropriate test of diagnostic accuracy. All persons undergoing the diagnostic test have the presence or absence of the disease determined. Level I studies are judged to have a low risk of bias.
2	Evidence provided by a **prospective** study of a **narrow spectrum** of persons with the suspected condition, or a **well-designed retrospective** study of a **broad spectrum** of persons with an established condition (by "gold standard") compared to a **broad spectrum of controls**, where test is applied in a **blinded** evaluation, and enabling the assessment of appropriate tests of diagnostic accuracy. Level II studies are judged to have a moderate risk of bias.
3	Evidence provided by a **retrospective** study where either person with the established condition or controls are of a **narrow spectrum**, and where **the reference standard, if not objective, is applied by someone other than the person that performed (interpreted) the test**. Level III studies are judged to have a moderate to high risk of bias.
4	Any study design where **test is not applied in an independent evaluation** or evidence is provided by expert opinion alone or in **descriptive case series without controls**. There is **no blinding or there may be inadequate blinding**. The **spectrum of persons tested may be broad or narrow**. Level IV studies are judged to have a very high risk of bias.

Table 2—AASM Levels of Recommendations

Term	Definition
STANDARD	This is a generally accepted patient-care strategy that reflects a high degree of clinical certainty and generally implies the use of level 1 evidence or overwhelming level 2 evidence.
GUIDELINE	This is a patient-care strategy that reflects a moderate degree of clinical certainty and implies the use of level 2 evidence or a consensus of level 3 evidence.
OPTION	This is a patient-care strategy that reflects uncertain clinical use and implies either inconclusive or conflicting evidence or conflicting expert opinion.

Adapted from Eddy[13]

scientific literature regarding the validity and clinical utility of polysomnography in pediatric sleep disorders. In most cases recommendations were based on evidence from studies published in the peer-reviewed literature. When scientific data were absent, insufficient, or inconclusive, the collective opinion was obtained from experts comprising the pediatric task force and the SPC. The RAND/UCLA Appropriateness Method was used to rate each of the recommendations. The RAND/UCLA Appropriateness Method[11] is a tool that measures the appropriateness of recommendations for care or performing procedures developed through the combination of the best scientific evidence available and the collective judgment of experts. Our panel of experts, comprised of the SPC and the task force, individually completed voting sheets to rate the appropriateness of each recommendation. Based on these ratings, the following recommendations were all classified to be appropriate.

The Board of Directors of the AASM approved these recommendations. All members of the AASM Standards of Practice Committee, the pediatric task force and the Board of Directors completed detailed conflict-of-interest statements and were found to have no conflicts of interest with regard to this subject.

These practice parameters define principles of practice that should meet the needs of most patients in most situations. These guidelines should not, however, 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 propriety of any specific care must be made by the physician, in light of the individual circumstances presented by the patient, available diagnostic tools, accessible treatment options, and resources.

The AASM expects these guidelines to have an impact on professional behavior, patient outcomes, and, possibly, health care costs. These practice parameters reflect the state of knowledge at the time of publication and will be reviewed, updated, and revised as new information becomes available. This parameter paper is referenced, where appropriate, using square-bracketed numbers to the relevant sections and tables in the accompanying review paper, or with additional references at the end of this paper. Although the SPC currently uses the GRADE system for grading evidence, this paper was started before the adoption of the GRADE methodology for evaluating diagnostic tests was adopted by the SPC. Thus, for this paper, the Standards of Practice Committee used an evidence grading system developed by the American Academy of Neurology (AAN) for assessment of clinical utility of diagnostic tests. The system involves 4 tiers of evidence, with level 1 studies judged to have a low risk of bias and level 4 studies judged to have a very high risk of bias. Table 1 describes the essential features of the evidence grading system used by the task force. Definitions of levels of recommendations used by the AASM appear in Table 2.

3.0 RECOMMENDATIONS

3.1 Hypersomnia

The MSLT is the recommended test for objective assessment of excessive daytime sleepiness using the protocol delineated in the 2005 AASM Practice Parameter for Clinical Use of MSLT and MWT.[7] The MSLT shows good clinical utility in children for diagnosing narcolepsy (3.1.1 below), but there is less available evidence regarding the clinical utility of the MSLT to diagnose other causes of hypersomnia (3.1.2 below). The collective evidence demonstrated that the MSLT is technically feasible and can provide meaningful results in developmentally normal children age 5 years and older.[14-34] Normative data indicate that children who were prepubertal or at early pubertal stages were less likely to fall asleep during the MSLT than older adolescents, suggesting that the standard protocol may underesti-

mate mild degrees of sleepiness.[15,16,28] To address this concern, some researchers have modified the standard protocol by using 30-minute nap opportunities instead of 20 minutes for prepubertal children, but more research is needed to confirm the value of longer nap opportunities.[28,35] In addition, the MSLT in adolescents may need to be interpreted with caution; SOREMPs are fairly common in adolescents, as demonstrated by one study of normal adolescents that reported 48% of subjects had at least 1 SOREMP.[17] As discussed below (3.1.1), mean sleep latencies are generally less than 8 minutes in children with narcolepsy, for which the standard MSLT protocol appears well suited. The task force found no normative data regarding sleep latencies in preschool children for whom daytime napping is to be expected; standard nap protocols may require modifications to allow for a child's usual daytime napping.

The search of the literature identified no studies which provide normative values for the MWT in children or adolescents.

3.1.1 The MSLT, preceded by nocturnal PSG, is indicated in children as part of the evaluation for suspected narcolepsy. [4.1.2] (STANDARD)

Although the MSLT for children has limitations, there are consistent data including one level 3 study[30] and five level 4 studies[14,19-21,29] demonstrating the diagnostic utility of the MSLT in school-aged children as young as 5 years and adolescents with a clinical diagnosis of narcolepsy with cataplexy [4.1.2]. These studies demonstrated that the MSLT has a sensitivity for diagnosing narcolepsy ranging from 79%[19] to 100%,[20] indicating that this is a highly sensitive test in this population. Although these studies reported mean sleep latencies of fewer than 8 minutes in most subjects, many children who had narcolepsy with cataplexy had mean sleep latencies < 5 minutes and more than 2 SOREMPs.

Only two studies provided evidence for the usefulness of the MSLT to assess response to treatment for narcolepsy. One level 1 study[22] showed a small increase in mean latency (from 3.0 ± 4.5 minutes to 5.35 ± 5.6 minutes) with modafinil treatment, whereas a level 4 study demonstrated a more marked improvement in mean latency (6.6 ± 3.7 minutes to 10.2 ± 4.8 minutes) with modafinil therapy.[24] These studies demonstrate test-retest validity for MSLT in children and adolescents.

According to the recommended MSLT protocol, polysomnography should be performed during the major sleep period that precedes the nap testing.[7] A polysomnogram is useful to exclude other major sleep disorders that could contribute to sleepiness and to assure that the individual had sufficient sleep (at least 6 hours) prior to the MSLT. There are no specific recommendations for sleep duration on the PSG preceding the MSLT in children which can potentially affect sleep latencies on nap testing because children generally have higher sleep requirements that vary with age. In several small level 4 studies evaluating children with narcolepsy, abnormal findings seen in the PSG during the major sleep period preceding the MSLT in some children included SOREMPs, fragmented sleep, or leg movements.[20,21,24,27,32]

3.1.2 The MSLT, preceded by nocturnal PSG, is indicated in children suspected of having hypersomnia from causes other than narcolepsy to assess excessive sleepiness and to aid in differentiation from narcolepsy. [4.1.1, 4.1.2, 4.1.3, 4.1.4] (OPTION)

As mentioned above, the MSLT was technically and clinically feasible in developmentally normal children age 5 years and older, but normative values may vary according to pubertal stages.[15,16,28] One level 1 study demonstrated criterion validity for the use of MSLT in assessing hypersomnia in children, with a significant but weak correlation between sleep latency on MSLT and subjective sleepiness.[18]

There are too few studies in conditions with hypersomnia other than narcolepsy to demonstrate sensitivity, specificity, positive predictive value, or negative predictive value of this test. Nonetheless, the MSLT can provide important information regarding degree of sleepiness in children with suspected hypersomnia from causes other than narcolepsy such as hypersomnia associated with a medical or psychiatric condition, recurrent hypersomnia, and other hypersomnias. There is only one low grade (level 3) study[23] on the use of MSLT in recurrent hypersomnia, which demonstrated borderline mean sleep latency scores during symptomatic periods (10.1 minutes) that were similar to scores found during asymptomatic periods (10.6 minutes), and no studies on the use of MSLT in other hypersomnias. Therefore, the recommendation for the use of MSLT in these situations is at the OPTION level.

3.2 Parasomnias

In general, polysomnography is unnecessary to confirm the diagnosis in children with *typical* parasomnias or confirmed sleep-related epilepsy. However, polysomnography may be helpful to differentiate atypical cases of nocturnal behaviors from nocturnal seizures or to identify when sleep-disordered breathing or other sleep disorders contribute to frequent parasomnias, enuresis, or affect control of seizures.

3.2.1 The polysomnogram using an expanded EEG montage is indicated in children to confirm the diagnosis of an atypical or potentially injurious parasomnia or differentiate a parasomnia from sleep-related epilepsy when the initial clinical evaluation and standard EEG are inconclusive. [4.2.1, 4.2.2, 4.2.3] (OPTION)

There are sparse data regarding the clinical utility of polysomnography in children with parasomnias. In 2005 the AASM published recommendations for polysomnography in parasomnias without specification for age, based mostly on studies of adult subjects.[6] According to this paper, the diagnosis of uncomplicated typical disorders of arousal, nightmares, enuresis, sleeptalking, and bruxism can usually be determined solely by clinical assessment. Nonetheless, polysomnography could be useful to identify alternate sleep-related diagnoses that may present similarly to parasomnias or to confirm the diagnosis of a parasomnia in cases that are violent or associated with injury. According to these practice parameters,[6] a PSG is suggested if the parasomnia has any of the following characteristics: (1) it is 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) ([4.4.3.3 of AASM practice parameter] GUIDELINE); (2) it is potentially injurious or has caused injury to the patient or others ([4.4.3.2] OPTION); or (3) it could be seizure-related but the initial clinical evaluation

and a standard EEG are inconclusive ([4.4.3.1] OPTION). It was also specified that the PSG should include EEG with an expanded bilateral montage, EMG channels, and good quality video [4.4.3.1 of Practice Parameter].[6]

The literature regarding PSG in NREM parasomnias in children primarily focused on describing the clinical and polysomnographic features that distinguish NREM parasomnias from nocturnal seizures. Two level 3 papers[36,37] indicate that NREM parasomnias occur from N3 sleep, usually 1 or 2 hours after falling asleep, while seizures occur at more random times, frequently from N2 sleep. In addition, these papers further described that NREM parasomnias generally last a few minutes to (rarely) as long as 30 minutes and usually occur no more than once or twice a night. In contrast, supplemental information from a study that used only EEG data without full PSG indicated that nocturnal seizures are generally briefer than NREM parasomnias (lasting 30 seconds to 2 minutes) with several episodes on any given night (sometimes as many as 20 per night) and are characterized by stereotyped behavior.[38] Although the task force did not identify literature on violent sleepwalking in children, based on an extension of the adult literature the clinician may consider using a PSG to distinguish violent sleepwalking from disorders such as seizure, REM sleep behavior disorder (RBD), or a sleep-related dissociative event. Reports in adult subjects suggest more than one night of PSG may be required to establish a diagnosis of a parasomnia, but there are insufficient data in children regarding number of nights of PSG needed.[39,40]

Most of the literature regarding PSG in children with RBD consisted of case reports [4.2.2]. In 1 level 4 case series[41] of pediatric RBD, loss of REM sleep atonia was documented in REM sleep supporting the recommendation to include multiple limb EMG channels in studies of unusual motor behaviors in children in addition to the video and other PSG channels when RBD or loss of REM sleep atonia is clinically suspected.

In summary, based on extension from the adult literature and limited studies in children, it is recommended that a video-PSG with an expanded EEG montage be used when it is not possible to clinically differentiate a parasomnia from a seizure and the seizure work-up was non-diagnostic, or to confirm the diagnosis of a parasomnia in an atypical or potentially injurious case.

3.2.2 Children with frequent NREM parasomnias, epilepsy, or nocturnal enuresis should be clinically screened for the presence of comorbid sleep disorders, and polysomnography should be performed if there is a suspicion for sleep-disordered breathing or periodic limb movement disorder. [4.2.1, 4.2.3, 4.2.4.3] (GUIDELINE)

Frequent NREM Parasomnias [4.2.1]

The task force identified only a few papers assessing the role of PSG in children with NREM parasomnias. These papers focused on the prevalence of snoring and obstructive sleep apnea syndrome in children with chronic parasomnias as opposed to indications for PSG in subjects who only have symptoms of a parasomnia without clinical evidence of sleep-disordered breathing.

One level 2,[42] one level 3,[36] and one level 4[43] study from the same institution indicate that there is a significant prevalence ranging from 58% to 100% of sleep-disordered breathing confirmed by PSG in children with chronic NREM parasomnias. In particular, one study emphasized that clinical suspicion for SDB should be heightened when there is snoring and craniofacial features that predispose to SDB,[43] and another study identified a high prevalence of SDB in subjects with frequent enough episodes of NREM parasomnias to prompt clinical consultation, with occurrences as frequent as once a week but sometimes occurring as nightly clusters once every few weeks.[36] These data are limited, but suggest that patients presenting with NREM parasomnias be questioned for symptoms of SDB, and if present, a PSG should be performed to assess for SDB as recommended in the Practice Parameters for the Respiratory Indications for Polysomnography in Children.[8]

Epilepsy [4.2.3]

Sleep problems should be considered in children with epilepsy, particularly in patients whose seizures are not well-controlled by medication. Sleep problems occur more commonly in this population and are often treatable. Two level 3 studies[44,45] and 1 level 4 study[46] demonstrated a significant prevalence of sleep disorders in children with epilepsy. The prevalence of SDB in children with epilepsy and sleep complaints ranged from 27%[45] to 80%.[46] One small study of 11 children with severe developmental disability and epilepsy found 27% had an elevated PLMS index.[45] Although these data indicate that primary sleep disorders can accompany epilepsy, the studies are too small to indicate the true extent of the overlap of seizure and sleep disorders. The clinician is urged to use clinical judgment as well as recommendations delineated in published Practice Parameters to determine the need for polysomnography to diagnose a comorbid sleep disorder.[8]

Nocturnal Enuresis [4.2.4.3]

Nocturnal enuresis is defined as urination during sleep in children ≥ 5 years, which is when nocturnal bladder continence is developmentally expected. The task force identified 6 reports, one level 2 study,[47] three level 3 studies,[48-50] and two level 4 studies[51,52] that evaluated children with enuresis. The PSGs in children with a history of enuresis generally demonstrate nonspecific findings that were inconsistent except for potentially identifying SDB. Enuresis can occur in any stage of sleep and at any time of night.[49-52]

There is some evidence that children with enuresis may be more likely to have SDB. One level 3 study found that enuresis increased the odds ratio 5.3 times that SDB would be found on the PSG of a child.[53] They also found that children with SDB were more likely to have enuresis than those without SDB. In another level 3 study, children referred for suspected SDB who had a respiratory disturbance index (RDI) > 1 had a higher prevalence of enuresis (47%) as compared with those with an RDI ≤ 1 (17%).[54] A level 2 study demonstrated a higher prevalence of enuresis among children who habitually snored than those who did not (27% versus 12%), but the prevalence of enuresis among the habitual snorers who had PSG evidence for OSA (22%) was not significantly different from those without OSA (16%).[47] Of interest, a number of the above papers also demonstrated that the presence of enuresis did not correlate with severity of OSA as defined by AHI severity.[47,54,55] Enuresis

often improves or resolves after adenotonsillectomy in children with adenoidal hypertrophy, habitual snoring, and/or obstructive sleep apnea.[55] However, because many of the studies used varying follow-up intervals, it is possible that spontaneous resolution of enuresis with age explains why enuresis often remits following adenotonsillectomy.[55-57]

In summary, there appears to be a significant prevalence of SDB in children with enuresis. Children with enuresis, particularly those who are obese or resistant to standard treatments, should be assessed for symptoms and physical findings suggestive of sleep-disordered breathing, and if present, a PSG is recommended.

3.3 Sleep-Related Movement Disorders

Most of the available research focused on the use of polysomnography in children with suspected periodic limb movements, either as supportive data for restless legs syndrome (RLS) or to diagnose periodic limb movement disorder (PLMD). Other studies of sleep-related movement disorders, such as bruxism and rhythmic movement disorder (RMD), either showed that PSG was unnecessary or that there was insufficient evidence upon which to base a recommendation.

3.3.1 Polysomnography is indicated in children suspected of having RLS who require supportive data for diagnosing RLS. [4.3.1] (OPTION)

RLS is a clinical diagnosis that includes sensorimotor discomfort of the legs worsening in the evening hours, particularly while the child is at rest. These uncomfortable sensations are attenuated by movement. Polysomnographic evidence of periodic limb movements of sleep (PLMS) occurs in at least 80% of adults with RLS.[58] Because it is often difficult for children to provide a reliable history, ancillary historical and laboratory information can be helpful, such as the presence of a sleep disturbance for age, a positive family history of RLS, or a polysomnogram demonstrating a PLMS index of 5 or more per hour of sleep.[59] In support of these recommendations, the task force identified evidence that the PSG can assist the clinician in making the diagnosis of RLS in children. One level 2[60] and 1 level 3 study[61] demonstrated the unreliability of parental report of leg movements; 1 level 3[62] and 1 level 4 study[63] demonstrated a high prevalence of RLS in children with elevated PLMS indices, particularly if other risk factors for RLS are present; and 1 level 4 study[64] showed a high prevalence of an elevated PLMS index in children already diagnosed with RLS. Finally, there is still a need for further research on the relationship between RLS and attention-deficit/hyperactivity disorder in children.

One level 2 study[60] found that parental history of restless legs, growing pains, and symptoms of poor sleep on the Pediatric Sleep Questionnaire had a positive predictive value of only 38% compared with overnight PSG finding of PLMS. Similarly, in one level 3 study[61] of patients mostly referred for SDB, parental report of a child kicking during sleep had a positive predictive value of only 10% for PLMSI > 5/h (sensitivity 50%; specificity 51%), and a parental report of restlessness during sleep had a PPV of only 9% (sensitivity 70%; specificity 26%). A level 3 paper[62] demonstrated a high prevalence of RLS in children with an elevated PLMS Index. In this study, 25% of those children with a PLMSI > 25/h had RLS. In a retrospective level 4 study of children with PLMS > 5/h who also had 1 parent with a history of RLS, 74% had a clinical diagnosis of RLS.[63] Conversely, in a level 4 study 65% (11/17) of a small cohort of children diagnosed with RLS had a PLMS Index > 5/h.[64] These studies provide evidence that PSG can provide useful ancillary data for the diagnosis of RLS.

The relationship between RLS and PLMS and attention-deficit/hyperactivity disorder is still being refined. In a level 2 report[65] of children referred for SDB, the group with PLMS had higher hyperactivity scores than those without PLMS regardless of PSG evidence of SDB. In two small studies of children with attention-deficit/hyperactivity disorder, one level 3 study[66] found that 44% of those with elevated PLMSI > 5/h had symptoms consistent with RLS; in one level 4 study[67] 6/9 children with PLMSI > 5/h had a parent with RLS, meeting 2 of the 3 supportive criteria for RLS in children, suggesting an increased prevalence of RLS in the attention-deficit/hyperactivity disorder population. One small level 3 study[68] that presented PSG data on 10 children with growing pains and RLS found no difference between the PLMS index in the subgroup with attention-deficit/hyperactivity disorder and the subgroup without attention-deficit/hyperactivity disorder.

In summary, there is an association between a clinical diagnosis of RLS and PLMS on PSG that is based on mostly small retrospective studies. In addition, these studies provide further evidence for limitations of the parental report regarding RLS symptoms and highlight the need for ancillary diagnostic information. Some reports suggest that PLMS may be found more often among children with attention-deficit/hyperactivity disorder, but further research is necessary to define the prevalence and significance of this finding.

3.3.2 PSG is indicated for children suspected of having PLMD for diagnosing PLMD. [4.3.2] (STANDARD)

By definition, periodic limb movement disorder (PLMD) in children includes not only a complaint of a sleep disturbance or daytime fatigue but also documentation of PLMS at a rate of at least 5/h.[59] Polysomnography is necessary to document PLMS, as parental report is unreliable with a low positive predictive value (please see discussion above in parameter 3.3.1), and actigraphy, the other common measure of leg movements, overestimates PLMS events (level 3).[69] A level 3 study demonstrated that a single night of monitoring is usually sufficient to demonstrate PLMS.[70] There is a paucity of data concerning the prevalence of PLMS in general community samples. In several studies of children referred for sleep issues, the prevalence of PLMSI > 5/h was generally 7% to 16%,[61,71-75] with most subjects referred for SDB.

This parameter is based on the current unavailability of alternative measuring techniques and thus is at a STANDARD level, since the diagnosis of PLMD cannot be made without performing PSG and is similar to recommendations in prior practice parameters regarding necessary components of the work-up of the disorder.

3.3.3 Polysomnography is not routinely indicated for evaluation of children with sleep-related bruxism. [4.3.3] (STANDARD)

The task force identified only 1 study[76] evaluating the role of PSG in children with bruxism. This level 1 study showed that

the bruxism group had more arousals than a control group but did not show that a PSG had any diagnostic value. The evidence is high level, but there is only one study. This parameter may change as further data become available.

4.0 SUMMARY AND FUTURE DIRECTIONS

A comprehensive, evidence-based review of the literature by the pediatric task force indicates that PSG is indicated to evaluate children with (1) parasomnias with atypical features or injury; (2) sleep-related epilepsy differentiated from other parasomnias when the clinical history and standard EEG is inconclusive; (3) parasomnias, including enuresis, with symptoms of a comorbid sleep disorder; and (4) PLMD or clinically unconfirmed RLS. An MSLT preceded by a PSG is indicated to evaluate children for suspected narcolepsy with or without cataplexy, or other hypersomnias. In the pediatric age group, as in all others, the PSG should be interpreted in the context of an individual's clinical presentation.

Insufficient evidence exists for the task force to evaluate the clinical utility of PSG in connection with some primary sleep disorders, such as sleep-related rhythmic disorders and circadian rhythm disorders. The use of PSG to evaluate sleep disorders in patients with pain, cancer, depression, trauma, and traumatic brain injury has not been well studied; nevertheless, the task force strongly emphasized that PSG as a matter of clinical judgment could be employed in these circumstances. Juvenile fibromyalgia (JF) also remains an area that requires further research, as very limited data suggest an increase in prevalence of PLMS in some children with JF, but the subpopulation of JF children who would benefit from PSG is unclear.[77]

The MSLT has limitations in the pediatric age group not observed in adults. Some examples are as follows: (1) very few normative MSLT data exist that evaluate changes in sleep needs that occur as children develop; (2) the 20-minute nap protocol to assess daytime sleepiness in pre-pubertal children (other than those with narcolepsy) may underestimate sleepiness because young children have long sleep latencies during naps, so that some researchers have extended the MSLT nap opportunity from 20 to 30 minutes to avoid a ceiling effect. Such a modification of the MSLT requires further validation; (3) SOREMPs have been reported in normal adolescents, possibly related to sleep scheduling, so more normative data would help clarify the usefulness of this measure. At this time, no objective diagnostic test exists to assess sleepiness in preschool children. The role of MSLT in evaluating narcolepsy without cataplexy and other hypersomnias still needs further study. There is also a need to evaluate the clinical utility and normative values for the MWT in children.

Polysomnography and MSLT demonstrate clinical utility in children when interpreted in the context of the clinical evaluation. Because many of the studies identified were of low evidence level, adequately powered research in diverse populations will be required to further define the clinical utility of the PSG and MSLT.

ACKNOWLEDGMENTS

The Standards of Practice Committee would like to acknowledge and thank the members of the Pediatric task force for their tireless effort and contribution to the development of these practice parameters: Suresh Kotagal, MD, Lynn A. D'Andrea, MD, Madeleine M. Grigg-Damberger, MD, Timothy F. Hoban, MD, Valerie G. Kirk, MD, Carole L. Marcus, MBBCh, Cynthia D. Nichols, PhD, Manisha B. Witmans, MD.

DISCLOSURE STATEMENT

This was not an industry supported study. The authors have indicated no financial conflicts of interest.

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