



NCC Pediatrics Continuity Clinic Curriculum: Sleep Disorders



Goals & Objectives:

To learn how to identify and treat sleep disorders in children and adolescents:

- Obtain a complete and accurate sleep history
- Distinguish between normal sleep patterns and sleep disorders
- Provide parents with interventions to deal with sleep disorders

Pre-Meeting Preparation:

Please read the following enclosures:

- “Normal Sleep Patterns”
 - “General Principles of Sleep” (*figure- PIR, Oct 2001*)
- “Diagnosis & Management of Common Sleep Problems” (*PIR, 2011*)
 - “Difficulty Falling Asleep by Age” (*figures- PIR, Oct 2001*)
- **Do your own BEARS screen:** Score yourself (use the adolescent scale ☺), your child, or your patient. +1 pt for every positive answer.



Conference Agenda:

- Discuss Sleep Disorders Self-Reflection Q’s
- Review Sleep Disorders Quiz and "Name that Sleep Product"
- Complete Sleep Disorders Mini-Cases

Post-Conference: Board Review Q&A

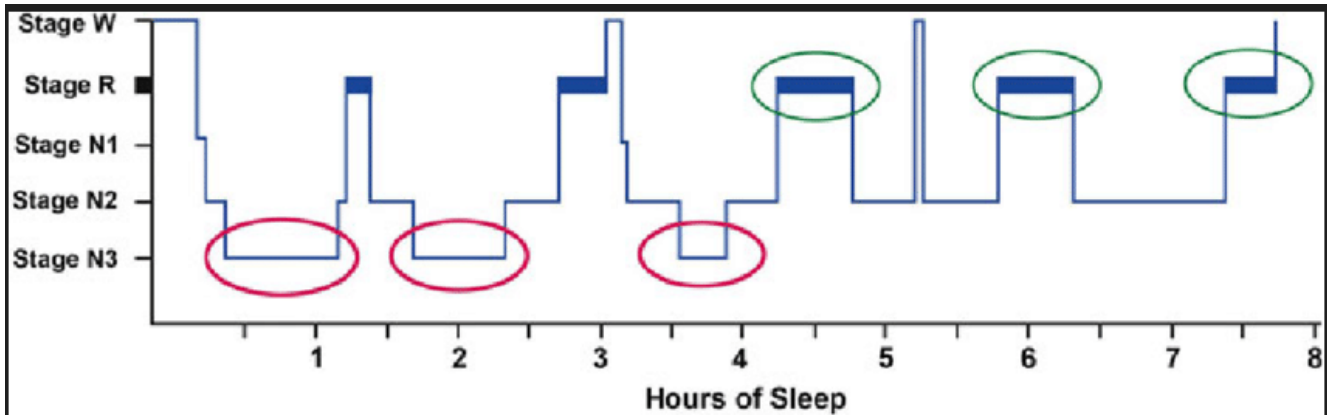
Extra Credit:

- [American Academy of Sleep Medicine Practice Parameters](#) (*includes links for behavioral treatment of bedtime problems & indications for polysomnography*)
- [SIDS Practice Parameter](#) (*AAP, Oct 2011*)
- [“Prevalence, Patterns, and Persistence of Sleep Problems in the 1st 3 years”](#) (*Peds, 2012*)
- [The Ferber Method Demystified](#) (*parent resource*)
- [Healthychildren.org](#) (*parent resource for infant & toddler sleep issues*)
- Review articles from **AAFP** and **Journal of Clinical Sleep Medicine**
- "Sleep-Disordered Breathing in Children" (*PIR, 2019*)
- "Long term melatonin. . .children with neurodevelopmental disorders" (*BMC Psychiatry, 2020*)
- "Effect of melatonin in children with neurodevelopmental disabilities and sleep disorders" (*J of Family Medicine and Primary Care, 2022*)
- "Even dim light before bedtime may disrupt a preschooler's sleep" (*Science Daily, 2022, U of CO*)

Normal Sleep

Stages of Sleep Cycle

There are 2 basic types of sleep: **REM** (rapid eye movement)—the active sleep when dreams take place, and **non-REM** or quiet sleep, which is subdivided into **3 stages**. Each stage is marked by changes in brain waves (EEG), muscle activity, eye movements, heart function, and breathing. Alternating cycles of non-REM and REM sleep make up the sleep stages that occur throughout the night. Every person will have stage changes and transient awakenings throughout the night. These are usually so short that the person may believe they did not awaken at all. The first half of the night tends to have a predominance of NREM sleep. The second half of the night is richer in REM sleep.



* **Stage I:** Brief period (up to 5min) of transition from drowsiness to sleep. Brain activity slows and the eyelids close, although the eyes continue to move together slowly beneath the closed lids. A person is easily awakened from this stage. Sometimes, the person may be aware that she is nodding off; some other times she may think that she is day-dreaming.

* **Stage II:** Light sleep; lasts from 10-46min. The brain waves may change with the appearance of vertex and **K-complexes** (large, slow waves interspersed with bursts of rapid waves called **sleep spindles**). There is some data suggestive that sleep

* **Stage III:** Deepest and usually most refreshing stage of sleep. There is further slowing of the brain waves, and breathing and heartbeat become slow and regular. The muscles relax, and the person lies very still; although, there may be some involuntary twitching of the leg. Snoring may also occur. The person is not easily awakened, and if aroused, may take at least a few minutes so to become fully awake. This is when parasomnias such as sleep walking and night terrors are most likely to occur. Characterized by high amplitude "**slow-wave sleep**" (**SWS**) based on EEG patterns— last up to 60min. Then, there is a gradual return to a lighter stage of sleep.

* **REM Sleep:** Occurs after 1-2 complete cycles of Stage I-III sleep. Referred to as “**active sleep**”, during which most dreams occur. The eyes move rapidly under the closed eyelids, breathing and heart rate become less regular, and muscles are more relaxed, although twitching may increase. The *first* periods of REM sleep during the night usually last for only a few minutes; as the night goes on, REM sleep *lengthens*. This is why many people awaken in the morning while dreaming, and may feel as though the entire night had been spent dreaming.

Other Key Points:

- * There are periods of wakefulness between each sleep cycle (stages I-III + REM). The sleeper usually forgets these arousals because of **anterograde and retrograde amnesia** that occurs after sleep onset.
- * The relative volume of each of these stages varies both with age and over the course of the night.
- * **SWS** predominates during the 1st few cycles of the night, and **REM** predominates in the final cycles.
- * There is a physiologic need for *both* REM and SWS. Children and adults who are **sleep-deprived**—whether total or stage-selective—tend to make them up on subsequent nights. “Sleep intrusions” in the forms of **micro-sleep**— EEG-identifiable sleep lasting $\geq 30s$ —are inevitable with sleep deprivation.

Sleep Cycle by Age

Age	Average Sleep Duration in a 24-h Period	Sleep Patterns
Newborns	16 to 20 h	<ul style="list-style-type: none"> • 1- to 4-h sleep periods followed by 1- to 2-h awake periods • Amount of daytime sleep=amount of nighttime sleep
Infants (0 to 1 y)	14 to 15 h at 4 mo 13 to 14 h at 6 mo	<ul style="list-style-type: none"> • Sleep periods of 3 to 4 h for first 3 mo • 6- to 8-h periods at 4 to 6 mo • Day/night differentiation develops between 6 wk and 3 mo • 70% to 80% of babies “settle” (sleep through the night at 9 mo of age) • Naps 2 to 4 h in two naps per day
Toddlers (1 to 3 y)	12 h	<ul style="list-style-type: none"> • Naps 1.5 to 3.5 h in one nap per day
Preschool (3 to 6 y)	11 to 12 h	<ul style="list-style-type: none"> • Napping declines; most stop by 5 y of age
Middle Childhood (6 to 12 y)	10 to 11 h	<ul style="list-style-type: none"> • Low levels of daytime sleepiness
Adolescence (> 12 y)	9 h	<ul style="list-style-type: none"> • Often irregular sleep schedule • Circadian phase delay postpuberty with later bedtimes and later rise times

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Newborn: Sleep **16-20hrs/day**, broken up into **1-4hr sleep periods** and 1-2hr awake periods. They cycle through REM and non-REM sleep **every 50min** vs. 90min cycle for older children/adults.

During **REM** sleep, the infant may twitch or flail her arms or legs, and her eyes may move under her thin eyelids. Breathing may be somewhat irregular and she may smile or make sucking motions with her mouth. This behavior may lead parents to believe that their baby is not having restful sleep. During **non-REM** sleep, as in adults, breathing is more regular and the baby will not move as much, although she may occasionally twitch or make a sudden movement. At first, sleep is about evenly distributed between REM and non-REM sleep; this falls to a ratio of 25:75 in an older child or adult.

Based on level of arousal, newborn behavior has been divided into **6 clusters**— two of which are sleep states. Some parents may require help distinguishing active sleep from wakefulness. Active sleep occurs every 50min during a sleep cycle,

State	Description	What Your Baby Does
State 1	Deep Sleep	Lies quietly without moving
State 2	Light Sleep	Moves while sleeping; startles at noises
State 3	Drowsiness	Eyes start to close; may doze
State 4	Quiet Alert	Eyes open wide, face is bright; body is quiet
State 5	Active Alert	Face and body move actively
State 6	Crying	Cries, screams; body moves in very disorganized ways

with an arousal—but not true awakening—at the end of every cycle. Although most newborns return immediately to sleep, some parents see the arousal and immediately pick up the baby, creating a true awakening. *If parents rush to check or feed the infant at every rustle or moan made during active sleep, or every arousal between sleep cycles, the development of sustained sleep is then delayed.*

2-4 months: Sleep becomes more consolidated and a **preference for nighttime** begins to develop. Remember, though, that every baby is different; therefore, at 2mo some are sleeping for 5-6hrs at night while others are still waking up and wanting to be fed every 2-3hrs. *Parents should not introduce solid foods too early in the hopes that it will get their baby to sleep through the night.*

The more consolidated sleep pattern comes about, in part, thanks to behavioral cues from the parents who encourage the baby to play more during the daytime waking periods. By contrast, *nighttime waking should be kept calm, quiet, and no longer than necessary to change, feed, and burp the baby and return him—comfortable, sleepy, but still awake—to his crib.* Many parents may complain of a 4-month sleep regression. This timeframe is usually characterized by infants having more ability, more advanced wake patterns and the ability to have more attentiveness to their environment. Parents can be counseled that this is normal and as long as interventions are kept minimal should improve within the next 2 months. Even as babies become more alert and playful, many continue to take **≥2 daily naps** for at least the first 6mo.

6-12 months: By the time the infant is 6mo, one can expect him to sleep for **11hrs at night** and to take 2 naps totaling 3-4hrs/day. For some lucky parents, the 11hrs will occasionally take place in a single stretch; *at this age, there is no need for an overnight feeding.* A longitudinal study of 104 infants aged 1-12mo found that 71% of kids “settled” (sleep from MDN to 0500) by 3mo of age; 83% “settled” by 6mo of age; and 10% never completely settled during the 1st year of life.

Sleep cycles now occur every 90-120 min, with nighttime arousals occurring at the end of every cycle. SWS predominates in the 1st half of the nighttime sleep and is a time when the arousal threshold is very high. REM sleep occupies the latter ¼ of the night. *Babies should now have the ability to self-soothe through the arousals and return immediately to sleep.* Gross motor milestones such as rolling over and pulling to stand can also disrupt sleep.

18 months – 4 years : Naps are usually consolidated into **1 regular nap per day.**

5 years- early school age: Napping typically stops. Children may reflexively want to nap if they didn’t sleep well in the previous night.

Adolescent: As people grow older, sleep patterns and circadian rhythms change. Many adolescents experience difficulty falling asleep and prefer to awaken late (i.e. “delayed sleep-phase syndrome”—see PIR article). This is not merely a result of teenage rebellion, but a reflection of altered melatonin release during puberty and young adulthood. A similar effect occurs in elderly people who experience the opposite— early to bed and early to rise, with daytime sleepiness.

Adult: Normal adult sleep is marked by recurring cycles of Stages III (SWS) or lighter stages of I & II sleep, followed by varying periods of REM sleep. **Each cycle lasts an average of 90 minutes,** although this varies from one person to another, and even from one night to the next.

Table 7. General Principles of Sleep

- Establish a good sleep environment that is dark and quiet and has a steady, slightly cool temperature. Sleep should be in the same place for night and naps as much as possible.
- Establish a soothing bedtime routine that involves friendly interaction between parent and child. This may include a snack, followed by tooth brushing, use of the toilet, several stories read to the child in his or her own bed, presence of "stovies" or favorite toys, prayers or a song, and the parent leaving the room while the child is still awake.
- Feed infants in the parent's arms and place them in the crib without a bottle.
- Put a child to bed when the child is tired to get enough sleep and to avoid resistance if the child is put in bed when not sleepy.
- Teach the child the skill of falling asleep on his or her own by avoiding pacifiers or body contact with the parent as the child drifts into sleep. This makes it possible *for* the child to go back to sleep independently when awakening during the night.
- Avoid changing the routine because of demands or tantrums at bedtime, these can become regular problems.
- Avoid television in the child's room because it can delay sleep and become a habit needed to fall asleep.
- Try to keep bedtime naps, and morning wake-up at the same time 7 days a week to avoid shifting the child's internal clock. Naps should not be too close to bedtime so that the child will be sleepy. Avoid caffeine beverages or cigarette smoke very active play, television or movies, or arguments before bedtime. They stimulate the child and make falling asleep more difficult.

Diagnosis and Management of Common Sleep Problems in Children

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Author Disclosure
Dr Bhargava has disclosed no financial relationships relevant to this article. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

Objectives After completing this article, readers should be able to:

1. Discuss the wide prevalence of sleep problems in children.
2. Recognize and manage common sleep problems in children.
3. Know the American Academy of Pediatrics guidelines for diagnosis and management of obstructive sleep apnea in children.

Introduction

Sleep plays a vital and often underestimated role in the growth and development of children. Community surveys have discovered that sleep problems have a high prevalence throughout childhood and adolescence, with 25% to 50% of preschoolers and up to 40% of adolescents experiencing sleep-related problems. (1) Disruption of sleep due to a variety of sleep disorders may affect cognitive development and growth, and the child's sleep problems may become a significant family stressor. Studies have shown that sleep issues are usually not addressed adequately in pediatric practice. (2) This article describes the features of common sleep disorders that present to the pediatrician and provides strategies for effective management.

Sleep in Infancy, Childhood, and Adolescence

Sleep architecture, sleep behaviors, and sleep problems change as children progress from infancy to adolescence. The ability to sleep through the night usually does not develop until at least 3 to 6 months of age. Sleep duration also varies by age (Table 1). Insufficient sleep and poor sleep quality may manifest as changes in mood, behavior, memory, and attention. Parents are usually quick to recognize any changes in their child's behavior and mood, and these observations should be ascertained during history taking. Younger children may develop symptoms of hyperactivity, poor impulse control, and neurocognitive dysfunction that includes attentional problems and impaired vigilance. Adolescents who are not getting sufficient sleep may have symptoms of excessive daytime sleepiness, such as falling asleep on the bus on the way to school or during class or not being able to wake up on time for school. It is important to keep in mind the substantial individual variation in the need for sleep as well as in the effects of sleep loss on daytime function in children. Therefore, advice for the optimal duration of sleep may vary from child to child. Optimal duration of sleep may best be estimated during vacation time, when sleep duration can be correlated with mood and daytime functioning.

Approach to Pediatric Sleep Disorders

Pediatricians should screen for and recognize the symptoms of childhood sleep disorders in well children and specific vulnerable populations, such as children who have behavioral and developmental disorders, genetic syndromes, and chronic medical conditions. A screening tool (BEARS) (Table 2) has been developed to allow for comprehensive screening for the major sleep disorders in the pediatric age group. This screening tool has been shown to increase the likelihood of identifying sleep problems in the primary care setting. (3) It is divided into five major sleep domains, each with appropriate trigger questions: B: Bedtime problems, E: Excessive daytime sleepiness, A: Awakenings during the night, R: Regularity and duration of sleep, S: Snoring.

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Table 1. Appropriate Duration of Sleep by Age

Age Category	Average Sleep Duration (Over a 24-hour Period)
Newborns	16 to 20 hours
Infants (0 to 1 year)	13 to 15 hours
Toddlers and Preschool Children (2 to 5 years)	11 to 12 hours total
School-age Children (6 to 12 years)	10 to 11 hours
Adolescents (13 to 18 years)	9 hours ideal

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Diagnosis and Management of Common Pediatric Sleep Problems

Insomnia: Behavioral Insomnia of Childhood

The essential diagnostic feature of this disorder is difficulty falling asleep, staying asleep, or both that is related to an identified behavioral abnormality (Table 3). Because children do not usually sleep through the night for the first 3 to 6 postnatal months, this diagnosis usually is made in toddlers and preschoolers. Behavioral insomnia of childhood can affect parental sleep and may lead to significant daytime impairment of the parents. Marital disputes may arise, and parents may develop negative feelings toward a child who repeatedly disrupts their sleep. The sleep difficulties of behavioral insomnia of childhood are due either to inappropriate sleep associations or to inadequate limit setting by the caregiver.

SLEEP-ONSET ASSOCIATION TYPE. This disorder presents typically as frequent night awakenings, with the child depending on a specific stimulus from the care-

Table 2. BEARS Screening Tool

	Toddler/Preschool (2 to 5 years)	School Age (6 to 12 years)	Adolescent (13 to 18 years)
<u>B</u> edtime Problems	Does your child have any problems going to bed or falling asleep?	Does your child have any problems at bedtime? (P) Do you have any problems going to bed? (C)	Do you have any problems falling asleep at bedtime (C)?
<u>E</u> xcessive daytime sleepiness	Is your child sleepy during the day or still taking naps?	Does your child have difficulty waking, seem sleepy during the day, or take a nap? (P) Do you feel tired a lot? (C)	Do you feel sleepy a lot during the day, in school, or while driving? (C)
<u>A</u> wakenings during the night	Does your child wake up a lot at night?	Does your child wake up a lot at night? (P) Do you wake up a lot at night and have trouble falling back asleep? (C)	Do you wake up a lot at night and have trouble falling back asleep? (C)
<u>R</u> egularity and duration of sleep	Does your child have a regular bedtime and wake time?	What time does your child go to bed and get up on weekdays/weekends? (P) Do you think your child gets enough sleep? (P)	What time do you go to bed on school days/weekends? How much sleep do you usually get? (C)
<u>S</u> noring	Does your child snore a lot or have difficulty breathing at night?	Does your child have loud or nightly snoring or difficulty breathing at night? (P)	Does your child snore loudly or nightly? (P)

(C)=child, (P)=parent
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Table 3. Diagnostic Criteria of Behavioral Insomnia of Childhood

- A. The child's symptoms meet the criteria for insomnia based upon parental report or that of other caregivers.
-
- B. The child shows a pattern consistent with either the sleep-onset association or limit-setting type of insomnia described below:
-
- i. Sleep-onset association type includes each of the following:
1. Falling asleep is an extended process that requires special conditions.
 2. Sleep-onset associations are highly problematic or demanding.
 3. In the absence of the associated conditions, sleep onset is significantly delayed, or sleep is otherwise disrupted.
 4. Nighttime awakenings require caregiver intervention for the child to return to sleep.
- ii. Limit-setting type includes each of the following:
1. The individual has difficulty initiating or maintaining sleep.
 2. The individual stalls or refuses to go to bed or refuses to return to bed following a nighttime awakening.
 3. The caregiver demonstrates insufficient or inappropriate limit setting to establish appropriate sleeping behavior in the child.
- C. The sleep disturbance is not explained by another sleep disorder, medical or neurologic disorder, mental disorder, or medication use.

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giver to fall back to sleep. Such stimuli may include being held or rocked to sleep or needing a specific object or a particular environment to fall asleep. Sleep-onset associations are widely prevalent in young children, and this phenomenon is defined as a disorder if sleep is significantly delayed or repeatedly disrupted in the absence of the desired stimulation, with intervention by the caregiver required to restore sleep.

Night wakings are a common phenomenon in young children, with a prevalence of 25% to 50% in the first postnatal year. Night wakings may be associated with cosleeping, breastfeeding, or other medical conditions

and other sleep-disrupting events. In toddlers, separation anxiety may manifest as increased night waking. Problematic night wakings may also be fostered by the child's temperament and poor parent-child interactions.

Management focuses on the establishment of a regular sleep schedule and bedtime routine. It is crucial for a successful treatment plan to be tailored specifically to the needs of the child and family. Parents should be advised to have a developmentally appropriate bedtime and a consistent bedtime routine that allows the child to obtain adequate sleep. A sleep-deprived child has more night wakings. The bedroom should be dark, cool, and quiet because this is the most conducive environment for sleep. It should be stressed to parents to put the child to bed drowsy but awake. The goal is to allow the child to learn to "self-soothe" and fall asleep easily after a night waking. Self-soothing at bedtime has been shown to generalize to other night wakings within 2 weeks. The behavioral approaches of extinction and fading can be discussed with parents as methods to teach their child to fall asleep independently. These techniques have been proven to be effective interventions for behavioral insomnia. (4)

Extinction involves putting the child to bed and systematically ignoring him or her until the next morning. This approach may not be acceptable to many families because parents may be concerned about the impact of this intervention on their child's emotional development. Graduated extinction may be more acceptable. In this method, the child is put to bed drowsy but awake, and the parents check on the child in progressively increasing intervals. On each night, the initial waiting period is increased by 5 to 10 minutes. The specific waiting period varies for each family and is dependent on the child's and the parents' tolerance for crying. To help parents try this approach, they can be told that instituting extinction at bedtime soon generalizes to the rest of the night. Parents should also be prepared for the "extinction burst," which is a worsening of the behavior, usually occurring on the second night.

"Fading" of the adult intervention, which is an option to the extinction approach, involves establishing a clear plan for gradually decreasing parental involvement in the child's falling asleep. An "exit plan" can be designed, with the parents first instituting a regular bedtime and sleep schedule and then gradually decreasing direct contact with the child as he or she falls asleep. The goal for the plan is for the parent to "exit" the room and allow the child to fall asleep independently.

LIMIT-SETTING TYPE. Stalling or refusing to go to sleep characterizes limit-setting disorder (Table 3). The

toddler does not respond to parental requests to get ready for bed. Once in bed, there are frequent demands for parental attention, resulting in delayed sleep onset. When limits are enforced, sleep onset is not delayed. This type of insomnia is perpetuated when caregivers set few or no limits or enforce limits inconsistently and unpredictably. The insomnia also may be affected by the child's temperament, the sleeping environment (sharing a room with a sibling or other relative), or by an inherent circadian preference.

Limit-setting disorder typically presents after 2 years of age, when children are sleeping in a bed or are capable of climbing out of the crib. Bedtime resistance is common, occurring in up to 10% to 30% of toddlers and up to 15% of school-age children, and may coexist with night wakings.

Management of limit-setting disorder is similar to that for recurrent night wakings. As with night waking, it is important to have a consistent bedtime routine and a sleep schedule that allows the child to sleep an adequate number of hours. Parents should establish clear bedtime rules and put the child to bed drowsy but awake. It is crucial for both parents to be persistent and consistent in behavior modification, and both parents must participate equally. It is not reasonable to allow children to sleep in the parent's bed on weekends as a reward for sleeping in their own bed during the week. Bedtime "fading" may be helpful initially, with bedtime temporarily set at the current sleep-onset time and then gradually advanced to the desired bedtime. Children who leave their beds should be taken back to their bedrooms gently but firmly. Parents should be strongly encouraged to use positive reinforcement so the child's compliance with the bedtime plan is rewarded.

Circadian Rhythm Disorders: Delayed Sleep Phase Syndrome

Delayed sleep phase syndrome is a common disorder among adolescents and young adults, with a prevalence of 7% to 16%. The condition is characterized by habitual sleep/wake patterns that are delayed relative to conventional sleep times by 2 hours or more (Table 4). The essential issue with this disorder is the timing rather than the quality of sleep. Adolescents who have this disorder complain of sleep-onset insomnia and extreme difficulty waking in the morning. They make up for the short nighttime sleep period by afternoon naps or by extending sleep time on weekends. These behaviors serve to disrupt their circadian rhythm even more, and a vicious circle ensues.

Almost all individuals who have this disorder report

Table 4. Diagnostic Criteria: Circadian Rhythm Sleep Disorder, Delayed Sleep Phase Type

- A. There is a delay in the phase of the major sleep period in relation to the desired sleep time and wake-up time, as evidenced by a chronic or recurrent complaint of inability to fall asleep at a desired conventional clock time together with the inability to awaken at a desired and socially acceptable time.
- B. When allowed to choose their preferred schedule, patients will exhibit normal sleep quality and duration for age and maintain a delayed but stable phase of entrainment to the 24-h sleep/wake pattern.
- C. Sleep log or actigraphy monitoring (including sleep diary) for at least 7 days demonstrates a stable delay in the timing of the habitual sleep period. *Note: In addition, a delay in the timing of other circadian rhythms, such as the nadir of the core body temperature rhythm or dim light melatonin onset (DLMO), is useful for confirmation of the delayed phase.*
- D. The sleep disturbance is not explained by another sleep disorder, medical or neurologic disorder, medication use, or substance use disorder.

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themselves to be evening types, with optimal functioning during afternoon, evening, and late evening. This natural predisposition is exaggerated by the normal phase delay in circadian rhythm of about 2 hours that occurs in adolescence. A positive family history is found in up to 40% of patients, and polymorphisms in the clock gene *per3* have been discovered in this disorder.

Exact pathophysiologic mechanisms remain unknown. Patients who have this disorder have an abnormal relationship between their endogenous circadian rhythm and the homeostatic process that regulates sleep and wakefulness.

Sleep logs are useful for demonstrating the habitually delayed sleep onset and late awakening. Afternoon naps may also be noted, as well as late rise times on weekends. Polysomnography is not routinely indicated for these patients unless they also have other symptoms of sleep-disordered breathing, such as snoring or apneas. Behavioral assessment is important because this syndrome may

be associated with depression, anxiety, school refusal, and school phobia.

The aim of treatment is to realign the sleep schedule to a more conventional and socially acceptable pattern and to maintain the realigned sleep schedule. Treatment involves improving sleep hygiene by avoiding naps and caffeinated beverages and decreasing bright light exposure in the evening. Therapy includes restricting television viewing in the late evening. Television sets and computers should be removed from the child's room and cell phones switched off. Other techniques such as chronotherapy or bright light therapy are best undertaken in consultation with a pediatric sleep medicine specialist. Successful outcomes are dependent on a highly motivated patient and family.

Maintenance of the sleep schedule is extremely important, and frequent relapses may occur. Any comorbid psychiatric issues must be addressed for the child to continue to maintain the new schedule successfully. Continued good sleep hygiene is essential. The patient may be allowed to sleep a little longer on weekends after a few months of strict compliance. However, weekend oversleep time should not extend more than 2 hours beyond the desired wake time. Close contact with the patient and the family during the maintenance phase is helpful in ensuring compliance with the sleep plan. This monitoring may be via telephone or regularly scheduled visits. Patients should be encouraged to continue to maintain a sleep log, so deviations from the sleep maintenance plan may be detected early.

Common Parasomnias of Childhood

Parasomnias are undesirable physical events that occur during entry into sleep, within sleep, or during arousal from sleep (Table 5). These are important clinical disorders of which the pediatrician should be aware because they occur commonly during childhood.

NIGHT TERRORS. Night terrors (*pavor nocturnus*) are arousals from deep (slow wave) sleep, usually in the first one third of the night and invariably accompanied by behavioral manifestations of intense fear. Tremendous autonomic system discharge occurs, with tachycardia, tachypnea, flushing of the skin, diaphoresis, and increased muscle tone. The child is found sitting up in bed and unresponsive; if awakened, the child is confused and disoriented. Vocalization occurs frequently. Amnesia for the episodes is usually the case when the child is questioned the next morning.

Prevalence rates vary from 1% to 6.5% in early childhood, with a relatively stable prevalence of 2.5% from the

Table 5. Diagnostic Criteria: Sleep Terrors and Nightmare Disorder

Night Terrors

- A. A sudden episode of terror occurs during sleep, usually initiated by a cry or loud scream that is accompanied by autonomic nervous system and behavioral manifestations of intense fear.
- B. At least one of the following associated features is present:
 - i. Difficulty in arousing the child.
 - ii. Mental confusion when awakened from an episode.
 - iii. Amnesia (complete or partial) for the episode.
 - iv. Dangerous or potentially dangerous behaviors.
- C. The disturbance is not explained by another sleep disorder, medical or neurologic disorder, mental disorder, medication use, or substance use disorder.

Nightmare Disorder

- A. Recurrent episodes of awakening from sleep with recall of an intensely disturbing dream, usually involving fear or anxiety, but also anger, sadness, disgust, and other dysphoric emotions.
- B. Full alertness on awakening, with little confusion or disorientation; recall of dream is immediate and clear.
- C. At least one of the following features is present:
 - i. Delayed return to sleep after the episode.
 - ii. Occurrence of episodes in the latter half of the habitual sleep period.

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age of 15 years onward. Night terrors are usually seen between 4 and 12 years of age. Genetics may play a role in night terrors. There is usually a family history of night terrors in one or both parents. There is no association of night terrors with psychopathology in young children. Night terrors also may be associated with sleep walking.

The diagnosis of night terrors is usually based on a typical history. History taking should focus on discovering if there is any sleep disorder that could result in disrupted sleep, such as obstructive sleep apnea (OSA), restless legs syndrome/periodic limb movement syndrome, or seizures. Polysomnography is not routinely indicated, although it may be helpful in distinguishing night terrors from nocturnal complex partial seizures or frontal lobe seizures. In addition, polysomnography can help to rule out OSA in a snoring child. OSA can lead to

recurrent arousals and shifts in sleep stage and may be associated with increased night terrors.

Management of night terrors is focused primarily on parental reassurance and education. Parents should be informed of the essentially self-limited nature of these episodes. Most children cease to have them after the onset of puberty due to the dramatic decrease in slow-wave sleep.

Scheduled awakening may be considered for the child who is having nightly episodes. In this approach, the parents identify the time of the episodes and wake the child to the point of arousal 15 to 30 minutes before that time. This can be done for 2 to 4 weeks, until the episodes stop occurring, and can be repeated if the episodes start again.

Short-acting benzodiazepines may be considered in the rare child who has frequent severe episodes that are excessively violent and place him or her at high risk of injury. Treatment can be considered for 3 to 6 months, until the episodes cease completely. Benzodiazepines should be slowly tapered because abrupt discontinuation results in slow-wave sleep rebound and a return of the nocturnal episodes.

NIGHTMARES. Nightmares are characterized by disturbing dreams that usually occur in rapid eye movement (REM) sleep in the latter half of the night and result in awakening. There is significant post-awakening anxiety and difficulty in returning to sleep. This symptomatology is especially common in younger children, who cannot distinguish between dreams and reality and may refuse to return to sleep.

Approximately 10% to 50% of children between the ages of 3 and 5 years experience nightmares severe enough to disturb their own and their parents' sleep. Nightmares can be precipitated by stress or traumatic events. They also are associated with sleep deprivation, anxiety disorders, and medications, including antidepressants, antihypertensive agents, and dopamine agonists. The proportion of children experiencing nightmares peaks between the ages of 6 and 10 years and subsequently declines.

Pediatricians should assess both the chronicity and severity of nightmares because unusual severity has been related to psychopathology. Nightmares can be distinguished from night terrors by their occurrence in the latter half of the night, when REM sleep predominates. Also, the child experiences no confusion or disorientation with nightmares and can recall the event. Finally, unlike night terrors, return to sleep is significantly delayed.

Management of nightmares focuses on maintaining good sleep hygiene. Exposure to frightening or overstimulating television shows and movies should be avoided before bedtime. Children may respond well to parental reassurance or the use of security objects such as blankets. A low-level night light may be helpful. For the child who is excessively disturbed by these events, referral to a developmental-behavioral pediatrician should be considered. Affected children respond well to relaxation strategies or systemic desensitization.

SLEEPWALKING. Sleepwalking consists of a series of complex behaviors that are related to arousal from slow-wave sleep and culminate in walking around with an altered state of consciousness and impaired judgment (Table 6). The sleepwalking child may appear confused, dazed, or occasionally agitated. The eyes are usually open during the episode. Children may perform bizarre acts, such as urinating in inappropriate locations or leaving the house.

About 15% to 40% of children sleepwalk at least once. The prevalence of frequent sleepwalking is low (3% to 5%). Peak occurrence is between 4 and 8 years of age, and there may be a family history of sleepwalking. Sleep deprivation, OSA, and a febrile illness may precipitate sleepwalking.

Diagnosis is made by the typical history. Polysomnography may be helpful if there are associated symptoms of

Table 6. Diagnostic Criteria: Sleepwalking

- A. Ambulation occurs during sleep.
- B. Persistence of sleep, an altered state of consciousness, or impaired judgment during ambulation is demonstrated by at least one of the following:
 - i. Difficulty in arousing the person.
 - ii. Mental confusion when awakened from an episode.
 - iii. Amnesia (complete or partial) about the episode.
 - iv. Routine behaviors that occur at inappropriate times.
 - v. Inappropriate or nonsensical behaviors.
 - vi. Dangerous or potentially dangerous behaviors.
- C. The disturbance is not explained by another sleep disorder, medical, or neurologic disorder, mental disorder, medication use, or substance use disorder.

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snoring or restless sleep and typically shows arousal from deep sleep in the first half of the night.

Treatment is focused primarily on protecting the child from harm. The child's room should be in a safe location, not close to stairs. Alarms such as bells may be placed on the doorknob to alert parents to the child's waking. Parents should be reassured that there is no significant association between childhood sleepwalking and psychopathology. They should be encouraged to maintain good sleep hygiene, with a regular sleep/wake schedule. For the rare child who has nightly events or a history of injury, treatment with benzodiazepines may be considered for a period of 3 to 6 months, with slow tapering. Most sleepwalking episodes resolve by puberty with the age-related diminution in slow-wave sleep.

Sleep-related Breathing Disorders: Pediatric OSA

OSA is characterized by intermittent complete or partial obstruction of the upper airway that leads to obstructive apnea or hypopnea, which disrupts normal ventilation during sleep and may be associated with hypoventilation and oxyhemoglobin desaturation. OSA must be distinguished from primary snoring, which is snoring without associated obstructive events or gas exchange abnormalities.

The prevalence of this disorder has been reported to vary from 2% to 4% in healthy children. The disorder can occur at any age but is most common in the preschool age group (2 to 6 years) and adolescents. In prepubertal children, the disease occurs equally in boys and girls. A higher prevalence has been reported in African-American children. OSA appears to run in families, with a family history of the disorder usually being present. However, the relative role of genetic versus environmental factors has not yet been determined.

The exact pathophysiology of the disorder in children is unknown. It appears to result from a combination of upper airway narrowing and upper airway hypotonia. The primary predisposing factor for OSA in young children is adenotonsillar hypertrophy, although size of the tonsils and adenoids does not predict disease in individual patients. Obesity appears to be a risk factor in older children. In many children, both factors may be relevant. Other children at high risk of OSA include those born with craniofacial abnormalities, specifically midface hypoplasia and micrognathia, and associated hypotonia. Among these patients are children who have Down syndrome, neuromuscular disease, and cerebral palsy.

Early diagnosis and treatment of OSA is important because the untreated condition has been associated with

cor pulmonale, pulmonary hypertension, and systemic hypertension as well as poor learning, behavioral problems, and attention-deficit/hyperactivity disorder (ADHD).

Typical of OSA is a history of loud nightly snoring with observed apnea spells. Parents may note that the child is a restless sleeper or that he or she sweats substantially while sleeping or sleeps in an abnormal position with the neck extended. Daytime symptoms can include chronic mouth breathing with chronic nasal congestion or morning headaches. Excessive daytime sleepiness is more common among older children. OSA may present with subtle neurobehavioral signs, including mood changes, ADHD-like symptoms involving inattention and easy distractibility, or academic problems due to difficulty concentrating. Findings on physical examination may include characteristic adenoidal facies as well as signs of atopy or nasal congestion such as "allergic shiners," nasal septal deviation, or enlarged turbinates. Oropharyngeal examination may reveal enlarged tonsils or a redundant soft palate with a long uvula. The rare child may present with cor pulmonale or systemic hypertension.

In April 2002, recognizing the significant impact of OSA on children, the American Academy of Pediatrics issued an evidence-based clinical practice guideline with recommendations for the diagnosis and management of OSA in children (Table 7). (5)

Table 7. Recommendations for the Diagnosis and Treatment of OSA (5)

1. All children should be screened for snoring.
2. Complex, high-risk patients should be referred to a specialist. These patients include infants and patients who have craniofacial disorders, genetic syndromes, neuromuscular disorders, chronic lung disease, sickle cell disease, and central hypoventilation syndromes.
3. Thorough diagnostic evaluation should be performed. History and physical examination cannot distinguish between primary snoring and OSA. Polysomnography is the diagnostic test of choice.
4. Adenotonsillectomy is the first line of therapy for most children. Continuous positive airway pressure is an option for those who are not surgical candidates or who respond poorly to surgery.
5. High-risk patients should be monitored as inpatients postoperatively.
6. Patients should be reevaluated postoperatively to determine if additional treatment is required. All patients should undergo clinical evaluation. High-risk patients should undergo polysomnography.

Summary

- Based on community surveys, sleep disorders in children are widely prevalent and preventable.
- Based on strong research evidence, behavioral treatment of insomnia of childhood is safe and effective.
- Based on strong research evidence, all children should be screened for snoring. Pediatricians are encouraged to follow evidence-based guidelines for diagnosis and management of OSA, as specified by the American Academy of Pediatrics in its clinical practice guideline.

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Suggested Reading

- American Academy of Sleep Medicine. *The International Classification of Sleep Disorders. 2nd Ed. Diagnostic and Coding Manual*. Westchester, IL: American Academy of Sleep Medicine; 2005
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HealthyChildren.org Parent Resources from AAP

<http://www.healthychildren.org/English/ages-stages/baby/sleep/Pages/default.aspx>

Table 1. Difficulty Falling Asleep—Infants

Type of Problem	Circumstances of Bedtime	Nap Routine	Relationship Factors	Treatment
Sleep Association (>2 mo)	Infant may be put to bed already asleep, in body contact with parent, with the bottle or pacifier	Falls asleep in body contact or with bottle or pacifier	Maternal depression, overresponsive parent, vulnerable child syndrome, inability to see/play with the child during the day	In bed alone and awake for night and naps
Hunger	Last feeding several hours before bedtime or infant needs more calories			Bedtime feeding
Circadian Rhythm Disorder (Phase Shift)	Infant is not tired; bedtime is too early	Long naps during the day or wakes from last nap after 4 PM		Shorten naps, end nap earlier

Table 2. Difficulty Falling Asleep—Preschool

Type of Problem	Circumstances of Bedtime	Nap Routine	Relationship Factors	Treatment
Sleep Association	Put to bed already asleep, in body contact, with bottle or pacifier, or with TV on	Falls asleep in body contact or with bottle or pacifier	Maternal depression, overresponsive parent, inability to see/play with child during the day	In bed alone and awake for night and naps
Circadian Rhythm Disorder (Phase Shift)	Toddler is not tired; bedtime is too early	Long naps or does not wake up until after 4 PM		To bed when tired, then advance by 15 min per night, keeping appropriate wake-up time
Limit-setting	Lack of bedtime routine, parent gives in to "one more" plea by child	Often no nap routine	Inability to set limits, guilt	Set routine; enforce "one more time;" use ticket; one story if comes out, two if stays in; or hold door/turn off light briefly
Bedtime Fears	Can't distinguish reality, little reassurance from parent, frightening environment (eg, TV); may also feign fears.		Inability to set limits, marital discord, exposure to media, chaotic household, family stresses, sexual/physical abuse	Evaluate and resolve stresses, establish soothing routine, use "monster spray"

Table 3. Difficulty Falling Asleep—School-age and Adolescents

Type of Problem	Circumstances of Bedtime	Nap Routine	Relationship Factors	Treatment
Sleep Association	Teen falls asleep with radio or TV on		Lack of limit-setting	Negotiate use of media, depending on success in morning
Circadian Rhythm Disorder (Phase Shift)	Child is not tired; bedtime is too early, given phase shift	Daytime naps exacerbate	Lack of limit-setting, increased social responsibilities of child, child may avoid family or school obligations by staying up late and getting up late	Reset rhythm by delaying bedtime 1 h/d around the clock, keeping total sleep appropriate to desired hour, or advancing 15 min/d. Then maintain 7 d/wk. No naps.
Anxiety at Bedtime	Daytime stresses, asthma, obstructive sleep apnea, restless leg syndrome		Daytime stresses, exposure to violent or frightening media, chaotic household, family stresses, sexual/physical abuse	Evaluate and treat possible medical and psychiatric causes and stresses

Sleep Disorders Self-Reflection/ Quiz:

1. Do you routinely ask about sleep during well-child visits? If so, how do you ask (general questions? specific symptom questions?)? Do you ask at *every* well-child visit from birth to adolescence?
2. What was your/your child's/your patient's BEARS score? Was it what you expected?
3. After reading this module, will you change anything about your own/your child's sleep patterns? Will you change anything about how you screen your patients for sleep disorders?

4. Please complete the following table (from PIR, Dec 2006):

Common Pediatric Sleep Disorders	
Diagnoses	Usual Age Range of Presentation
Sleep Onset Association Disorder	
Limit-setting Disorder	
Obstructive Sleep Apnea Disorder and Sleep-disordered Breathing	
Night Terrors and Other non-REM Parasomnias	
Inadequate Sleep Hygiene	
Delayed Sleep Phase Syndrome	

5. *Flashback:* Which behavior modification techniques can be used to address **Sleep-onset Association Disorder** and/or **Limit-Setting Disorder**?

6. **Delayed Sleep Phase Syndrome** is characterized by habitual sleep/wake patterns that are delayed relative to conventional sleep times by _____ hours.

7. Please complete the following table (from PIR, Dec 2006):

Table 3. Distinguishing Between Nightmares and Night Terrors		
Distinguishing Factors	Nightmares	Night terrors
Memory for the event		
Dreams		
Stage of sleep		
Time of the night		
Requires parent for comfort		
Family history		
Common age range		
Associated risk factors		

8. Untreated OSA has been associated with _____

Name That Sleep Product -- Safe or Unsafe?



Sleep Disorders Mini-Cases:

Take turns and complete as many cases as you can in the last 30 min of conference (cases are in chronologic order). Sleep training is often more of an art than a science, so the answer key leaves room for a variety of approaches—Share your own! (Residents—review the answer key after conference).

Case 1: My 6 week-old infant thrashes about and cries out when he sleeps. He continually hits himself in the face and wakes up. Is this behavior normal? How do I help him sleep better?

Case 2: Our 2 month-old baby won't sleep in his own bed. He has slept with us since his birth. We have tried lullabies, talking to him, and letting him cry, but he will only sleep in our arms. Help!

Case 3: My baby is almost 3 months of age and still wakes up hungry at least once or twice during the night. My mother-in-law insists that I could solve the problem by giving him some cereal in the evening. Is she right again?

Case 4: Now that my 5 month-old baby is rolling over by himself, is it safe to let him sleep on his tummy? If not, what is the best way to keep him on his back?

Case 5: My 6 month-old baby used to sleep all night, but suddenly, without any reason, is waking up in the middle of the night. He is not teething, hasn't been sick, and is growing and developing well. What could be the cause?

Case 6: Our 15 month-old is having terrible sleeping problems. He goes to bed around 2100, wakes up around 0100, and is wide awake until 0400. Then, he sleeps until 0800 and stays up until his 1hr afternoon nap. Thank goodness for Sesame Street in the middle of the night! What can we do?

Case 7: My son at 20 months is still waking up at 2-3 hour intervals every night. He usually asks for a drink of juice or something to eat. His daytime caregiver has trouble getting him to eat because he drinks a lot juice and has no appetite for solid foods. Is this normal behavior?

Case 8: My son is 4 years-old and snores loudly and wakes up several times every night. His tonsils look very large and I wonder if this could be dangerous for him?

Case 9: My 4 ½ year-old daughter has frequent nightmares and is now afraid to go back to bed. What should I do?

Case 10: It's impossible to wake my 15 year-old up for school. It's so frustrating—he stays up until 0130 watching Late Night with Jimmy Fallon (he tells me he can't fall asleep), and then of course he is exhausted when I try to wake him up for school at 0600. On the weekends, he could sleep straight through lunch if I let him. Can you tell him to stop watching Jimmy Fallon and go to sleep?

Sleep Disorders Board Review

1. The parents of a 3-month-old child are concerned that he is not getting enough sleep and is waking frequently during the night. Every time they check on him at night, he is making sucking movements and his limbs twitch. His past medical history and physical examination findings are within normal parameters. He is being fed a cow milk-based formula.

Of the following, the BEST next step in the management of this infant is to

- A. add rice cereal to the infant's formula
- B. change the infant's formula
- C. obtain polysomnography (sleep study)
- D. reassure the parents that this sleep pattern is normal
- E. refer the infant for neurologic evaluation

2. During the health supervision visit of a term newborn boy, his mother relates that a cousin's child died at age 4 months from sudden infant death syndrome. She asks what she can do to prevent such an occurrence in her son.

Of the following, the single MOST important preventive measure is to

- A. avoid use of a pacifier
- B. cosleep in the parental bed for close observation
- C. ensure side sleep positioning to prevent aspiration
- D. ensure supine sleep positioning
- E. use home apnea and bradycardia monitoring

3. An 8-month-old infant often falls asleep while his mother is feeding him. He tends to sleep longest during the day and wakes frequently during the night. The parents are sleep-deprived and ask for your assistance in getting the infant to sleep more during the night.

Of the following, your BEST suggestion is to

- A. instruct the parents to feed the infant promptly when he awakes at night
- B. instruct the parents to keep the child awake more during the day
- C. prescribe diphenhydramine for the infant at night to help him sleep
- D. reassure the parents that this is a phase that will pass and recommend a follow-up evaluation in 2 months
- E. recommend that the infant sleep with the parents to minimize nighttime disturbances

4. A 4-year-old boy presents with a 2-year history of persistent bilateral nasal congestion. His parents are worried because at night he snores loudly and has had pauses in his breathing. His symptoms occur daily and have not improved with the administration of oral decongestants, nasal corticosteroids, oral antihistamines, or antibiotics. The boy denies ocular pruritus, sneezing, or rhinorrhea. On physical examination, a low-pitched inspiratory noise is audible, and there is "cobblestoning" of his posterior pharynx. Findings on the remainder of the physical examination, including the tonsils, nose (by nasal speculum examination), and neck, are unremarkable.

Of the following, the MOST likely diagnosis is

- A. adenoidal hypertrophy
- B. allergic rhinitis
- C. choanal atresia
- D. chronic sinusitis
- E. juvenile nasopharyngeal angiofibroma

5. A 6-year-old boy presents for evaluation due to an episode of screaming and confusion at night. The boy's parents heard him scream in his room, and when they went to him, he exhibited rapid twitching of his left arm and hand, stiffening of his left leg, rolled back eyes, and some blinking of both eyes. He was incoherent and minimally responsive for 5 to 10 minutes. After the episode, he was weak on the left side of his body. By morning, he had returned to a normal status.

Of the following, the MOST likely diagnosis is

- A. benign rolandic epilepsy
- B. juvenile myoclonic epilepsy
- C. night terrors
- D. nocturnal frontal lobe epilepsy
- E. rapid eye movement sleep behavior disorder

6. A parent requests referral to a urologist for her 7-year-old son because of his bedwetting problem. He has no urinary incontinence during the day and is otherwise healthy. Physical examination reveals normal growth parameters and normal genitalia with a circumcised phallus. Dipstick urinalysis results are normal, with a specific gravity of 1.025.

Of the following, the MOST appropriate next step is

- A. a complete blood count
- B. psychological evaluation
- C. reassurance and a follow-up visit in 6 months
- D. referral to a urologist
- E. renal/bladder ultrasonography