Classification and Epidemiology of Childhood Sleep Disorders

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Approximately 25% of all children experience some type of sleep problem at some point during childhood, ranging from short-term difficulties in falling asleep and night wakings, to more serious primary sleep disorders, such as obstructive sleep apnea. A number of studies have examined the prevalence of parent- and child-reported sleep complaints in large samples of healthy, typically developing children and adolescents; many of these have also further delineated the association between disrupted sleep and behavioral concerns. Sleep problems are even more prevalent in children and adolescents with chronic medical, neurodevelopmental, and psychiatric conditions. It is important to note that definitions of normal sleep patterns, sleep requirements, and sleep disorders in childhood must necessarily incorporate the wide range of normal developmental and physical maturational changes across childhood and adolescence, and cultural, environmental, and social influences.

Normal sleep patterns and behavior in childhood

To define abnormal, problematic, or insufficient sleep in infants, children, and adolescents, it is important to have an understanding of what constitutes “normal” sleep in children. Definitions of normal sleep patterns and sleep requirements in childhood, and descriptions of sleep phenotypes, must necessarily incorporate the wide range of normal developmental and physical maturational changes across childhood and adolescence. Furthermore, cultural, environmental, and social influences, which profoundly influence children’s sleep in particular, must also be considered.

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Surprisingly, however, there are relatively little large-scale epidemiologic data available that systematically define normal sleep and wakefulness patterns and sleep duration in the pediatric population. Most of the existing studies have used subjective, parent-report, retrospective, cross-sectional surveys in selected populations. Although cross-sectional studies yield important information regarding sleep in discrete age groups, by their nature they do not describe the evolution and persistence of sleep-wake patterns over time, nor do they help to elucidate the complex reciprocal relationship between sleep and cognitive-emotional development from the prenatal period through adolescence. There are even more limited data from studies using more objective methods of measuring sleep quality and duration, such as polysomnography and actigraphy, and many of these studies were conducted before the establishment of accepted sleep monitoring and scoring standards.

Recognizing the limitations of the current knowledge base, epidemiologic studies do support several general trends in normal sleep patterns across childhood. As with most sleep behaviors, these trends reflect the physiologic-chronobiologic, developmental, and social-environmental changes that are occurring across childhood. These include the following:

1. A decline in the average 24-hour sleep duration from infancy through adolescence, which involves a decrease in both diurnal and nocturnal sleep amounts [1]. In particular, there is a dramatic decline in daytime sleep (scheduled napping) between 18 months and 5 years, with a less marked and more gradual continued decrease in nocturnal sleep amounts into late adolescence.
2. A gradual shift to a later bedtime and sleep-onset time that begins in middle childhood and accelerates in early to mid adolescence.
3. Irregularity of sleep-wake patterns characterized by increasingly larger discrepancies between school night and non–school night bedtimes and wake times, and increased weekend oversleep that typically begin in middle childhood and peak in adolescence.

There is also some evidence to suggest that sleep patterns and behaviors in children and adolescents have changed over time. Several studies have not only shown that average sleep duration decreases across middle childhood and adolescence (in contrast to sleep needs, which do not dramatically decline), but that sleep duration in equivalent age groups has declined over time [1]. This trend seems to be related in school-aged children largely to later bedtimes and, in adolescents, to earlier sleep-offset and later sleep-onset times.

Variables affecting sleep patterns and behaviors in children

The relative prevalence and the various types of sleep problems that occur throughout childhood must also be understood in the context of normal physical and cognitive-emotional phenomena that are occurring at
different developmental stages. For example, temporary regressions in sleep development often accompany the achievement of motor and cognitive milestones in the first year of life. Similarly, an increase in nighttime fears and night wakings in toddlers may be a temporary manifestation of developmentally normal separation anxiety peaking during that stage. Parental recognition and reporting of sleep problems in children also varies across childhood, with parents of infants and younger children more likely to be aware of sleep concerns (and to bring them to the attention of their health care provider) than those of school-aged children and adolescents. Furthermore, the very definition of what behaviors constitute a sleep problem is often highly subjective, and is frequently determined by the amount of disruption caused to parents’ sleep.

In addition to considering sleep disturbances within a developmental context, a number of other important child, parental, and environmental variables affect the type, relative prevalence, chronicity, and severity of sleep problems. In particular, it should be noted that sleep may function as a kind of barometer of a child’s physical and mental health. Child variables that may significantly impact sleep include temperament and behavioral style, cognitive and language abilities, individual variations in circadian preference, and the presence of comorbid developmental, medical, or psychiatric conditions. Parental variables include parenting and discipline styles; mental health issues, such as maternal depression [2]; medical issues; family stress; parents’ education level and knowledge of child development; quality and quantity of parents’ sleep; and differences between mothers and fathers in regards to perception of their child’s sleep [3,4]. Environmental variables include the physical sleeping environment (space, noise, perceived environmental threats to safety, sleep surface, room and bed sharing); family composition (number, ages, and health status of siblings and extended family members); and lifestyle issues (parental work status, competing priorities for time, household rules [5], and even socioeconomic status [household income [6]])]. For example, a number of studies have now suggested a link between television viewing habits and sleep problems in children [5,7,8].

Furthermore, although many sleep problems in infants and children are transient and self-limited in nature, the common wisdom that children “grow out of” sleep problems in many cases is not an accurate perception. A number of studies have documented both the persistence and recurrence of infant sleep problems into early childhood [9]. A number of intrinsic and extrinsic risk factors (eg, difficult temperament, chronic illness, neurodevelopmental delays, maternal depression, family stress) may predispose a given child to develop a more chronic sleep disturbance.

Finally, it is also important to consider the cultural, racial-ethnic, and family context within which sleep behaviors in children occur [10]. For example, co-sleeping of infants and parents is a common and accepted practice in many ethnic groups, including African Americans, Hispanics, and Southeast Asians, both in their counties of origin and in the United States.
Rates of bed-sharing also vary widely in more “western” cultures, including the United States, in conjunction with such variables as socioeconomic status, maternal education, and family composition, whereas in more “traditional” cultures these factors do not significantly affect bed-sharing rates. In many more traditional societies, sleep is heavily embedded in social practices, and both the sleeping environment and the positioning of sleep periods within the context of other activities is much less solitary and less rigid than in more urbanized cultures. The relative value and importance of sleep as a health behavior, the interpretation of “problematic” versus normal sleep by parents, location of the sleep space and bedtime practices [11], and the level of acceptability of various treatment interventions (pharmacologic, behavioral, complimentary, and alternative strategies) for sleep problems are just a few additional examples of sleep issues that are impacted on by race-ethnicity and cultural and family values and practices.

Impact of sleep problems

Although a detailed description of the impact of disrupted or insufficient sleep on children’s health and well-being is beyond the scope of this article, any discussion of the epidemiology of pediatric sleep must underscore the importance of the relationships between sleep problems and mood, performance, and behavior. Many of the studies that have examined these complex relationships have sought to provide answers to such fundamental questions as how much sleep is needed by infants, children, and teenagers for optimal functioning; the minimum amount of sleep required at different developmental levels; the relative impact of other variables that may also affect sleep needs (eg, pubertal development) and patterns (eg, racial differences in napping); and how patterns of growth and development from infancy to adolescence are negatively impacted by insufficient sleep. In general, studies that have examined these relationships have used one of a number of different methodologies: (1) assessment of effects of experimental in-laboratory or at-home sleep restriction on mood, neuropsychologic test performance, and observed behavior; (2) evaluation of mood, behavioral, and academic problems in children with clinical sleep disorders (eg, obstructive sleep apnea, restless leg syndrome, periodic limb movement disorder); (3) examination of the impact of treatment of sleep disorders (pharmacologic, surgical, behavioral) on neurobehavioral measures; (4) identification of behavioral and academic dysfunction in “naturalistic settings” of children identified as poor sleepers or those with insufficient sleep; and (5) identification of sleep problems in populations of children with behavioral and academic problems (eg, hyperactivity-impulsivity, inattention) compared with typically developing control children.

A number of studies have demonstrated that children for whom parents report sleep complaints are more likely to manifest not only increased subjective daytime sleepiness, but also moodiness, behavioral problems, and school and learning problems [12]. In one survey of sleep problems in
elementary school-aged children, teachers reported behavioral evidence of significant daytime sleepiness in the classroom setting in 10% of their students [13]. Disrupted sleep patterns, including variability in sleep amounts and bedtimes, have been shown to predict less optimal adjustment in preschoolers [14]. Another study found a significant correlation between early rise times and self-reported difficulties in attention and concentration in fifth graders [15]. Because of their cross-sectional design, however, and the reliance on parental (or self) report for description of both sleep and behavioral variables in many of these studies, the results must be interpreted cautiously in terms of sleep as a causal or sole contributing factor.

In similar survey studies, adolescents who reported disturbed or inadequate sleep were also more likely to report subjective sleepiness, mood disturbances, and performance deficits in both social and academic spheres [16,17]. Adolescents may be at increased risk for sleep disturbances and inadequate sleep for a number of biologic and environmental-psychosocial reasons, and studies have suggested that the lifetime prevalence of insomnia in random samples of adolescents may be as high as 11% [18]. The resultant decrease in total sleep time in adolescents has been associated in several studies with poorer grades in school, and depressed mood and increased anxiety. One study [19] that found an overall prevalence of significant sleep problems in about one third of the adolescents surveyed also reported an increased level of self- and parent-reported externalizing behavioral problems in the sleep-disturbed sample.

Sleep problems are also a significant source of distress for families, and may be one of the primary reasons for caregiver stress in families with children who have chronic medical illnesses or severe neurodevelopment delays [20]. Furthermore, the impact of childhood sleep problems is intensified by their direct relationship to the quality and quantity of parents’ sleep, particularly if disrupted sleep results in daytime fatigue and mood disturbances, and leads to a decreased level of effective parenting [4]. Conversely, successful intervention not only has the effect of improving the sleep of the entire family, but may also aid parents in developing behavioral strategies that have the potential to generalize for use with daytime behavior problems.

Empirical studies involving both normal and sleep-deprived pediatric populations (children with sleep disorders, adolescents, and so forth) have begun to describe the extent and the consequences of inadequate or disrupted sleep in children. Unlike adults, daytime sleepiness in children may not be characterized by such overt behaviors as yawning, complaining about fatigue, and so forth, but may rather be associated with a host of more subtle or even “paradoxical” (eg, increased activity) behavioral manifestations. These range from emotional lability, irritability, and low frustration tolerance (internalizing behaviors); to neurocognitive deficits (particularly those involving higher level executive functions, such as working memory, cognitive flexibility, and the ability to reason and think abstractly); to behavioral disinhibition (externalizing behaviors, such as increased aggression and
impulsivity) [12]. In turn, functional deficits in mood, attention, cognition, and behavior may lead to performance deficits in the home, school, and social settings. Studies of sleep in children with primary behavior and learning problems have further supported an association between sleep and performance impairments. Finally, sleep problems in childhood may be an important precursor and potential early indicator of future anxiety, depression, and substance use disorders.

More recent studies have also begun to explore potential links among sleep problems, insufficient sleep, and health problems [21]. One of the most potentially significant relationships from a public health perspective is that between short sleep duration and obesity in pediatric populations, a finding that has now been replicated in a variety of age groups in a number of different pediatric populations around the world [22–28], presumably mediated through effects on various metabolic systems and on patterns of hunger and satiety (glucose metabolism, insulin resistance, ghrelin and leptin levels). Additional health outcomes of inadequate or disrupted sleep in children include potential deleterious effects on the cardiovascular and immune systems, an increase in accidental injuries [29], and inappropriate consumption of alertness-enhancing substances, such as caffeine [30] and psychostimulants [31].

Empirical evidence indicates that children experience significant daytime sleepiness as a result of disturbed or inadequate sleep, and most studies suggest a strong link between sleep disturbance and behavioral problems. Behavioral manifestations of sleepiness in children not only vary with age and developmental level, but these behaviors may not be reliably interpreted as such by parents and other observers. Unfortunately, objective, reliable, and cost-effective measures of sleepiness and alertness that could be applied to large epidemiologic samples of children are currently largely lacking. In addition, there is little subjective parent-report or self-report data regarding sleepiness in children, although more recently daytime sleepiness measures for pediatric populations have been developed [32]. The few studies that have examined the prevalence of daytime sleepiness in large nonclinical samples of children have suggested that daytime somnolence is a common finding, even in school-aged children [33].

Classification systems for pediatric sleep disorders

For a variety of reasons, it is often a challenge operationally to define “problem sleep” in children. The range of sleep behaviors that may be considered “normal” versus “pathologic” is wide, and the definitions often highly subjective. Researchers have taken a number of approaches to this issue; some use a priori definitions of disturbed or poor sleep, which are tailored for age and developmental level (eg, waking for longer than 30 minutes more than 3 times a week); some have relied on comparison with normative populations; and others have based the definition of sleep problems on what the parent subjectively identifies as problematic. More recent attempts to
develop classification schemes for sleep-onset problems and night wakings in young children have used constructs related to specific sleep behaviors (ie, self-soothing and signaling) to predict the development of sleep problems [34,35]. Other authors have incorporated more concrete evidence of daytime sequelae (mood, behavior, academic performance) to quantify functional significance as part of the definition of problematic sleep in children. Some studies have included reports from other observers, including teachers, to avoid depending solely on parents’ awareness of, expectations for, tolerance of, and interpretation of the sleep and daytime behaviors. A number of studies in adolescents (and a handful in younger children) have included self-report measures of sleep quality, quantity, and perceived daytime impairment. The lack of consistent methodologies and standardized classification systems, however, which makes comparisons across studies problematic, underscores the need for a common nosology in terms of research definitions of sleep disorders.

From a clinical rather than research perspective, significant sleep problems, like many behavioral problems in childhood, may best be viewed as more loosely occurring along a severity and chronicity continuum that ranges from a transient and self-limited disturbance to a disorder that meets specific standardized diagnostic criteria. Several clinical classification systems exist that are applicable to sleep problems in the pediatric population, including the International Classification of Sleep Disorders and the Diagnostic and Statistical Manual of Mental Disorders-IV. Some of the clinical sleep disorders described in the International Classification of Sleep Disorders, such as behavioral insomnia of childhood (sleep-onset association and limit-setting subtypes), are almost exclusively found in children, whereas others (eg, psychophysiological insomnia) list diagnostic criteria that are intended to be applied to both adult and pediatric populations. This latter approach may not adequately capture developmental considerations and other factors unique to pediatrics (eg, the impact of sleep disorders on caregiver health and well-being), however, nor reflect the most common clinical presentations of these disorders when they occur in children. Any pediatric diagnostic classification system must acknowledge the validity of parental concerns and opinions regarding their child’s sleep patterns and behaviors, and the resulting stress on the family as primary in defining sleep disturbances in the clinical context. Furthermore, successful treatment of pediatric sleep problems in the clinical setting is highly dependent on these subjective parameters, such as identification of parental concerns, clarification of mutually acceptable treatment goals, active exploration of opportunities and obstacles, and ongoing communication of issues and concerns.

Epidemiology of sleep in general pediatric populations

The following discussion focuses on general sleep problems in children and on nonspecific presenting sleep complaints, such as bedtime resistance
and night wakings; prevalence data regarding specific sleep disorders, such as obstructive sleep apnea, and behavioral sleep problems in childhood are found elsewhere in this issue. A number of studies examined the prevalence of parent- and child-reported sleep complaints in large samples of children and adolescents; many of these have also delineated the association between disrupted sleep and behavioral concerns. Most of these studies have used broad-based parent-report sleep surveys to assess for a variety of sleep problems, ranging from bedtime resistance to prolonged night wakings to parasomnias [36,37]. It should be pointed out that there are limitations to these types of data in addition to varying definitions of “problem sleep,” including difficulty in identifying daytime sleepiness-related behaviors, especially in younger children and limited information regarding possible confounding factors (comorbid medical conditions, medication use, and so forth). Parent-reports may overestimate or underestimate the prevalence of sleep problems. Furthermore, it should be emphasized that parental descriptions of sleep problems are not synonymous with the diagnosis of a sleep disorder, which can only be made in conjunction with a clinical evaluation and needs to meet specified diagnostic criteria.

Approximately 25% of all children experience some type of sleep problem at some point during childhood, ranging from short-term difficulties in falling asleep and night wakings, to more serious primary sleep disorders, such as obstructive sleep apnea. Interestingly, these prevalence figures are quite consistent across different countries, and in the few studies that have conducted cross-cultural comparisons using a consistent methodology across populations [38]. Other studies have reported an overall prevalence of a variety of parent-reported sleep problems ranging from 25% to 50% in preschool-aged samples to 37% in a community sample of 4 to 10 year olds [13,39]. A more recent study of over 14,000 school-aged children [6] found sleep problems in 20% of 5 year olds and 6% of 11 year olds. Other studies have found a prevalence of sleeping difficulties in 43% of 8 to 10 year olds [40]. Many studies have examined the self-reported prevalence of sleep problems in adolescents; upward of 40% of adolescents also have significant sleep complaints [41] and 12% identified themselves as “chronic poor sleepers” [42]. Many of these studies have also documented a host of associated deficits in academic performance, social competence, and behavior problems [43]. Some of these studies have also suggested that there may be gender differences in rates and types of sleep problems in adolescents, and that sleep problems in this age group are highly likely to be persistent [31].

Studies that have used self-reports of sleep problems in older children have suggested that there may be a discrepancy between parental and child report, with parents less likely than the children to report sleep onset delays and night wakings. Finally, in studies that have asked health care providers to identify the prevalence of sleep problems in practice, rates of significant difficulties initiating or maintaining sleep across age groups vary, in one
recent study comprising on average about 3% ± 7% of all practice visits [44]. In the IMS HEALTH National Disease and Therapeutic Index Survey of 2930 office-based practices in the continental United States, which uses diagnostic codes, 0.05% (5 in 10,000) of all pediatric visits were for sleep problems and 0.01% (1 in 10,000) were specifically for insomnia. It should be noted, however, that a number of studies suggest that practitioner-identified sleep problems may also underestimate prevalence [45]; in the Rona study, less than 25% of the school children with sleep problems had consulted a physician [46].

Several studies suggest that the prevalence of sleep problems in minority and poor children may be significantly greater [47], although not all studies have found this association [2]. Vulnerable populations, such as children who are at high risk for developmental and behavioral problems because of poverty, parental substance abuse and mental illness, or violence in the home, may experience double jeopardy as a result of sleep problems. Not only are these children at higher risk for developing sleep problems as a result of such conditions as chaotic home environments, chronic medical issues like iron deficiency anemia, and neglect, but they are also less likely to be diagnosed with sleep problems because of limited access to health care services. Finally, they are likely to suffer more serious consequences from those sleep problems than their less vulnerable peers.

Epidemiology of sleep in special populations

Because of the multiple manifestations of poor and insufficient sleep, the clinical symptoms of any primary medical, developmental, or psychiatric disorder are likely to be exacerbated by comorbid sleep problems. Furthermore, sleep problems themselves tend to be more common in those children and adolescents with chronic medical and psychiatric conditions. Conversely, improving sleep has the potential benefit of improving clinical outcomes.

Sleep disturbances in pediatric special needs populations are extremely common. Estimates of sleep concerns in children with autism spectrum disorders, including Asperger’s syndrome, are in the 50% to 70% range [48,49]. Significant sleep problems have been reported to occur in 30% to 80% of children with severe mental retardation, and in at least half of children with less severe cognitive impairment. Significant problems with initiation and maintenance of sleep, shortened sleep duration, irregular sleeping patterns, and early morning waking have been reported in a variety of different neurodevelopmental disorders, including Angelman’s syndrome, Rett syndrome, Smith-Magenis syndrome, and William syndrome. Other studies have suggested that similar rates of sleep problems also occur in both younger and older blind children, with difficulty falling asleep and night wakings related to circadian disruption being the most common concerns.
Sleep problems, especially in children with special needs, are often chronic in nature and unlikely to resolve without aggressive treatment. In addition, sleep disturbances in these children often have a profound effect on the quality of life of the entire family. These children also frequently have multiple sleep disorders occurring simultaneously or in succession. Higher degrees of cognitive impairment tend to be associated with more frequent and severe sleep problems. Psychiatric disorders, such as depression and anxiety, in children and adolescents with developmental delays and autistic spectrum disorders and medications used to treat these disorders (eg, atypical antipsychotics) may further contribute to sleep problems.

Sleep disturbances often have a significant impact on the clinical presentation and symptom severity, and management of psychiatric disorders in children and adolescents. Virtually all psychiatric disorders in children may be associated with sleep disruption. Epidemiologic and clinical studies indicate that psychiatric disorders are the most common cause of chronic insomnia. Psychiatric disorders can also be associated with daytime sleepiness, fatigue, abnormal circadian sleep patterns, disturbing dreams and nightmares, and movement disorders during sleep. Use of psychotropic medications, which may have significant negative effects on sleep, often complicates the issue. Conversely, growing evidence suggests that primary insomnia (ie, insomnia with no concurrent psychiatric disorder) is a risk factor for later developing psychiatric conditions, particularly depressive and anxiety disorders [19].

Several studies have evaluated the prevalence of sleep problems in samples of children and adolescents with a variety of psychiatric disorders [19,50]. The results suggest an increase in a wide range of reported sleep disturbances in these mixed clinical populations, including parasomnias, such as nightmares and night terrors; difficulty falling asleep and frequent and prolonged night wakings; sleep-related anxiety symptoms (eg, fear of the dark); restless sleep; and subjective poor quality of sleep with associated daytime fatigue. Similarly, an association has been reported between Diagnostic and Statistical Manual of Mental Disorders-IV psychiatric disorders, including affective disorders, attention-deficit–hyperactivity disorder, and conduct disorder, and sleep problems in surveys of children and adolescents from the general population [13]. Studies of children with major depressive disorder, for example, have reported a prevalence of insomnia of up to 75% and severe insomnia of 30% and sleep onset delay in a third of depressed adolescents, although it should be noted that objective data (eg, polysomnography) do not always support these subjective complaints. Finally, reports of sleep complaints, especially bedtime resistance, refusal to sleep alone, increased nighttime fears, and nightmares common in children who have experienced severely traumatic events (including physical and sexual abuse) [51] may also be associated with less dramatic but nonetheless stressful life events, such as brief separation from a parent, birth of a sibling, or school transitions [52]. Sleep problems are not universally found in all children experiencing varying degrees of stress, and some authors
have suggested [51] that such variables as level of exposure and physical proximity to the traumatic situation, previous exposure, and the opportunity for habituation to the stress may play important roles in either mitigating or exacerbating associated sleep disturbances. Other developmental considerations, such as the age and temperament of the child, and variables, such as the presence of parental psychopathology, also clearly have an important influence.

Relatively little is currently understood about the interaction between sleep disorders and both acute and chronic health conditions, such as asthma, diabetes, and juvenile rheumatoid arthritis on either a pathophysiologic or behavioral level, although, particularly in chronic pain conditions, these interactions are likely to impact significantly on morbidity and quality of life [53–56]. Much of the information currently available regarding the types of sleep problems that occur in these children comes from studies of adults with chronic medical conditions or from clinical observations. A few recent studies have begun to examine the role of sleep disturbances in a number of chronic medical conditions of childhood, including sickle cell disease [57] and asthma [53], two disorders particularly common in high-risk and minority populations. Asthma in children has been associated with poorer subjective sleep quality, decreased sleep duration, increased nocturnal wakings with decreased sleep efficiency, and greater daytime sleepiness. The prevalence of sleep problems in children with asthma has been reported to be 60%. Asthma medications may also have adverse effects on sleep; for example, both theophylline and oral corticosteroids may cause significant sleep disruption.

Other specific medical conditions that may also have an increased risk of sleep problems include atopic conditions (chronic allergy-mediated rhinitis, chronic sinusitis, atopic dermatitis [58]); chronic headaches (migraine and tension headaches); cancer; and chronic pain conditions, such as fibromyalgia and juvenile rheumatoid arthritis. The interaction between sleep and physical and emotional dysfunction in acute and chronic pain conditions, such as burns and juvenile rheumatoid arthritis, has also begun to be explored. A number of patient-related and environmental factors, such as family dynamics, underlying disease processes, comorbid mood and anxiety disorders, and concurrent medications, are clearly important to consider in assessing this bidirectional relationship of sleep disturbances and illness in children. In particular, the impact of hospitalization on sleep quality and quantity can be significant. Studies of adult inpatient populations have found reduced sleep time and sleep efficiency, particularly in intensive care settings, and increased awakenings, nightmares, early morning awakening, and more daytime sleep; up to two thirds of adult inpatients report some type of sleep disturbance [59]. Although there are relatively few similar studies of sleep disturbances in hospitalized children, prolonged sleep latencies, significantly later bedtimes, shortened sleep duration, and reduced napping have been described [60–66]. Factors contributing to sleep disturbance identified in studies of adult and pediatric inpatients include light and noise levels, sleep interruptions for medical monitoring and treatment and
diagnostic procedures, circadian rhythm disruption, and alterations in normal home bedtime routine.

In children with any medical, psychiatric, and neurodevelopmental disorder, sleep disturbances are likely to have a significant impact on both morbidity and quality of life. Effects of insufficient and disrupted sleep on physiologic functions, such as immune response and healing, on pain perception, and even on treatment compliance may compromise recovery in children with medical and psychiatric illnesses. Poor sleep and fatigue can contribute to problems with school attendance and performance, ability to concentrate, and neurocognitive function, and may be associated with depressive symptoms and reduced social and emotional functioning, and with caregiver fatigue and impaired mood.

References


