Sleep Problems in Children and Adolescents with Common Medical Conditions

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• Sleep • Pediatric • Chronic illness

Sleep is intricately connected to health and well-being. Over the past decade, research has increasingly recognized the importance of sleep and the adverse daytime consequences and health outcomes of untreated sleep disturbances and sleep disorders. Studies have shown associations among sleep problems and key physiologic health parameters, including immune system functioning and metabolic/endocrine regulation.[1] In children, specifically, short duration of nighttime sleep has been associated with increased risk of subsequent overweight or obesity.[2]

Sleep disturbances are especially prevalent in children with both acute and chronic disease states (eg, juvenile rheumatoid arthritis, asthma, cancer). Studies have shown that both acute and chronic medical conditions increase the risk of sleep disruptions,[3–6] and there is some evidence that sleep problems are more often chronic and persistent in youth with chronic conditions compared with those without chronic conditions.[7] The association between sleep problems and medical conditions may be related to underlying disease-related mechanisms (eg, airway restriction, inflammation), treatment regimens (including medications), or hospitalization. Some medical

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conditions are associated with particular sleep disorders (eg, sleep-disordered breathing [SDB] and atopic disease, restless legs syndrome, and iron deficiency anemia). Regardless of the cause, sleep disturbances typically manifest as poor sleep quality, difficulty falling asleep, disrupted or fragmented sleep with frequent awakenings, and inadequate amount of sleep. Unfortunately, sleep disturbances are too often undiagnosed and not routinely assessed by clinicians.

Poor sleep and untreated sleep disturbances pose significant adverse daytime consequences, including problems with social and emotional functioning, deficits in neurocognitive performance, poor quality of life, school absenteeism, and poor school performance.[8–12] Sleep disturbances are also associated with fatigue and daytime sleepiness.[13–16] The impact of poor sleep in children with chronic medical conditions may be of more concern given the bidirectional relations between sleep and health. Sleep problems may worsen the chronic medical condition, and in turn, disease-related symptoms may contribute to sleep disruptions.[17–19]

In this review, the authors summarize the data linking sleep disturbances and sleep disorders in children and adolescents with various medical conditions, and discuss the potential underlying mechanisms resulting in sleep problems. The potential impact of treatment-related medications on sleep is also described. Although it is beyond the scope of this article to provide a comprehensive review of sleep in all pediatric medical conditions, illustrative examples from common medical disorders and information on clinical evaluation and management are provided. The authors refer the reader to other relevant articles in this issue pertaining to the relationship between obesity and sleep (Hart) and sleep in autism spectrum disorders (Malow), and therefore do not cover these conditions.

MEDICAL CONDITIONS ASSOCIATED WITH SLEEP PROBLEMS

Allergic Rhinitis

One of the most common medical problems in children is allergic rhinitis, a chronic inflammatory disease of the upper airway affecting 10% to 30% of the population, with the greatest frequency found in children and adolescents.[20,21] Chronic allergies are associated with sleep problems and a known risk factor for SDB including habitual snoring, obstructive sleep apnea, and adenoid hypertrophy due to the chronic effects of inflammation.[22,23] Atopic symptoms can also affect sleep in children, for example, nocturnal pruritus associated with chronic eczema.[24]

Asthma

Childhood asthma, a condition defined by airway inflammation, is associated with sleep problems including decreased sleep time, less stage 4 sleep, more frequent nighttime arousals, and SDB.[25–28] Research has shown that asthma symptoms often worsen at night as a result of physiological changes (eg, airway inflammation and resistance, episodic coughing, wheezing, shortness of breath, mucociliary clearance, and lower lung volume) (see review by Suratwala and Brooks[29]). These nighttime exacerbations are related to circadian variations in lung function. Youth with asthma also show increased nocturnal awakenings compared with healthy youth. Asthma severity has been associated with both objective and subjective sleep reports,[26] and sleep disturbance has been shown to predict more severe asthma symptoms the following day.[17]

Cancer

Children and adolescents with cancer commonly report nocturnal sleep disturbances, but their causes are not well understood. Studies report frequent night awakenings, difficulty falling asleep, and increased wake time during hospitalization[30,31] and at home.[32–35] A recent study by Walker and colleagues[32] found that adolescents with cancer reported poor sleep quality, with more problems going to bed, falling asleep, maintaining sleep, and reinitiating sleep than healthy adolescents. Sleep disturbances for children and adolescents with cancer likely has many causes. Brain tumors or intracranial neoplasms are believed to affect sleep by their impact on brain structures. Brain tumors can affect sleep regulation, particularly if the mass impinges on brain structures affecting the circadian and homeostatic systems such as the hypothalamic-pituitary axis.[36] For example, craniopharyngiomas (tumors located in the basal forebrain near sleep-regulating structures) have been linked to a host of childhood sleep disturbances, including night awakenings, inability to maintain sleep, and secondary narcolepsy.[37] Tumors located near the pineal gland can result in irregular melatonin secretion, contributing to sleep-wake disturbances.[38] Central nervous system–mediated effects may also affect alertness. For example, neoplasms in the hypothalamus, thalamus, and brainstem have been linked to excessive daytime sleepiness as well as SDB.[39] Cranial radiation has also been linked to daytime sleepiness as well as sleep problems, particularly through injury to the optic nerve or retinohypothalamic track.[36]

Chronic Pain Conditions

Pain is common in youth with medical problems. Chronic pain may be a symptom or consequence of the medical problem (eg, sickle cell, arthritis, or cancer) or pain can be the problem itself (eg, headaches, chronic abdominal pain). Pain can make it difficult for children to settle and stay asleep. Youth with chronic pain report shorter sleep duration,[3,40] poorer sleep quality,[41,42] and more night wakings[43] than healthy youth. Insomnia symptoms are also common; estimates from several studies show that over half of children with different chronic pain conditions (eg, musculoskeletal pain, abdominal pain) report insomnia.[44,45] On actigraphy, youth with chronic pain demonstrate lower sleep efficiency than healthy youth.[42] Sleep disturbances are related to children's pain intensity as well as to their depressive symptoms.[46] A recent study of adolescents with mixed chronic pain conditions found that poor nighttime sleep was associated with a higher level of pain next day.[47]

In terms of specific pain conditions such as headache, frequency and duration of migraine headaches have been associated with sleep disturbances including parasomnias and bedtime resistance.[48] Furthermore, one study examining associations among sleep and headaches in youth found that tension headaches were associated with bruxism; SDB was frequent in youth with migraine and nonspecific headache; and that children with severe and chronic migraine headaches had disrupted sleep architecture (shortened sleep time, prolonged sleep latency, reduced slow-wave and rapid eye movement [REM] sleep[49]).

Craniofacial Abnormalities

Children diagnosed with genetic disorders such as Trisomy 21 and Crouzon syndrome, and children with muscular dystrophy and cerebral palsy are predisposed to craniofacial anomalies. Children with craniofacial structural overdevelopment or underdevelopment are at risk for and are often diagnosed with SDB.[22] Retrognathia, macroglossia, or mid-facial hypoplasia is commonly seen in children with underlying genetic disorders and/or hypotonia, which affect the airway and sleep. For example, cleft lip/palate is associated with several airway structural anomalies that restrict the pharyngeal airway, increasing the risk for SDB (see review by MacLean and colleagues[50]). In one study, 87% of children with cleft lip/palate had symptoms of SDB, with 28% demonstrating severe breathing problems during sleep.[51] Studies have shown that even after undergoing surgical repair, children may continue to experience nighttime sleep disturbances. A recent study by Rustemeyer and colleagues[52] showed that 40% of children who underwent surgery continued to have posterior airway narrowing, increasing the risk for SDB.

Cystic Fibrosis

Sleep problems in children with cystic fibrosis have also been associated with airway restriction.[53] Cystic fibrosis is a hereditary disease of the exocrine glands that usually develops during early childhood. The disease affects the pancreas, respiratory system, and sweat glands, and is characterized by the production of abnormally viscous mucus resulting in chronic respiratory infections and impaired pancreatic function. Studies have shown frequent sleep complaints, more nocturnal wakings, and alteration in sleep architecture in this population.[18] Children and adolescents with cystic fibrosis also demonstrate nocturnal hypoxemia, low sleep efficiency, prolonged REM latency, and a reduced percentage of REM sleep on polysomnography.[53,54] Structural alterations in airways of children with cystic fibrosis can result in obstructive sleep apnea,[55] although the frequency of sleep apnea in this population is currently unknown.[54] Recent findings suggest that the relations between sleep and symptoms secondary to cystic fibrosis are bidirectional.[18] Further longitudinal studies are needed on the impact of disturbed sleep on symptoms.

Epilepsy

Children with epilepsy may manifest significant sleepiness as a result of disruptions in sleep architecture, such as longer stage 1 sleep and latency to REM sleep.[56] Children with epilepsy have also been reported to have SDB and parasomnias.[14] The associations between epileptic seizures and sleep are thought to be bidirectional. Patients with epilepsy experience electroencephalographic (EEG) discharges at night that may affect sleep, and sleep deprivation may subsequently influence EEG discharges and seizures (see review by Parisi and colleagues[19]).

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease (GERD) is a chronic condition in which the lower esophageal sphincter allows gastric acids to reflux into the esophagus, causing heartburn, acid indigestion, and possible injury to the esophageal lining. During sleep periods, the esophageal mucosa has more contact time with acid, and acid clearance is reduced.[57] Often GERD is a common culprit of nighttime awakenings in infants. Children with reflux have demonstrated a high number of apneas and hypopneas (transient episode of shallow breathing or abnormally low respiratory rate) at night, particularly during REM sleep, and GERD is considered a risk factor for obstructive sleep apnea.[58]

Rheumatological Conditions

Rheumatological conditions including juvenile idiopathic arthritis (JIA) and juvenile fibromyalgia (JF) are associated with significant sleep disruption in children and adolescents. Youth with JIA report poor sleep quality and daytime sleepiness,[3,12,15,59] with children and their parents endorsing symptoms suggestive of sleep disorders, including insomnia, parasomnias (sleep terrors, sleepwalking), SDB, and daytime sleepiness.[59,60] Objective reports of sleep in youth with JIA including polysomnography and multiple sleep latency tests (MSLT) show mild SDB, sleep fragmentation (eg, sleep stage shifts, wake bouts), and daytime sleepiness.[12,16,61] For example, Passarelli and colleagues[3] found that compared with healthy controls, children with JIA had reduced total sleep time, more transient EEG arousals (brief shifts in the EEG to fast frequency without an awakening), and increased limb movements. Longer mean self-reported nap duration ($\sim$1 hour) and shorter mean sleep latencies[12,15] in MSLTs have been reported in children with JIA compared with mean sleep latencies from previous studies of healthy children.[3,62] Pain related to arthritis has been identified as a correlate of sleep disturbances[59] and is a potential mechanism.

Disruptions in sleep architectures in youth with JF are also common.[63,64] Compared with controls, children with JF have prolonged sleep latency, less total sleep time, decreased sleep efficiency, and more periodic limb movements,[63] and sleep anomalies are related to the intensity of pain experienced by children. Roizenblatt and colleagues[64] found decreased sleep efficiency, increased arousals, and disturbed EEG frequency during slow-wave sleep in children with JF. The mechanisms accounting for sleep alterations in JF are unclear, and additional research is warranted.

Sickle Cell Disease

The clinical manifestations of sickle cell disease (SCD) include episodes of severe pain (also called vaso-occlusive crises), infections (especially pneumococcal), cerebrovascular accidents, anemic episodes (aplastic crises or sequestration crises), and fragmented sleep. Excessive adenoidal and tonsillar growth occurs in children with SCD secondary to lymphoid tissue hyperplasia or recurrent tonsillitis.[65] Adenotonsillar hypertrophy is a risk factor for obstructive sleep apnea and vaso-occlusive crisis due to periods of hypoxemia.[66] Sleep patterns in children with SCD have not been well characterized, although studies report associations among nocturnal hypoxemia, SDB, and sleep disruption secondary to pain.[46,67–69] Compared with healthy children, parents of children with SCD report more symptoms of SDB, nocturnal enuresis, parasomnias, and night wakings.[70] In children with greater SCD severity, these parents reported more restless sleep in their children when compared with children with lower disease severity. A recent study using polysomnography reported prolonged sleep latency, decreased total sleep time, increased wake time, poor sleep efficiency, increased obstructive events, and periodic limb movements in children with SCD (HbSS, HbSC genotypes).[71] In their sample, obstructive sleep apnea was also common. Compared with children with the HbSC genotype, those with the HbSS genotype experienced more severe nocturnal oxygen desaturation.

OTHER CAUSES AND CONTRIBUTING FACTORS

Hospitalization and Treatment-Related Factors

The experience of being in hospital is associated with sleep disruptions for many children with medical conditions.[31,72,73] For example, 25% of hospitalized children with cancer reported poor sleep involving, for example, sleep fragmentation and night wakings.[72] Sleep disturbances may be due to disruptions in routine, fears and anxiety about separation from parents, loss of privacy, and frequent interruptions by medical staff. Children may also have to alter their sleeping position because of intravenous placement or location of surgical incisions. Sleep disruptions may also relate to specific treatment regimens. For example, children with chronic kidney disease experience sleep problems, and this has been linked to both the pathology of the disease and the dialysis process.[74] In a sample of pediatric dialysis patients, 86% reported sleep problems, including daytime sleepiness (60%), SDB (46%), and restless legs syndrome (29%).[74] Similarly, 49 nondialysis youths (19 had undergone a renal transplant) also reported sleep problems, particularly restless leg syndrome/periodic limb movement disorder, and 37% of these youths met diagnostic criteria for a sleep disorder.[75]

Behavioral, Emotional, and Psychological Factors

Children with chronic medical conditions are at increased risk for psychological problems[76,77]; therefore, it is important to consider the role of behavioral, emotional, and psychological factors that influence sleep. In youth with chronic conditions, behavioral and emotional problems were predictive of difficulties initiating and maintaining sleep.[6] Of importance, depression and anxiety symptoms have been associated with daytime sleepiness in female adolescents with chronic musculoskeletal pain.[43] In another study of adolescents with chronic pain, higher levels of depressive symptoms were related to more severe sleep disturbances (eg, irregular sleep habits, prolonged sleep latency, and difficulties getting up in the morning) even after controlling for adolescents' pain levels.[46] Among survivors of childhood cancer, greater symptoms of global distress predicted fatigue and continued sleep problems.[78] Symptoms of SDB have also been shown to predict behavior problems in children with asthma.[27] While depression, inattention, and oppositional behaviors were associated with sleep problems in children with epilepsy, the severity of epilepsy did not predict sleep disturbances.[79] Finally, it is important to consider the potential impact on sleep of psychotropic medications that may be used to treat comorbid psychiatric symptoms in these children.

EFFECTS OF MEDICATION ON SLEEP

Both over-the-counter and prescription medications used to treat chronic medical conditions affect sleep. Therefore it is important for the clinician to understand the effects on sleep of commonly used medications including antihistamines, antidepressants, anticonvulsants, corticosteroids, opioids, and benzodiazepines.

Anticonvulsants

Antiepileptic drugs (AEDs) are used for seizure control in youth with epilepsy. In addition, anticonvulsants such as gabapentin are commonly used agents for pain control in youth with chronic musculoskeletal pain. AEDs have mixed effects on sleep, and these effects appear independent of their anticonvulsant actions. AEDs also have the side effect of weight changes in children. A recent study by Kaleyias and colleagues[67] reports SDB, primary snoring, and periodic limb movement disorder in a cohort of 40 children with epilepsy. Children with poor control of epilepsy were more obese, had lower sleep efficiency, and higher arousal index in comparison with children with good seizure control or children free of seizures.[67]

Antidepressants

Antidepressant medications may be prescribed to treat comorbid conditions (eg, chronic pain, depression, anxiety) in children with medical conditions, and may also be prescribed specifically to treat sleep disturbance, particularly insomnia. Antidepressants have several effects on sleep and daytime wakefulness, most of which has been learned from studies in adults. These studies show prolonged sleep latency, reduced REM latency, decreased slow-wave sleep, and sleep fragmentation.[80–82] Studies in adolescents also have found prolonged sleep latency and reduced REM latency.[83–85] Most antidepressants suppress REM and increase latency to REM sleep, and abrupt withdrawal may lead to REM rebound.[86] Tricyclic antidepressants (TCAs; eg, imipramine) prolong REM latency and decrease REM sleep, and abrupt withdrawal can result in REM rebound.[87] TCAs have sedating side effects and therefore may be considered for the patient with insomnia. However, disruptions in sleep architecture are reported in children and adolescents treated with TCAs, including REM sleep suppression, decreases in slow-wave sleep, increases in stage 2 sleep, and sleep fragmentation.[88] Selective serotonin reuptake inhibitors (SSRIs) including fluoxetine (Prozac), sertraline HCl (Zoloft), and paroxetine (Paxil) have fewer sedating effects than TCAs. Little is known about the influence of SSRIs on sleep architecture in children and adolescents. Armitage and colleagues[89] examined fluoxetine use in depressed children and adolescents and found increases in stage 1 sleep, number of arousals, REM density, and oculomotor abnormalities.

Antihistamines

Antihistamines such as diphenhydramine, chlorpheniramine, and hydroxyzine are first-generation H1-histamine receptor blockers that have multiple effects on the central and peripheral nervous systems. These medications cross the blood-brain barrier and are rapidly absorbed through the gastrointestinal tract.[90] Many over-the-counter medications such as antiemetic, antiallergy, and antitussive agents contain diphenhydramine. Clinically antihistamines induce drowsiness and sleepiness, and are given to promote sleep. Sleep-onset latency is shortened and these agents have little effect on sleep architecture.[91] Some of the side effects include daytime drowsiness, lethargy, and dry mouth. Antihistamines can also intensify primary sleep disorders such as restless legs syndrome.[92]

Benzodiazepines

Benzodiazepines, such as clonazepam and diazepam, have both anticonvulsant and anxiolytic as well as hypnotic properties, and are thus used clinically for a variety of purposes. Randomized controlled studies of benzodiazepines for insomnia in children and adolescents are lacking, and it has been shown that benzodiazepines can disrupt sleep architecture (eg, suppressed delta sleep, prolonged REM latency, and increased stage 2 sleep), worsen SDB, and are associated with daytime sleepiness and cognitive effects.[93] Thus the use of these medications in the pediatric population is clinically limited.[94]

Corticosteroids

Corticosteroids are frequently used in children with chronic conditions including asthma, JIA, and cancer. These agents have a wide range of effects on multiple organs and also effect sleep.[34,95,96] Prolonged sleep-onset latency, increased wake time after sleep onset, and reduced REM sleep have been reported.[34,93,95,96] A recent study by Vallance and colleagues[95] reports that increased frequency and dosage of dexamethasone was associated with increased wake after sleep onset, poor sleep efficiency, decreased total sleep time, and increased night awakenings, as measured by actigraphy in children diagnosed with acute lymphoblastic leukemia. In pediatric cancer, studies have shown that daytime fatigue is highest during the first few days after the start of chemotherapy, and that corticosteroid use and hemoglobin values are associated with significant fatigue.[13,97] Often children receive intensive multiagent chemotherapy, and each agent can produce immediate or delayed effects on sleep.

Opioids

Opioid medications, such as oxycodone, commonly used for pain management, have also been linked to disruption of sleep architecture. There is a paucity of pediatric research on effects of opioids on sleep; however, adult studies have shown opioid use is associated with reductions in REM and slow-wave sleep, and that chronic use of opioids is associated with obstructive sleep apnea.[98,99] Timing of opioids may also affect daytime alertness; short-acting agents often induce sleep during the day.

EVALUATION OF SLEEP PROBLEMS

The clinical evaluation of sleep and its related disorders in children with medical conditions is challenging. Some sleep disorders or disturbances have a gradual onset and remain undetected for an extended period of time, in part because of the absence of adequate sleep assessment. Parents, children, and adolescents may not be familiar with the signs and symptoms (ie, altered mood, daytime sleepiness, inattention, and hyperactivity) or may attribute sleep disruptions to their underlying medical condition. Accurate assessment is critical for guiding identification and treatment of sleep problems in children with medical conditions. Differential diagnosis is key, as it can be difficult to differentiate medical, psychiatric, and sleep disorders that commonly co-occur. Thus the assessment of sleep disorders in children and adolescents with medical conditions requires a multidisciplinary team that may include advanced practice nurses, staff nurses, neurologists, pediatricians, psychologists, psychiatrists, pulmonologists, otolaryngologists, and dentists.

Similar to the assessment of sleep in the otherwise healthy child, evaluation should begin with a thorough sleep and medical history, psychiatric, developmental, and social health history, medication history, and physical examination. The physical examination should evaluate a child's physical appearance, focusing on craniofacial characteristics (midfacial hypoplasia), nasal obstruction, the oral cavity (eg, sizes of soft palate, tongue and tonsils, adenoidal tissue), a neurological evaluation for hypotonia, and an obesity assessment.[100] In the context of the medical condition, assessment of additional factors including the sleep environment and experience of nighttime symptoms will be important. For example, in children with allergies or asthma, assessment should include the child's exposure to environmental allergens including pets in the household, mattress, linens, and the living environment that might be associated with symptom exacerbations at night. Sleep assessment includes a thorough sleep history, addressing subjective and objective characteristics of sleep and sleep disturbances, related factors, and consequences (eg, mood, fatigue, excessive daytime sleepiness). Where indicated, depending on the sleep disorder, specialized sleep testing in a sleep laboratory setting may be recommended. The reader is referred to articles elsewhere in this issue for further details on evaluating sleep disorders (Babcock) and regarding sleep in the family (Meltzer).

In the general medical history evaluation, the clinician should pay particular attention to the child's underlying chronic condition (eg, pulmonary for a child diagnosed with asthma). Assessments should include cardiopulmonary (eg, heart disease, lung disease), neurological (eg, seizure disorder, restless legs syndrome), immune disorders (ie, rheumatoid arthritis), gastroenterology (eg, GERD), screening for psychiatric conditions (eg, anxiety, depression, bipolar), as well as other pain-related conditions (eg, JF, SCD). In the family history, information about sleep and psychiatric and medical conditions should be obtained; for example, history of family members or relatives who snore or are diagnosed with SDB, restless legs syndrome, narcolepsy, insomnia, or other problems such as fibromyalgia, depression, and anxiety.

In the medication review, in addition to consideration of the potential effects of medications on sleep and alertness outlined earlier, it is important to consider several other aspects of pharmacological treatment. These factors include timing (ie, direct versus withdrawal effects), dosage (ie, some sleep-disruptive effects are dose dependent), and use of combinations of medications (ie, synergistic effects of sedating drugs). During medication review, it is important to differentiate whether daytime sleepiness is secondary to symptom management (eg, pain exacerbation), in response to taking sedating medicines during the day, or to compensate for sleep loss at nighttime.

TREATMENT OF SLEEP PROBLEMS

The clinician's approach to management of sleep problems in children with common medical conditions is challenging and complex. The goal of treatment involves promotion of healthy sleep habits, prevention strategies, and treatment of diagnosed sleep disorders. Similar to otherwise healthy children, treatment of SDB in children and adolescents with medical conditions includes tonsillectomy and adenoidectomy, pharmacological interventions, and the use of noninvasive ventilation devices (eg, continuous positive airway pressure [CPAP], bilevel positive airway pressure [BiPAP]), as well as behavioral treatments and sleep education for any coexisting behaviorally based sleep issues. In children diagnosed with obstructive sleep apnea, an adenotonsillectomy is typically the first-line treatment, particularly when there is evidence of adenotonsillar hypertrophy.[101] However, children with medical conditions may require additional monitoring in the postoperative period following surgical intervention. It is important for the treating clinician to know that despite surgical intervention, some children with medical conditions continue to have obstructive sleep apnea due to underlying craniofacial anomalies or oropharyngeal features that affect the airway.[102] In these particular cases, noninvasive ventilation including CPAP or BiPAP is commonly used to treat obstructive sleep apnea. CPAP delivers a constant pressure of air to stent open the airway, and BiPAP delivers an inspiratory and expiratory pressure to children during sleep through a face mask. CPAP has been effectively used in medical populations including children with SCD[103] and young adults with cystic fibrosis.[104]

Pharmacological Treatment

Prescription and over-the-counter medications have been used to treat sleep disturbances in youth with medical conditions. For example, exogenous melatonin has been successfully used to treat circadian rhythm disturbances and sleep-onset insomnia in children with epilepsy[105] and neurodevelopmental disabilities,[106] and in children who are blind.[107] Despite the use of prescription and over-the-counter medications, there is a paucity of knowledge on the pharmacological management of sleep disturbances in children with medical conditions. In 2006, a consensus statement on the pharmacological management of pediatric insomnia was developed, which reported concerns on the lack of clinical trials and knowledge about safety and efficacy, particularly in children with chronic conditions.[108] Additional research is warranted on the pharmacological practices for the management of pediatric insomnia in children with medical conditions.

Behavioral and Psychological Treatments

There is also a paucity of research on behavioral and psychological treatments for sleep problems in children with medical conditions. Cognitive-behavioral therapy (CBT) is a psychological treatment that incorporates both cognitive strategies and behavioral techniques to promote more adaptive behaviors that facilitate sleep. CBT for insomnia (called CBT-I) has been well described for the treatment of adults and has received much empirical support in diverse populations of adults with medical conditions.[109] Only a few studies of behavioral treatments for sleep problems have been conducted in pediatric medical populations. The findings are promising, however, showing improvements in sleep quality and reductions in pain and fatigue in children and adolescents with fibromyalgia and cancer.[36,110]

Given the importance of sleep for health and well-being, strategies to heighten clinician and parental awareness and educate children, adolescents, and parents about the importance of sleep in health outcomes (eg, school and work function, quality of life, psychosocial functioning) is essential in the management of pediatric medical conditions.

SUMMARY AND RECOMMENDATIONS

Sleep is an important consideration in the management of common medical conditions in children and adolescents. Sleep loss carries specific health risks that may exacerbate a chronic condition and disease-related symptoms. Because of the adverse effects of inadequate sleep and untreated sleep disorders on health outcomes, routine screening for sleep disturbances and disorders as well as sleep assessments are needed to improve the clinical care of children and adolescents with medical conditions. Future research is needed on sleep disturbances using subjective and objective measures to better understand the relationships among sleep, disease-related symptoms, and health outcomes in children and adolescents with medical conditions. Such knowledge will enable optimal tailoring of sleep interventions to the unique needs of different medical populations.

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