Sleep Disorders Part I:
Children and Adolescents

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ABSTRACT

Although a *good night’s rest* is vital for people of all ages, it can be especially critical for children and adolescents due to the impact of sleep on growing minds and bodies. However, even young people can suffer from sleep disorders ranging from mild to debilitating, and these disorders can have an impact on the entire family.
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Statement of Need:
The current research and developments in sleep medicine highlight a need for nurses to be educated and updated on the importance of screening for childhood/adolescent sleep disorders – to support early intervention and to avoid poor health outcomes.

Course Purpose:
To provide nurses and health team associates with knowledge about sleep disorders, health outcomes and treatments in children and adolescents.
Learning Objectives:

1. Differentiate between REM and NREM sleep.
2. Describe the recommended length of nightly sleep for adolescents.
3. Identify the recommended length of nightly sleep for children.
4. Define parasomnia.
5. Describe how sleep disorders impact a child’s ability to learn.
6. Explain the relationship between sleep disorders and the immune system.
7. Identify strategies for behavior modification to resolve sleep disorders.
8. Explain how a CPAP machine works.
9. Describe the role that allergists may play in treating sleep disorders in children.

Target Audience:
Advanced Practice Registered Nurses, Registered Nurses, Licensed Practical Nurses, and Nursing Associates

Course Author & Director Disclosures:
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Please take time to complete the self-assessment Knowledge Questions before reading the article. Opportunity to complete a self-assessment of knowledge learned will be provided at the end of the course.
1. A person spends approximately _____ percent of his or her time asleep in the stage of NREM sleep.
   a. 10 to 20 percent
   b. 30 to 50 percent
   c. 75 to 80 percent
   d. 85 to 95 percent

2. Which process most likely occurs during rapid eye movement sleep?
   a. muscle atonia
   b. decreased blood pressure
   c. dilated pupils
   d. decreased respiratory rate

3. Once a child reaches 2 to 3 years of age, what is the recommended amount of sleep he should receive each night?
   a. 16 hours
   b. 13 hours
   c. 11 hours
   d. 8 hours

4. Which part of the body regulates cortisol production?
   a. pineal gland
   b. hypothalamic-pituitary-adrenal axis
   c. thyroid gland
   d. supra-chiasmatic nucleus

5. Which of the following is considered a potential cause of bedwetting?
   a. Prolonged periods of stage 4 sleep
   b. Decreased fluid intake in the morning
   c. Increased periods of rapid eye movement sleep
   d. Low levels of anti-diuretic hormone
6. Which is a true statement regarding obstructive sleep apnea in children?
   a. Obstructive sleep apnea most commonly occurs in children who were born prematurely.
   b. Obstructive sleep apnea in children is most often caused by enlarged tonsils and adenoids.
   c. Obstructive sleep apnea most often develops between the ages of 11 and 15 years.
   d. Obstructive sleep apnea is more commonly seen in children who are underweight and developmentally delayed.

7. Which best describes the most appropriate treatment for delayed sleep phase syndrome?
   a. lorazepam
   b. supplemental oxygen
   c. CPAP
   d. morning phototherapy

8. Which best describes the difference between night terrors and nightmares in children?
   a. The child typically remembers nightmares but does not remember night terrors
   b. Night terrors occur within the first hour of sleep but nightmares occur after 2 to 3 hours of sleep
   c. Parents can awaken a child who is having a night terror but they often cannot awaken a child from a nightmare
   d. There is no difference; night terrors and nightmares are essentially the same
9. An episode of sleep paralysis that occurs just as a child is falling asleep is known as:
   a. chronological
   b. hypnagogic
   c. confusional
   d. hypnopompic

10. Sleep talking that occurs more than once a week but not every night is classified as _____ severe.
    a. mildly
    b. moderately
    c. significantly
    d. profoundly

11. The process where the information that has been sent to the brain is stored there to become part of memory is called:
    a. acquisition
    b. acknowledgement
    c. consolidation
    d. recall

12. Children with ADHD more likely have difficulties with:
    a. going to bed at night
    b. swallowing medication
    c. establishing REM sleep
    d. waking up in the morning

13. Which best describes how depression may be manifested in a child?
    a. Weight loss
    b. Increased amounts of sleep
    c. Clingy behavior
    d. Slowed metabolism
14. Which of the following is a true statement regarding growth in sleep-deprived children?
   a. Sleep-deprived children are more likely to be taller but may weigh less than their peers.
   b. Children who are sleep-deprived experience more bone fractures and joint dislocations than their counterparts.
   c. A sleep-deprived child may be unable to repair and regenerate muscle tissue while sleeping.
   d. Children who are sleep deprived exhibit a hyperactive response to vaccinations.

15. According to the National Research Council, which age group is most likely to be injured in car crashes that occur as a result of sleep deprivation?
   a. Infants and toddlers
   b. 3 to 9-year-old children
   c. 14 to 18-year-old teens
   d. 16 to 29-year-old young adults

16. An example of behavior modification used in treating sleep problems is:
   a. extinction
   b. absolution
   c. delectation
   d. fulmination

17. According to the U. S. FDA, a child must be _____ years old before adequately using CPAP for sleep apnea.
   a. 2 years old
   b. 5 years old
   c. 7 years old
   d. 12 years old
18. Which is an example of a nasal corticosteroid that may be used to treat allergic rhinitis?
   a. montelukast
   b. ipratropium bromide
   c. cromolyn sodium
   d. mometasone furoate

19. A type of orthodontic treatment that has been successfully used among children with obstructive sleep apnea is a:
   a. palatoplasty
   b. rapid maxillary expansion
   c. pharyngeal flap
   d. expansion sphincter pharyngoplasty

20. Imipramine is most commonly used to treat which type of sleep disorder?
   a. sleepwalking
   b. obstructive sleep apnea
   c. bedwetting
   d. delayed sleep phase disorder
Introduction

Human beings spend approximately one-third of their lives in a state of sleep. The importance of this activity cannot be overestimated, yet many children and teens suffer from sleep disorders that disrupt their daily activities and wreak havoc in their lives. Sleep disorders may result in a lack of appropriate sleep or may lead to other situations that can cause medical conditions, psychological problems, and even accidents and injuries. Parents play a significant role in helping their children to learn good sleep habits early on, as well as maintaining an awareness of their children’s sleep habits to know if disrupted sleep is occurring so that they can get help if needed.

Normal Sleep Patterns

Despite being essential to human life, the reasons for sleep are often mysterious and the full extent of why humans need regular sleep is not completely known. Although it may appear to be a time of rest and relaxation when a person feels tired, instead, sleep is known to be a time of regeneration and repair for the body. While it appears that most of the body remains in a state of rest the brain is hard at work, managing and supervising activities within the body.

Sleep is actually a structured phenomenon that is organized into different stages. The basic stages of sleep are classified as rapid eye movement sleep and non-rapid eye movement sleep. These stages may be further broken down into other segments, but each plays important roles as the body moves through patterns of sleep each night.
NREM Sleep

Non-rapid eye movement (NREM) sleep is typically the first part of the sleep cycle that a person enters after falling asleep. Sleep actually moves through a cycle of the stages of sleep, rather than consisting of one period of NREM sleep followed by rapid eye movement sleep. The length of each cycle between NREM and REM sleep varies, but typically lasts about 75 to 100 minutes for the first stage and increases in length with successive stages throughout the night. A person spends approximately 75 to 80 percent of his or her time asleep in the stage of NREM.21

NREM sleep is further divided into stages 1, 2, 3, and 4. Each stage has its own characteristics and purposes for the sleeping person. Studies performed on people while they were asleep show that different types of brain activity occur with each stage of sleep during the NREM cycle.

Most people start out sleeping in NREM sleep, stage 1. The exceptions to this are newborn infants and people who have narcolepsy, who transition directly into REM sleep.21 Stage 1 is the lightest form of sleep, in which the person may be easily awakened by an outside noise or activity in the room. A person spends approximately 5 percent of total sleeping time in stage 1 NREM sleep.21

The average amount of time a person spends in stage 1 of NREM sleep is approximately 7 minutes,31 although some people may spend longer in this time and others may move through this stage more rapidly. Overall, sleep is a very individual experience that differs between people. Stage 1 sleep has been described as a dreamy feeling, where sights and sounds may be amplified at times. Hypnogogic hallucinations may also occur during this time, which happen when a person experiences the sensation of hearing or
seeing something that is not really there. This occurs because the person is falling asleep and is between the stage of sleeping and being awake. Other sensations that may occur during stage 1 NREM sleep are vivid and unusual sensations of "slipping away," or the feeling of falling, which may be disrupted by abrupt awakening or a response from the muscles of the body.

The initial period of stage 2 NREM sleep lasts up to 25 minutes in the first sleep cycle of the night, but this stage then lengthens with each successive cycle thereafter. A person who is in stage 2 of NREM sleep is harder to wake up because he is in a deeper state of sleep than stage 1. Stage 2 is characterized by a decrease in body temperature and in heart rate. Stage 2 also demonstrates short periods of brain activity that occur in rhythmic patterns. These patterns are known as sleep spindles, and they are essential for consolidating or “locking in” information learned throughout the day to become part of memory. A person who does not experience enough of stage 2 sleep may be more likely to develop memory problems because this stage is important for retaining information in memory that can be later recalled.

Stage 3 NREM sleep is a transitional period in which a person moves from light sleep into deep sleep. During stage 3, delta waves begin, which are slow brain waves. Stage 3 is the beginning of what is known as slow wave sleep, which is restorative for the body. Stage three may last only a few minutes before transitioning into stage 4 NREM sleep. The average person spends approximately 8 percent of their total sleep time in stage 3 sleep.

Stage 4 NREM sleep is the deepest stage of sleep and it is at this stage that a person is most difficult to wake. Stage 4 constitutes about 15 percent of
total sleep and may last up to 40 minutes in length. Sleep studies have also shown increased amounts of slow wave brain activity during stage 4 sleep. Because these slow brain waves are also called delta waves, stage 4 is sometimes referred to as the delta stage of sleep. It is during this stage of sleep that some types of sleep disorders begin to manifest as behaviors, often at the point where the person is starting to transition into the next type of sleep classification, rapid eye movement, or REM sleep.

**REM Sleep**

In contrast to NREM sleep, the REM stage of sleep constitutes much less total sleeping time. A person spends approximately 25 percent of his or her time sleeping in the stage of REM sleep. As described by its name, REM sleep is characterized by rapid eye movements that occur while a person is dreaming. This stage is also made up of low voltage brain wave activity and muscle paralysis or atonia. The initial phase of REM sleep may be quite short during the first cycle between NREM and REM. However, periods of REM sleep become longer in length as the night progresses.

REM sleep differs consistently from NREM sleep. During REM sleep, the heart rate may increase after initially falling when first going to sleep during early phases of NREM. Blood flow to the brain increases, and the person has an
increase in blood pressure levels. The person may breathe at a faster rate and their body temperature, which may have decreased initially during the early stages of NREM sleep, may increase or may take on that of the surrounding environment. In fact, during REM sleep, the body does not maintain temperature regulation and the person is unable to sweat for heat loss or shiver to produce heat.\textsuperscript{21}

REM sleep is also the period where most dreaming occurs at night. If a person is awakened from REM sleep, he or she may be more likely to remember the dream. The muscles of the body enter a state of atonia or paralysis, in which they are slightly frozen while the person is dreaming. This prevents the person from acting out what he or she dreams.\textsuperscript{21} Because of the difference between high brain activity and low body and muscle activity during REM sleep that occurs, REM sleep is sometimes referred to as the paradoxical stage of sleep.\textsuperscript{31}

\textbf{Circadian Rhythm And Sleep Hormones}

One major function of sleep that has been noted is the production of certain hormones. Sleep hormones are responsible for not only regulating the amount of sleep a person gets, they can help a person to fall asleep and later wake up. Some hormones secreted while a person sleeps contribute to other body areas and play significant roles on metabolism and stress.

\textbf{Melatonin}

The body normally has a 24-hour clock that controls the time when a person typically goes to sleep and when he or she is awake. This 24-hour clock is known as the circadian rhythm. The body produces hormones in response to the time on the
clock of the circadian rhythm; in other words, the body is aware of certain times of day when it knows it should be sleeping or awake and then produces hormones in response.

One hormone that is secreted by the body in response to circadian rhythm is melatonin. The control of secretion of this hormone is by a part of the brain known as the supra-chiasmatic nucleus (SCN), which is responsible for regulating the internal clock. The SCN responds to changes in the outside environment, such as the sun going down and the external environment becoming darker, to stimulate parts of the brain to secrete hormones such as melatonin.\textsuperscript{13}

Melatonin is secreted by the pineal gland in the brain and, during the day, secretion of this hormone is almost non-existent. This is because most people do not sleep during the day and do not need larger amounts of melatonin to increase the ability to sleep. Alternatively, as the day moves into night, the SCN stimulates the pineal gland to secrete melatonin into the bloodstream. As blood levels of melatonin rise, the person begins to feel sleepier. This release of melatonin typically starts to occur around 9 pm and lasts for approximately 12 hours.\textsuperscript{13}

Melatonin is only released in an environment that does not have bright light. It must be dim for the body to produce melatonin, otherwise, sleep may be more difficult to come by. This is why most people need to sleep in a dark environment, rather than sleeping with an overhead light on or in a bright room. Even if the clock says that it is a normal bedtime, if the external environment still contains bright light, the body will not produce much melatonin and the person will have a more difficult time going to sleep.\textsuperscript{13}
The amount of melatonin that the body secretes varies between people. As a person grows, their melatonin production decreases. Alternatively, children and teens typically secrete more melatonin than do adults.\textsuperscript{13}

Parents can help their children with sleeping by maintaining a dim area to sleep in. Although some children do not like complete darkness, a dim environment is typically necessary for sleep. A nightlight can be used for some children who do not like the dark, and it should not have a major impact on the body’s production of melatonin. Parents can also help their child’s melatonin production by dimming the lights and helping the child to “wind down” as it gets closer to bedtime. This dim and quieter environment may be more likely to help the child naturally produce melatonin, which will in turn stimulate more sleep.

In some situations, melatonin supplementation may be necessary for children or teens that have significant sleep difficulties. While there are some true cases of diminished melatonin production in some people, the ability to determine this depends on laboratory testing and studies done by a healthcare provider. Melatonin can be purchased without a prescription; in fact, it is the only hormone sold in the United States that is available over the counter.

Because melatonin can be found in some foods, it is not necessarily classified as a drug when it is sold. Therefore, the U. S. Food and Drug Administration do not regulate it. This means that it’s labeling does not have to list potential side effects and dosages may vary between products. There is not necessarily a set dosage that is recommended for children and teens, and parents who buy melatonin supplements may need to guess or rely on hearsay to determine the right amount to give to a child for the first time.
Although there have not been reported cases of melatonin toxicity in supplements, the practice of randomly trying a dose of melatonin to see if it helps a child to sleep could be harmful and should be avoided.\textsuperscript{13}

Use of melatonin supplements may help some children and teens that have sleep disorders that result in sleep deprivation and its negative effects. Some studies have shown that melatonin can help people to fall asleep faster and stay asleep, but it does not necessarily increase total sleep time for all people. If melatonin supplements are taken at the wrong time, such as just before normal waking time or during the day when a person would normally be awake, it can cause increased drowsiness, fatigue, reduced reaction time, and lethargy.\textsuperscript{13} If a parent decides to use melatonin supplements to help a child with sleep problems, it is best used under the guidance of a healthcare provider.

**Cortisol**

Cortisol is another type of hormone that is produced during sleep. Cortisol production is regulated by the hypothalamic-pituitary-adrenal (HPA) axis in the body. The part of the brain called the hypothalamus secretes the hormone called corticotropin-releasing hormone. The pituitary gland in the brain contains receptors for corticotropin-releasing hormone, and the secretion of the hormone then causes the pituitary gland to secrete another type of hormone called adrenocorticotropic hormone (ACTH) into the bloodstream. This release of ACTH acts on the adrenal cortex to release cortisol into the body.\textsuperscript{32}
Cortisol actually has a type of negative feedback loop with the HPA axis in that the more cortisol that is released, the greater level of stimulation it will provide to the hypothalamus, which ultimately limits the beginning of the cycle of the release of corticotropin-releasing hormone. The circadian rhythm affects cortisol secretion; cortisol begins to be secreted during sleep approximately 2 to 3 hours after a person has fallen asleep. As the night progresses, cortisol secretion continues and peaks in late morning after awakening, approximately 9 am. After this point, cortisol levels start to drop and slowly decrease throughout the course of the day until the point when a person goes to sleep again at night, and the process repeats. Often, when a person has a cortisol level checked in a laboratory setting, the timing of the test is recommended to be early in the morning because this is when levels will be at their highest.

Cortisol is sometimes referred to as a stress hormone. When a person is under stress, norepinephrine levels and glucocorticoid receptors become activated. Corticotropin-releasing hormone binds to the glucocorticoid receptors, which causes an increase in brain wave frequency on the electroencephalogram (EEG), decreased amounts of slow wave sleep, and lighter sleep overall. This is how increased stress levels contribute to problems with sleep, because the person with increased amounts of stress will be less likely to experience deep, restorative sleep.

The main function of cortisol is to regulate the body’s response to stress. Cortisol also plays many other major roles in the body, including regulating metabolism, controlling blood glucose levels, and regulating the pH of the body. Cortisol also plays a role in controlling immune response and can stifle the inflammatory process, meaning that when a person is under chronic stress, he or she may not be able to respond well to infection and may be
more likely to become ill or develop certain diseases. Additionally, excess cortisol production caused by stress can cause atrophy in certain parts of the brain where memories are stored, making memory consolidation and recall difficult.33

Sleep is essential for cortisol production and adequate and restful sleep will help to better regulate cortisol levels. Parents can help their children by assisting them to get enough sleep at night by encouraging regular bedtimes, helping them to sleep in environments where it is easier to fall asleep and stay asleep, such as dim environments that do not contain a lot of distractions, and helping them if they suspect that a sleep disorder is present. Additionally, parents may help their children to regulate stress levels during the day by helping them learn to control big emotions and practice appropriate responses to stressful times. Because the effects of chronic stress can be very harmful to children and teens, it is imperative that parents help their children learn to manage stress early in life.

**Sleep Recommendations**

A good night’s sleep is not simply a recommendation; it is a necessity. People require different amounts of sleep depending on their ages, with the most sleep required at the very youngest of ages during the newborn period. Parents who help their children with developing sleep habits early on and who monitor that their children are getting enough sleep will go a long way in keeping children healthy, reducing illness and injuries, and preventing other negative consequences that can result from sleep deprivation.

**Infants**

The length of sleep cycles varies between people; infants can have very short sleep cycles when compared to older children, teens, and adults. An
Infant may go through a complete sleep cycle every 50 to 60 minutes, which means that he or she is likely to awaken much more often. Depending on an infant’s age, the number of hours of sleep each day and night can vary. Newborns and very young infants may sleep most of the day and night and have few periods of wakefulness. As a baby approaches one year of age, he or she may sleep in larger chunks of time, with longer periods of wakefulness in between.

On average, a one-month-old infant sleeps approximately 16 hours in a 24-hour time period. This includes regular naps and periods of sleeping, on and off, during the day and at night. By three months, a baby may sleep 6 to 10 hours at night and between 5 and 9 hours on and off during the day. At around four months of age, infants start to sleep for longer periods at night—between 6 and 8 hours at a time—which can give tired parents a much needed rest. However, this varies between infants and some babies may not sleep longer than a few hours at a time, while others may easily sleep for long stretches.

By six months, an infant sleeps between 14 and 15 hours out of a 24-hour period. Most of this time is spent sleeping at night, but he or she will still sleep on and off for about 4 hours during the day. By 9 months, most babies still wake up at least once at night, but can sleep for long periods, mostly during the nighttime hours. Infants between 9 and 12 months are readily differentiated between day and night, spending most of their sleeping time at night. The average amount of sleep a child between 9 and 12 months
should get is 11 hours at night and about 2 to 3 hours during the day, split between 2 naps.¹

The first year of life can be quite difficult for some parents who must adjust to their baby’s sleep schedule. Every person is different; some people are able to sleep easily and fall asleep quickly, while others take more time or wake more frequently. The same holds true among infants as well. Parents can take measures to improve their infant’s sleep time, but infants quickly develop their own individual sleep styles, including length and quality of sleep early on.

An infant who does not sleep well not only develops sleep deprivation for him- or herself, but also for their family. Parents often are awakened during the night to rock or feed a crying baby, sometimes awakening frequently, leading to poor and disrupted sleep for all members of the family. It can be a trying time to get through the period of infancy; to help a child develop good sleep habits in order to avoid sleep deprivation and sleep disorders that can develop in childhood, and also to allow parents to eventually get adequate and restful sleep.

Children

Unfortunately, sleep deprivation is not simply relegated to adults. Children can develop sleep deprivation at very early ages when they do not have good sleep habits or they develop disorders that impact the quality of their sleep. Children may start to show signs of sleep deprivation at about the time of starting elementary school, and the effects can be problematic. Sleep difficulties cause fatigue and lethargy as well as difficulties with concentration and memory, making for poor performance in school and in relationships among young children.¹
Throughout infancy, babies need regular naps and will often take at least two naps per day. As a baby grows, the need for a nap lessens to the point that it is no longer necessary and the child is getting all the sleep he or she needs at night. Many children stop taking naps around the age of 3 years, although some children will nap daily until they are 5 or 6 years old, and other children give up taking naps before they have reached 3 years. Typically time during the preschool years should allow for a daily nap. Once a child reaches 2 to 3 years, he or she should sleep for approximately 11 hours at night and should take one nap each day that is anywhere from 1 to 2.5 hours long.¹

As a child continues to grow, he or she still sleeps roughly the same amount each night—between 11 and 12 hours—but the daytime naps are eliminated. Often, this is due to a child starting pre-kindergarten or elementary school where school activities and classroom work take the place of daily naps. Children who have reached 4, 5, and 6 years old often stay awake all day with preschool or elementary school activities and sleep only at night.¹

The total hours of sleep a child gets during a 24-hour period slightly diminishes as he or she approaches adolescence. From age 7 to age 9, children need approximately 11 hours of sleep at night, with no nap during the day. This number drops to 10 hours of sleep at night that is typical of a child between the ages of 10 and 12 years.¹
These numbers vary between children. Some kids sleep for longer periods and others need less. According to the University of Michigan Health System, school-aged children sleep between 9 and 12 hours each night on average. Many parents worry that their child is not getting enough sleep because the number of hours of sleep their child gets does not seem to match the recommended numbers. However, parents can have a better idea if their child is sleeping well by looking for clues that show he or she is well rested and does not have difficulties sleeping, rather than by focusing on numbers alone.

In general, a child is getting enough sleep if he or she can fall asleep in under 30 minutes; can wake up with relative ease and without consistent nagging, prodding, or other means of attempting to get a child to get up and go; and, if he or she seems mentally alert throughout the day and does not need a nap. In most cases, parents can tell if their child is getting enough sleep if he or she does not have problems falling or staying asleep and stays awake during the day. If teachers or other caregivers are reporting that certain children are falling asleep in class or otherwise do not seem engaged due to fatigue, parents may need to consider whether their child is getting enough sleep at night.

Adolescents

Adolescence is a time of physical and emotional changes, yet many teens do not get enough sleep and end up sleep deprived. This can occur for a number of reasons, including a desire to stay up late to talk to or be with friends, lack of sleep because of activities such as studying, increased anxiety due to social pressures and hormone changes.
The average amount of sleep needed for teens is less than that of school-aged children, but the importance of the quality of sleep for adolescents remains the same as that for younger children. By 12 to 13 years of age, most teens need between 9.5 and 10 hours of sleep at night without sleeping during the day. By 16 years of age, teens should be getting about 9 to 9.5 hours of sleep each night, which is just a little more than the recommended amounts for adults.¹

Just as with any other age group, sleep is essential for adolescents; however, teens often have added pressures and risks that may be threatening to their sleep habits and their health. Teens continue to produce melatonin to help them go to sleep at night, but some adolescents may have trouble getting sleep or may fall asleep later, despite the fact that they still get up at the same time in the morning. Teens may be more likely to develop delayed sleep phase syndrome, in which the circadian rhythms are shifted and they may have trouble getting to sleep until very late at night or even early in the morning.

Because of changes in the body that occur during adolescence, many teens also experience higher levels of stress, whether due to social pressures, hormone changes, or family circumstances. These increased levels of stress may lead to more sleep problems and greater risks of chronic sleep deprivation among adolescents.
A teen that is excessively tired during the day may need to see a medical provider to rule out any potential health problems, including some types of sleep disorders. Although daytime sleepiness and feeling tired during the day are symptoms of sleep deprivation, there could be other conditions that are also occurring that may need to be identified and treated.

**Types Of Sleep Disorders**

Sleep is such an important activity for children and adolescents that sleep disorders can wreak havoc on their regular schedules and abilities to get enough sleep overall. Sleep disorders may be mild or something that a child will outgrow; alternatively, some sleep disorders are so significant that the child requires medication, therapy, and continuous treatment. Parents may or may not be aware that their child has a sleep disorder, depending on the symptoms of the disorder and the child’s response. Children who experience signs of sleep deprivation without it being attributable to another outside cause should be monitored for signs of disrupted sleep due to sleep disorders.

**Bedwetting**

Bedwetting, also known as nocturnal enuresis, occurs in a number of children younger than five years and is a relatively common sleep-related problem. Bedwetting may persist well after a child is potty trained; as the child learns to control his or her bladder during the day, it may take longer to gain full control during the night. Many parents become quite concerned about their children who experience regular bedwetting, but studies show that 16 percent of five year olds occasionally have episodes of nocturnal enuresis. The issue may persist despite moving through childhood and into adolescence; up to 2 percent of 15-year-old teens still have occasional issues with nocturnal enuresis.2
Bedwetting may be caused by a number of factors. Because it is so common, it is not typically classified as a “standard” type of sleep disorder. Instead, it is a problem that should be dealt with through education of the child and his family to help him or her to gain control of nighttime wetting. Some children, despite being potty trained for years, still have difficulty with controlling their bladders at night and are not aware of the need to void while asleep. This is often a matter of the rate at how a child’s bladder is maturing, in a similar situation as potty training. Most children cannot be forced to potty train and will learn when they are ready and understand what to do; nighttime bladder control has similar effects.

Some children have very small bladders that simply do not hold much urine, which can be a cause of bedwetting. Limiting the amount of fluid the child is allowed to drink in the hours before bedtime could identify this problem. A child may also have a lower-than-normal level of antidiuretic hormone (ADH), which controls blood pressure but also limits urine production, particularly at night. If a child has low levels of ADH, he or she may continue to produce the same amount of urine as during the daytime, which could cause problems with bedwetting at night. Finally, bedwetting seems to have a family or inherited influence as well. If a child has one or more parents with enuresis when they were children, the child is more likely to have bedwetting problems as well.

Most of the time, bedwetting resolves on its own with time, but some people benefit from the advice and education of a healthcare provider. Additionally, there are some cases in which bedwetting needs further treatment, such as through therapy, alarms, or medication.
Parents should be taught that bedwetting is a common problem in childhood and it is not the child’s fault. Punishing a child for wetting his or her bed will not solve the problem, but it may make the child feel worse over something that they cannot control. When the problem is first identified, parents can help their child with techniques to minimize the risk of having enuresis during the night, such as by limiting fluid intake after the evening meal and avoiding drinks that contain sugar and caffeine. Parents should have their child use the bathroom regularly and especially before going to bed at night, making sure that the bathroom is easy to find and use when it is dark.

In some cases, extra bedding or waterproof mattress pads may be necessary to protect the mattress. A parent can work with the child to teach them to help make the bed and change the sheets if they have a bedwetting episode. It may be necessary to have a clean towel and a change of clothes available so that, if the child wakes up during the night with enuresis, they can go back to sleep with clean clothes and a towel to cover the urine before changing their sheets in the morning.

Parents should avoid using diapers and training pants that are used for potty training that the child sleeps in. An older child with enuresis may have less motivation to get out of bed and use the bathroom if he or she is wearing an absorbent undergarment. However, there are some situations, such as sleepovers or overnight trips, where these items may be necessary and
desirable to save the child from some embarrassment if an accident were to happen.\(^2\)

Some families use bedwetting alarms that are designed to alert the child when they are starting to have an episode of enuresis. The alarm sensor is placed in the child’s underpants and is triggered at the first drops of urine. It then sends an alarm message to the child, and is designed to wake him or her up to finish urinating in the bathroom. Enuresis alarms are more effective for children over age seven who have difficulties with bedwetting but who are also mature enough to understand the concept. These alarms should also be tried after other efforts have not produced much success, rather than as a first line of treatment for enuresis.\(^2\)

**Medication therapy for enuresis**

There are also medications that may be prescribed for some children and teens that, despite other efforts to control bedwetting, have not been able to gain control of the problem. Medications are typically most effective when combined with other methods of learning bladder control at night. *Desmopressin acetate* (DDAVP) is one of the most common types of medications used to control bedwetting. DDAVP acts in a similar manner to vasopressin, which is another name for antidiuretic hormone. The medication stimulates the body to control urine production at night, which can reduce the number of bedwetting episodes. DDAVP does not need to be taken every day; instead, it is used as needed and taken at bedtime to control enuresis.\(^3\) Unfortunately, use of DDAVP has a high relapse rate and up to 70 percent of children and teens that use it continue to have enuresis when it is not being used.\(^2\)
A second type of medication that may be used is imipramine, an antidepressant that can successfully help to control nighttime bedwetting. Although imipramine is also used to treat depression in some people, it is not thought that children with bedwetting issues are depressed or otherwise need antidepressants. Instead, the drug’s off-label use is for nocturnal enuresis. Imipramine has been shown to improve bedwetting and lead to longer episodes of dryness for up to 50 percent of children who use it. It is not recommended for children under the age of six. The exact mechanism of action and how it controls enuresis is not entirely clear; it may work by reducing overall urine production or changing a child’s sleep cycles so that he or she awakens more often and can use the bathroom. Imipramine also has a high relapse rate and many children who use it for bedwetting revert back to periods of enuresis after stopping the medication.³

**Sleep-onset anxiety**

Also referred to as sleep onset association, sleep-onset anxiety occurs when a child becomes accustomed to certain situations, objects, or activities in order to fall asleep. If the child does not have those items or situations and tries to go to sleep, he or she may become very agitated and anxious, and may not be able to fall asleep until the situation has resolved. Sleep onset associations are most common in children and most of them outgrow these circumstances. Often, sleep onset associations can be managed with the help of parents and some behavior modifications.¹⁷

Sleep-onset anxiety most often develops in young children when parents are first training them to sleep in a crib or bed on their own. They may use a pacifier, stuffed animal or toy, or special blanket that the child can keep in his bed that is calming and helps them to sleep. Alternatively, there are other situations in which a child may learn that he or she needs to have
certain items or go through specific rituals before being able to sleep at night. Sometimes, parents will sit with a child until they fall asleep, rock them to sleep, or actually sleep on the floor next to the bed to help the child get to sleep. Other situations that may develop include having a drink of water or milk before bed, listening to certain music, or keeping a lamp on. If the child wakes during the night, he or she may need these items again in order to fall back asleep. If the child does not have them, then they may develop anxiety and be further unable to sleep without them.

While these activities can provide a certain amount of security for a child who is going to sleep, the developing association between sleep and the item or activity can ultimately cause sleep difficulties if the child has to go without. Additionally, parents may feel bound to continuing to keep up the rituals in order to make the child happy and to prevent further problems. Ultimately, sleep-onset anxiety and associations are problematic to children and families because the affected child does not learn to put themselves to sleep on their own, and parents are unable to have much quality time to themselves after the child goes to bed because they are continuing to provide the rituals or activities that the child needs.

Parents of a child with sleep-onset anxiety can help their child to slowly let go of those items or activities that he or she needs in order to sleep. This involves teaching the child how to sleep on his or her own while continuing to provide reassurance and feelings of security. According to the American Sleep Association, parents should put the child to bed without going through the ritual while they are sleepy but not yet asleep, then tuck them in, turn out the lights, and leave the room. If the child starts to cry, the parents should wait for 2 minutes before returning to the room to provide comfort and reassurance. When they do, they should avoid turning on the light or
picking up the child, but instead provide calming words of reassurance and a gentle touch so that the child feels secure. If the child cries again later, the parents should continue to return to provide reassurance but they should lengthen the time that it takes for them to return to the room.\textsuperscript{17}

Clearly, learning to sleep without an associated event or item can be difficult for some children and often takes time. Parents may feel very bad about themselves and their parenting skills, particularly when their child is crying. However, by teaching the child to sleep, the parent is teaching him or her to have good sleep habits that will prevent later sleep deprivation and the problems it can cause.

**Sleep apnea**

Sleep apnea occurs among both children and adults. It is the cessation of breathing for more than 20 seconds, occurring while the person is asleep. Sleep apnea may be classified as one of three types: central sleep apnea, mixed sleep apnea, and obstructive sleep apnea (OSA).

*Central sleep apnea*

Central sleep apnea occurs when either the part of the brain that signifies the person to breathe does not work properly, or the muscles that are used for breathing do not respond to the brain signals to take a breath. Central sleep apnea may be more common among infants who were born prematurely and who have developed a tolerance for higher levels of carbon dioxide in the blood, which under normal circumstances would stimulate a person to take a breath. Central sleep apnea has also been seen among children who have endured some type of physical abuse or head trauma that impacted the brain’s ability to stimulate breathing. Additionally, it can occur
as the result of medication toxicity, as an overdose of medication can result in a slowed or halted respiratory response.\textsuperscript{18}

Infants who are born before 28 weeks’ gestation are more likely to develop episodes of chronic central apnea, even after they have grown and are discharged from the hospital setting. Often, parents who are taking their infants home from the NICU (neonatal intensive care unit) must learn how to use apnea monitors on their children at home; these infants may need monitoring for central apnea for months after discharge from the NICU.\textsuperscript{18}

\textit{Mixed apnea}

Mixed apnea is a combination of both central apnea and obstructive sleep apnea. Mixed apnea often occurs in situations where a child has one type of apnea already present and then develops another. For instance, a patient with OSA may develop mixed apnea if he or she undergoes a form of sedation that causes apneic episodes.

\textit{Obstructive sleep apnea}

The most common form of apnea that occurs among children is obstructive sleep apnea. Approximately 2 percent of children in the United States have OSA, however, the numbers may be higher due to growing numbers of pediatric obesity, which is a major risk factor for development of OSA. When compared to central sleep apnea, which most commonly occurs among infants and very young children, OSA can develop in a child of any age. In childhood, it most often starts between the ages of 2 and 6 years, although a child of any age can develop the condition well into adulthood.\textsuperscript{18}

Obstructive sleep apnea occurs as periods of apnea that develop while a person is asleep, typically because of some type of obstruction that blocks
adequate airflow. The sleeping person may try to breathe, but because of
the obstruction, airflow is blocked, resulting in an inability to take in
adequate air and breathe normally. While asleep, a person with OSA may go
through numerous periods of apnea when he or she stops breathing at
intervals throughout the night. When he or she stops breathing, oxygen
levels in the body drop, which stimulates the person to wake up. The person
awakens briefly — although they are often unaware of the waking — and
starts breathing again. If apneic episodes occur multiple times each night,
this can lead to a large number of times of waking up, thereby ultimately
becoming sleep deprived.\textsuperscript{14}

Because the child may or may not be aware of how many times they are
waking up at night due to apneic episodes, they may be very tired with little
understanding of the cause. When parents are familiar with the signs and
symptoms of OSA, they may be able to have their child evaluated if he or
she exhibits symptoms and is frequently demonstrating signs of sleep
deprivation. Obstructive sleep apnea may be manifested in children as
snoring; the sounds of choking, snorting, or gasping while asleep; morning
headaches, nasal congestion, restless sleep, and irritability upon
awakening.\textsuperscript{14}

Symptoms of sleep apnea may extend beyond what is noted at night while
the child is sleeping. During the day, the child may be excessively sleepy,
due to waking up multiple times at night and not getting adequate sleep. He
or she may fall asleep during regular activities, including while at school. The
child may be lethargic and lack motivation or energy for regular activities;
he or she may have trouble concentrating and may suffer from poor grades
in school. Many children with obstructive sleep apnea are concurrently
diagnosed with behavioral problems, such as attention deficit hyperactivity
disorder (ADHD) due to lack of attention and poor concentration, when they are often sleep deprived from OSA. The child may have other behavioral issues as well, including poor listening, irritability, and angry outbursts.¹⁴

Among children, enlarged tonsils or adenoids that obstruct the airway most often cause obstructive sleep apnea. Enlarged tonsils can block the flow of air through the mouth or the nose. Children who are overweight or obese are also at increased risk of developing OSA. The excess fat tissue in the face, jaw, and neck can obstruct airflow and make it difficult to breathe while asleep. Other factors contribute to the condition as well, and OSA may be more commonly seen among children who have respiratory conditions such as asthma or environmental allergies and children who have gastroesophageal reflux. Finally, children who have a small bone structure of the face and neck and those who already have a family member with obstructive sleep apnea may all be more likely to develop the condition as well.¹⁴

For parents who are concerned that their child has OSA, proper diagnosis is critical to getting treatment and restoring adequate sleep for the child. If the healthcare provider suspects that the child has OSA, a sleep study may be most likely warranted for diagnosis. A sleep study involves having the child spend the night in a sleep lab, where he or she is connected to monitors that keep track of breathing patterns, heart rate, oxygen levels, and body movements while the child is asleep. The sleep study can also determine which stages of sleep the child enters during the night and how long he or she remains in each phase. Depending on the child’s age, most parents stay in the room with the child during the sleep study to minimize fear of the procedure.¹⁴ The sleep study can detect periods of apnea as well as many
other types of issues that may occur while the child is asleep. It is a conclusive process for diagnosing obstructive sleep apnea.

If the child has been diagnosed with obstructive sleep apnea, treatment with continuous positive airway pressure (CPAP) may be warranted, depending on the extent of the results. If there is another underlying issue that is causing the OSA, such as enlarged tonsils, surgery may be required to correct the situation. Removal of large tonsils may eliminate the sleep apnea, and follow up after the surgery should be done to determine the level of success.

If the child experiences symptoms of OSA and is overweight, weight loss may significantly reduce or eliminate apneic episodes. For children who have nasal congestion or other respiratory conditions that may be associated with OSA, treatment with nasal decongestants or control of the respiratory condition may help to reduce apneic episodes. Parents can also help their child to get a better night sleep, not only by helping him or her to get treatment for the sleep apnea, but also to promote good sleep habits by going to bed at a regular time, reducing or eliminating caffeine intake, and limiting the amount of spicy foods or foods that may cause stomach upset for their child.

**Delayed Sleep Phase Disorder**

Delayed sleep phase disorder, also sometimes called delayed sleep phase syndrome (DSPS), is one of the circadian rhythm sleep disorders. These conditions occur as a result of a disruption in the timing of sleep, when the internal body clock does not work in a normal manner. DSPS is characterized by altered sleeping patterns, in which a child goes to sleep later and awakens later than a normal time. A child with DSPS may try to go to bed at a routine time, such as 9 pm, but may be unable to fall asleep until 1 am.
Additionally, the child then may have trouble wakening before 8 am in the morning because of going to sleep so late.

Children with DSPS are often referred to as “night owls,” and typically are more comfortable staying up late and sleeping late the next day. However, this schedule often interferes with other routines, such as getting up to go to school. The child or teen who goes to sleep very late but then must get up early to go to school may begin to suffer from chronic sleep loss. Even with being chronically sleep deprived, these children are not able to compensate and fall asleep earlier. Their internal clocks remain set at the same time and they still fall asleep late, despite being very tired.\textsuperscript{11} Parents may struggle with trying to get their child to go to sleep at a normal time and may have additional difficulties with getting them up in the morning to get ready, which can throw off schedules and set a difficult tone for the rest of the day.

Delayed sleep phase disorder may be associated with other types of sleep disorders or it may be a problem on its own. When children with DSPS develop chronic sleep deprivation, it can significantly disrupt their lives and affect activities such as school and homework, sports, and social relationships. These children may feel better by taking a nap in the afternoon after school or on the weekends; however, this can perpetuate the disruption of the circadian rhythm and continue to cause problems.\textsuperscript{11}

Circadian rhythm disorders, particularly DSPS, are often more common among teens or may be more likely to develop during the adolescent years. The person who has DSPS
is not considered to have insomnia, as an insomnia diagnosis indicates an inability to sleep. Rather, the affected child or teen cannot fall asleep before the time dictated by their internal clock; however, once he or she reaches that time sleep usually comes easily and the normal stages of sleep progress.

DSPS can also be worsened by exposure to bright lights during the evening hours or times when the person would normally be asleep. For younger children, this may occur during some months when the sun goes down much later at night—when they are normally supposed to be in bed, sleeping—yet they feel completely awake when the room is bright and there is still daylight outside. For teens, exposure to the lights and screens of video games, computers, and texting may keep them awake for hours past a normal sleep time. Continued exposure to light during the hours when a child or teen should be sleeping prolongs the circadian rhythm disruption and perpetuates symptoms of DSPS.¹²

There are several options for treatment of DSPS and several strategies that parents can enforce to implement changes that can help with management of the situation. Initially, parents should not try to force the child or teen to go to bed at a “reasonable” time and wait for the clock to reset itself. For example, if a child is unable to go to sleep before 1 am, expecting him or her to go to bed at 9:30 pm and lie in bed for several hours may be exhausting and frustrating for the child. There are small steps that parents and families can take to slowly reset the child’s internal clock.

Eliminating screen time in the evening hours, such as watching TV, using the computer, texting, or playing video games, decreases the eye to exposure to light sources when the body should normally be winding down for sleep.¹²
Additionally, families may have some success with adding room-darkening shades that can block light coming in from outside and that may otherwise continue to disrupt the internal clock for the child. Parents may also try having the child go to bed a little sooner and in shorter increments. This activity is known as chronotherapy.\textsuperscript{12}

In the previous example of the child who is unable to sleep until 1 am, the parents could try having the child stay up late and then lie down at 12:30 or even 12:45 am and try to get them to sleep then. After several nights, the child might go to bed earlier, such as at 12:15 am, and so on, until the child’s internal clock has been reset. Obviously, management of DSPS and change into more regular sleep habits can take considerable time and commitment on the part of the family and the affected child or teen.

Morning phototherapy is another option for treatment, which is typically prescribed and directed for use by a healthcare provider. Morning phototherapy involves use of a bright light when the child awakens. Exposure to bright light during the normal time of awakening can increase how alert the child feels and may shift the internal clock slightly so that later in the evening, he or she may feel more tired and ready to sleep.

The phototherapy may be provided through a light box that can omit various amounts of light. The child or teen is exposed to the bright light for a period of about 30 minutes after waking up in the morning. It may help to use the light at the time when the affected child normally awakens, even if he or she is sleeping late because of going to sleep late the night before. Use of the light box can then be set back to 30 minutes earlier the next morning to gradually change the timing of the clock to waking up earlier. This, in turn, may also cause the child to feel tired earlier in the evening and he or she
may be ready to go to sleep at a slightly earlier time. Again, the process of using light therapy may take time and families should commit to using it for at least 1 to 2 weeks or more to achieve some results.\textsuperscript{12}

Some families have also experienced success with using melatonin to help with sleep and to reset the circadian rhythm.\textsuperscript{12} Melatonin is a hormone that is normally produced by the body in the pineal gland of the brain. As the evening approaches and the environment turns darker, the body starts to secrete more melatonin in preparation to induce sleep. The melatonin levels often remain elevated in the body for about 12 hours, which helps a person feel sleepy and less alert and eventually lulls them to sleep.\textsuperscript{13}

Melatonin is also available in supplemental form, which can be purchased without a prescription. Some people have had success with taking melatonin in pill form about an hour before going to sleep and have found that they are able to get to sleep easier than if they had not taken the supplement. Melatonin has been shown to be especially effective in some people with disruptions to circadian sleep rhythms, such as those with jet lag or people who have jobs that require shift work.\textsuperscript{13}

Once a standard bedtime has been established and a child with DSPS has developed a regular sleeping schedule, it is important to continue to try and stay on the same schedule to continue to have effective sleep and to avoid chronic sleep deprivation. For example, although some children and teens with DSPS may be able to establish regular sleep habits after some training and changes, it may be tempting to go back to staying up late and sleeping late during the summer when there are fewer daytime responsibilities, such as school. However, the child may then need to undergo the same changes in routine and repeat the work of getting on a regular sleep schedule again
in the fall when school starts again. Some families may have a better time of establishing regular sleep habits and maintaining them, regardless of summer or holiday schedules that would result in changes.

Sleepwalking/Sleep Talking

Sleepwalking is a relatively common childhood disorder that occurs on a regular basis in approximately 17 percent of children. It often starts between the ages of 4 to 6 years old, peaks around 8 years of age, and then declines as a child enters adolescence and adulthood. Sleepwalking is a type of parasomnia that is similar to night terrors in physiological characteristics because both types of disorders tend to occur at around the same stage of sleep for the child.\(^\text{14}\)

With sleepwalking, a child is asleep but may get up out of bed and walk around the room or the house. The child appears to be awake and has their eyes open, may talk, or may even answer questions (although often inappropriately). In actuality, the child is asleep and is unaware of these interactions or his or her behavior at all and typically has no memory of the event in the morning. Episodes of sleepwalking may be very short or may last for several minutes. Sometimes, a sleepwalking child may appear confused or agitated, or he may act out in a bizarre manner, such as performing a small, apparently meaningless ritual or urinating in an odd location. Sleepwalking is usually harmless but could cause injury for the child if he or she walks into items or falls. In some rare cases, a child may go
outside, in which case the risk of injury is also much greater.\textsuperscript{14}

Sleepwalking is most likely to happen in the first 1 to 2 hours after a child falls asleep. This is also the stage of REM sleep, where the person is most likely to be in a very deep stage of sleep.\textsuperscript{15} During this time, the child may be dreaming of an event and may get up and walk around or perform activities in response to the dream. Sleepwalking can be caused by a number of factors and is most often associated with sleep deprivation. It may also occur more commonly in children who are under significant stress, are physically ill, such as with a fever, or who are sleeping in a different environment (such as at a sleepover or staying with relatives). Sleepwalking is also associated with other underlying sleep disorders; the most common association is with sleep apnea.\textsuperscript{14}

In most cases, treatment for sleepwalking is unnecessary, as it is typically a benign situation and the child outgrows it. However, if the child is sleepwalking excessively or has become injured as a result of sleepwalking, it may be necessary to contact a healthcare provider.\textsuperscript{14} If there is an underlying sleep disorder that is also occurring, treatment of the disorder may help to resolve the sleepwalking as well.

Parents can help their child when they find them sleepwalking, by guiding the child back to his bed and keeping them from getting hurt. It is a myth that someone should not wake a sleepwalker; in fact, waking someone up who is sleepwalking may prevent him or her from becoming injured during the experience.\textsuperscript{15} Alternatively, if a child seems agitated and very upset when parents try to wake them, it is best to simply stay with the child until the episode stops.\textsuperscript{14}
Additionally, parents should ensure that their child is getting enough sleep overall, since sleep deprivation contributes to sleepwalking. Establishing a bedtime routine and helping the child to get adequate sleep at night can help to prevent some episodes of sleepwalking. Parents should also establish a safe area in the room where the child is sleeping. Avoiding clutter on the floor and stairs, not sleeping in a bunk bed or loft, locking windows and outside doors, and putting away any sharp objects can reduce the risk of injury to a sleepwalker. Some parents may need to place an alarm on their child’s room door or put a gate at the top of the stairs to further reduce the risk of injury and to alert them if the child has gotten out of bed.\textsuperscript{14,15}

*Sleep talking* may be associated with sleepwalking or with other parasomnias, including REM behavior disorder, sleep apnea, confusional arousals, and night terrors. Sleep talking occurs when a child talks in his or her sleep; the child may also cry out, yell, mumble, or laugh. The person is usually not aware he or she is talking and may or may not remember the event after they awaken. Some children who talk in their sleep use different voices compared to their everyday speech; they may have conversations with others, speak for long periods, or they may mumble or speak unintelligibly.\textsuperscript{16}

Sleep talking is typically harmless, although affected children and teens may be self-conscious about it and be less willing to sleep over in situations in which they might be embarrassed by talking in their sleep in front of others. Sleep talking occurs more often when the child is experiencing sleep deprivation, when he or she is under significant stress, or when illness or fever is present. It may occur at any stage of sleep and can happen once in a while or up to several times in one night. Typically, sleep talking is more
 annoying and frustrating for anyone who shares a bed or room with the person, rather than the affected child themselves.\textsuperscript{16}

According to the National Sleep Foundation, sleep talking is classified as mild, moderate, or severe based on frequency and duration. Mildly severe sleep talking occurs less than once a week, moderately severe occurs more than once a week but not every night (and may disturb a roommate or bed partner), and severe sleep talking is quite intrusive to roommates or bed partners and happens at least once each night. Acute sleep talking is classified as occurring for less than a month’s duration; sub-acute sleep talking happens for longer than a month but for less than a year; and, chronic sleep talking is classified as going on for a year or longer.\textsuperscript{16}

In most cases, sleep talking does not require treatment, unless it is excessive and is causing too much disrupted sleep for other bedroom occupants. Parents should explore if there are any stressful events that may be happening in their child’s life and by working through them, which may be able to reduce instances of sleep talking. Like the behavioral modifications suggested to help with sleepwalking, parents of sleep talkers should also establish regular bedtime routines and encourage and help their child to get enough sleep at night to reduce sleep talking. Treatment of an underlying sleep disorder or other medical condition that impacts the amount of sleep the child gets can also help to reduce episodes of sleep talking.\textsuperscript{16}

**Night Terrors**

Although they may be confused with nightmares, night terrors are actually a phenomenon that occur during sleep but that can be greatly disturbing to parents and caregivers of the affected child because they may be difficult to
stop once started. Night terrors are thought to affect up to 6 percent of children and occur as a type of disorder of arousal, in which the child may cry or scream inconsolably. Night terrors may last anywhere from 5 to 20 minutes although some may go on for longer periods.

Night terrors typically start after a child has been asleep for approximately 60 minutes. This is a transitional stage from stage 4 NREM sleep into REM sleep and occurs abruptly before the night terror. Under normal circumstances, the transition is slow; however, the abrupt transition typically causes a sudden response from the child, who has entered REM sleep, but whose body is sending an autonomic response.

The child often sits up, thrashes around, or bolts out of bed and appears to be awake and crying, but does not respond to attempts at soothing or being wakened. He or she may stare at nothing and avoid eye contact or may have a glassy-eyed appearance. The autonomic response also produces a rapid heart rate, fast breathing, tremor, and sweating, and it can be difficult to calm the child. The episode eventually resolves and the child often goes back to sleep very quickly, with no memory of the event the next day.\(^4\)

Parents of children who have night terrors may be concerned about the causes of the episodes or the inability to get their children to respond when these episodes occur. It can be upsetting to parents to watch their child scream and cry and to be unable to help the child calm down. Part of nursing care of these families is to provide reassurance to the parents and to explain
the physical response that is occurring within their child when night terrors happen.

If night terrors are occurring on a regular basis, or are disrupting the sleep of others in the family, the child can be awakened just prior to the night terror starting. Often, parents can narrow down the time of when they believe a night terror will occur, which is often about 60 minutes after the onset of sleep. By knowing when their child went to bed or fell asleep, the parents can awaken the child almost an hour later to prevent the night terror from developing. Many times, this action will prevent another night terror from developing later in the night.⁴

Some literature discusses that night terrors are mostly benign and do not indicate an underlying issue. Many parents are told that children grow out of night terrors and there is no reason to fear any long-term psychological issues associated with their occurrence.⁴ Alternatively, some research has shown that night terrors are more common among people who are having psychological distress, including those with post-traumatic stress symptoms. According to Thorpy and Plazzi, some studies have shown that night terrors occur more often in people that have periods of anxiety because this heightens the arousal of the reticular system, thereby disrupting sleep.⁵

The explanation for this may be best described as categorizing night terrors into two different classifications. The first group of children who experience night terrors are those that have periodic episodes that are part of the maturation process and that typically resolve by the time a child becomes an adolescent. The children in this group have normal psychological backgrounds to begin with and experience night terrors as part of growth through childhood. Alternatively, the second group of people who experience
Night terrors are those who seem to have some type of psychological abnormality in their background and may develop night terrors as a response to anxiety and stress. These children may be more likely to continue to have night terrors into adolescence and adulthood.\textsuperscript{5}

In most cases, medical treatment for night terrors is not necessary or recommended for children, typically because most children will outgrow the night terrors and parents may take a few steps to reduce the incidence of them happening, such as by awakening the child early on in the night as described above. When night terrors reach a point that they are significantly disrupting sleep for the individual and others in the family, and the affected child has become injured as a result or otherwise experienced significant distress that is manifested during the daytime, treatment with medication may be an option.

\textit{Medication for night terrors}

There have been several kinds of medications used successfully with children to control night terrors. Imipramine, an antidepressant, may be prescribed for some children and has been shown to reduce night terrors and other types of nighttime sleep disorders, such as sleepwalking. Other medications, such as those used to treat anxiety, have also been used to reduce or eliminate sleep terrors, including lorazepam (Ativan\textsuperscript{®}) and diazepam (Valium\textsuperscript{®}). The reduction in anxiety that these drugs produce may be more likely to help overall anxiety in a child if he or she has enough stress that it is causing night terrors.\textsuperscript{5}

\textbf{Confusional Arousals}

Confusional arousals are often classified within the same pathophysiological range as night terrors because they often share some of the same
characteristics of what happens to a child during a night terror, such as the stage of sleep when they occur and the physiological changes that occur.\(^5\)

Confusional arousals have also been referred to as sleep drunkenness, because the behavior of the person coming out of sleep is similar to that of someone who is drunk. A child with a confusional arousal may appear disoriented upon awakening, regardless of whether he or she is waking up during the night or in the morning. The child may have been awakened by a parent and may otherwise appear to be awake but he or she does not act in a usual manner and instead is confused, speaks slowly or inappropriately, is disoriented to time and location, and has memory problems. In some cases, a person with a confusional arousal may become violent.\(^5\)

A confusional arousal is thought to develop because of an alteration during the transition of NREM sleep to wakefulness. It may be more likely to occur when a child is forced to wake up. The episodes can last anywhere from a few minutes to a few hours, and the child often has no memory of what has happened.\(^6\) Confusional arousals may be more likely associated with other sleep disorders, including night terrors and sleepwalking.

Some children with sleep apnea are also at higher risk of confusional arousals due to periodic decreases in oxygenation that occur during sleep. It is thought that when a person experiences decreased oxygen to the brain, such as someone who has sleep apnea, and who is awakened during that time, he or she is more likely to be confused and disoriented upon arousal. Other factors that may contribute to confusional arousals include use of medications before bed, such as some medications that may be used to treat other types of sleep disorders and overall sleep deprivation.\(^5\)
Most children who have confusional arousals outgrow the situation by the age of five years. However, studies have shown that children who have confusional arousals when they were younger are more likely to be sleepwalkers when they are teenagers. Confusional arousals are best treated by first managing underlying sleep disorders that are present, such as sleep apnea. Because most children outgrow confusional arousals on their own, other treatment, such as medications, may be used but not as commonly. When used, medications such as antidepressants have been shown to help some children who consistently have confusional arousals.⁶

Additionally, parents of children with the condition should learn how to best handle their child’s behavior when he or she is having a confusional arousal. Parents should remain calm and not panic when they see their child in such a state, although it may be difficult and a little frightening to watch. They should also not try to wake the child or force him or her to become more alert. Instead, parents should wait out the arousal period and stay by their child to ensure that he or she is safe.

**REM Behavior Disorder**

REM behavior disorder (RBD) is another type of sleep disorder known as a parasomnia, which describes any type of disorder or unusual activity that occurs when a person is asleep. REM behavior disorder is often described as the acting out of dreams.⁸

Normally, a person experiences dreams during REM sleep. It is during this time that researchers have discovered that brain activity is similar to that of when a person is awake. However, when a person is in a state of REM sleep and is dreaming, he or she also experiences a temporary muscle paralysis, which often inhibits physical movement of the body to act out dreams.
People with RBD have some type of dysfunction in which their bodies react to the dreams and they do not have as much muscle paralysis.\(^8\)

People with RBD may demonstrate mild reactions to dreams, such as movement of the legs, jerking movements, or calling out in their sleep. On the other end of the spectrum, some children may also sleepwalk, talk or shout, hit, or scream.\(^8\) The condition could cause injury to other people nearby, such as a sibling who shares a room with the child. The child who has RBD is only aware of the dream he or she is experiencing, not the outward activity that is occurring.

REM behavior disorder is more common among adults, although some children can develop the disorder. If a parent suspects that his or her child has RBD, a sleep study is warranted, particularly if the episodes are significantly disruptive to other members of the household and if the child has reacted violently. A sleep study can be done with the child spending the night at a sleep center for evaluation, which can determine if the child suffers from a lack of muscle paralysis during REM sleep.\(^8\)

A study in the *Journal of Clinical Sleep Medicine* found that children with RBD tend to have backgrounds that fall into certain categories, including pre-existing narcolepsy, children who take certain medications, including selective serotonin reuptake inhibitors as antidepressants, and children who have underlying neurodevelopmental disorders, such as autism. Of the
children and teens studied who have REM behavior disorder, almost all benefitted from medication to diminish or alleviate episodes of RBD. The medication that was used successfully was clonazepam, a prescription drug that has been used to treat seizures and anxiety. When given in low doses to the children in the study, two-thirds of the children and teens responded favorably.⁹

**Sleep Paralysis**

Sleep paralysis is a condition that may occur on its own or it may be associated with another type of sleep disorder. When it occurs individually, it may be known as isolated sleep paralysis; however, it can also be affiliated with other conditions, including narcolepsy. Episodes of sleep paralysis may vary, depending if there is an underlying condition. The child may experience an isolated event that only affects him or her once or twice in life, or there may be repeated episodes of sleep paralysis that occur once a week or several times per month.⁵

Sleep paralysis occurs when a child awakens from sleep but is unable to move or speak. The condition may last from several seconds to minutes at a time, and can be terrifying for the child involved. Some people have noted that they hear voices or sounds that are not really there during episodes of sleep paralysis; other reports including the feeling of choking, a feeling of someone sitting on the chest, or seeing visions or hallucinations of things in the room that are not real.¹⁰

Sleep paralysis may be classified according to two types, depending on when it occurs. It most typically happens either when the person is falling asleep or just before waking up. If it happens as the child is falling asleep, it is known as hypnagogic sleep paralysis. As the child falls asleep, his body
enters a state of relaxation and decreased awareness that may result in temporary paralysis and inability to speak. Alternatively, sleep paralysis that occurs when a person is awakening is termed hypnopompic sleep paralysis. Under normal circumstances, a person undergoing REM sleep has mild muscle paralysis. This is because the person is experiencing dreams during REM sleep but the paralysis prevents him or her from acting out the dream sequences. If the child awakens at a late stage of REM sleep but his or her body is still coming out of the paralysis stage associated with the dream sequence, the child may experience sleep paralysis.¹⁰

Sleep paralysis can occur in people of any age, but it most commonly develops during the teen years. It can be caused by a number of factors, including association with underlying sleep disorders, poor sleep habits and lack of consistent sleep, overwhelming stress and anxiety, and use of certain medications. Most cases of sleep paralysis do not require treatment and resolve on their own,¹⁰ however, if the condition consistently disrupts the child’s life, the parents may need to explore more of the causes of sleep paralysis and may need to take the child to see a healthcare provider.

Parents of a child who experiences sleep paralysis should be sensitive to the situation, as it can be terrifying for the child. Parents should understand that the sleep paralysis episodes are not the child’s fault and there is not much that can be done to treat or stop them from happening. It may help to talk to the child and determine if there are other issues that are causing stress in his or her life and work to resolve what can be done, as resolution of stress could lessen episodes. If the child has another sleep disorder, treatment and management of that situation could prevent further episodes of sleep paralysis from developing.¹⁰ For example, if parents are aware that their child has sleep apnea and he or she often has episodes of sleep paralysis,
they should treat the sleep apnea first to see if the paralysis resolves. Finally, establishing good sleep habits in children and teens, such as regular bedtime routines and encouraging enough sleep, can reduce the risk of sleep paralysis episodes from happening.

**Nightmares**

Nightmares, often referred to simply as bad dreams, are terrifying episodes for the affected child. Nightmares differ from night terrors, although the two terms are often confused or sometimes used interchangeably. A nightmare is a dream experience for a child that may be scary or sad and that can cause anxiety, anger, or fear in the child when he or she wakes up. Parents may notice that their child talks, yells, or cries in their sleep while having a nightmare. In contrast to night terrors, when a child has a nightmare, he or she can be awakened and does have memory of the event.⁴

Nightmares are more likely to occur later in the sleep cycle and closer to the time before a child wakes up for the day. Anyone can have nightmares, but they typically start after the age of two years and tend to peak between the ages of three and six.⁷ Nightmares can consist of many different topics and their frequency may vary between children. Some children have nightmares only once in a while, where others may experience them more than once per week.

Nightmares may occur due to various reasons, but the most common causes include the child’s processing of daily events that cause stress and anxiety, as well as a response to a traumatic event that may have happened. A child that experiences trauma may have nightmares on a regular basis for months or years following the event. Additionally, some children have nightmares because of other physical factors, such as fever.⁷
Parents should remember to try and calm their child if they have a nightmare, by going into the room and being nearby until they are able to go back to sleep. Children often remember nightmares, so it is important to try and explore the feelings that the dream generates for the child. The parent should never ignore the child, force him or her to ‘cry it out’ or punish the child in any way. Instead, the parent and child should calmly sit together and the parent can provide comfort. In some cases, such as when nightmares are very frequent, the parent may need to address factors that may be contributing to the nightmare, such as extreme stress for the child through changes in school or in the family.7

**Symptoms Of Sleep Deprivation**

Sleep is essential for every person for rest and regeneration. Sleep deprivation in children and adolescents can lead to chronic exhaustion where both the child and family suffer. Children suffer from physical symptoms of sleep deprivation and may also have emotional problems and behavioral issues. The symptoms of lack of sleep in children and teens can vary widely and may be obvious to parents and caregivers, or they may be subtle and difficult to recognize.

Additionally, sleep deprivation among children and teens can be difficult to measure for parents and caregivers. Parents may believe that they are sending their child to bed and that he or she is going to sleep relatively quickly, but they may not be aware of the amount of sleep the child actually
gets, how much the child awakens at night, or the overall quality of the child’s sleep. For parents of younger children who are unable to verbalize or otherwise explain their sleep difficulties, sleep deprivation could go unnoticed for a long period of time until an episode or situation indicates to the parents that their child may not be getting enough sleep.

For older children and adolescents, sleep may still be difficult to quantify, particularly if they are unaware of how much sleep they should be getting or if they do not know what is “normal.” A child or teen may have always had sleep difficulties and may chronically be sleep deprived, never knowing the difference that appropriate and satisfying sleep can make. They may believe that everyone feels the same way that they are feeling with their sleep deprivation. Lack of sleep can develop from sleep disturbances, such as parasomnias or circadian rhythm disorders, or underlying physical problems that could be treated with medical intervention. Despite the cause, it may be difficult to determine what constitutes a major problem that causes a lack of sleep. For example, a child who sleepwalks on occasion may not feel any ill effects of sleep deprivation, but a child who talks in his or her sleep on a nightly basis may have enough sleep difficulties that the child is becoming sleep deprived.

Based on some of these issues, it can be difficult to measure and fully determine the full extent of sleep deprivation on children and teens. While experts have given numbers of how many hours of nighttime sleep is adequate for certain age groups, children and adolescents are individuals and some will require more sleep than others. Regardless of how sleep deprivation is measured or diagnosed, evidence is clear that there are many symptoms related to lack of sleep that can be detrimental and damaging to the children involved.
**Slow Reaction Times**

A child that is sleep deprived will develop a slowed reaction time. Normally, reaction times are the amount of time it takes to make a decision about a situation. It can range from deciding what to wear in the morning to choosing to stop at a crosswalk in front of an oncoming car. Children and teens must make many decisions each day. A slowed reaction time can be a recipe for disaster if the delay causes the child to make a poor choice or take too long in making a decision such that negative or harmful consequences result.

A study conducted by the journal *Sleep* showed that decreased amounts of sleep could impact a person’s abilities to make decisions, particularly those decisions that require split-second thought. The study had participants perform tasks known as information-integration category learning, in which information is taken in and integrated into memory through learning of tasks that required quick decisions. Some of the participants were sleep deprived before starting the tasks, while a group of others in the study participated after receiving restful sleep. The study showed that those who were sleep deprived were less accurate in response and decision-making when compared to those who received adequate and restful sleep.  

While children and teens are not often in situations that require them to make rapid, quick-response decisions, they do need to make regular decisions that can affect their lives, their schoolwork, and the relationships they have with those around them. Further, there may be some situations in which children must make rapid decisions that can prevent injury or that may impact their health, such as by moving out of the way of an approaching car while near the street or maneuvering a bike appropriately. Adolescents who drive must also make quick decisions based on the
circumstances they may face while driving. If there is inclement weather, other drivers not paying attention or distracted by outside measures, then the adolescent must make fast choices as they drive at times to prevent collisions and injuries.

Any of these situations can impact a child or teen’s health and ability to prevent injury, particularly if a decision must be made in which response time is important. Additionally, there are some situations that, while not life threatening, can impact a child’s ability to perform, such as during timed tests taken at school or while playing on a sports team. The number of decisions a child makes in a given day can be vast and the ability to make those decisions with an adequate response time and an understanding of what to decide can be greatly impacted by sleep deprivation.

If a child is showing signs of sleep deprivation manifested by an inability to make appropriate decisions or a slowed response time that affects his or her decisions, parents or caregivers may consider the impact of sleep on this behavior. As with other signs of sleep deprivation, feeling tired from lack of sleep is not always outwardly obvious in children. Parents must be aware of the subtle signs of sleep loss, which may include delayed reaction times among children, to determine if they need to seek further information about their child’s sleep habits.

**Memory or Concentration Issues**

Children with sleep loss may be at risk of developing memory problems and difficulties with concentration. It was once thought that a person could adapt to loss of sleep by attempting to “catch up” at other times or simply living with overall less sleep. Researchers now know that sleep deprivation can be
significantly harmful to children who need more sleep than adults because of their growth and development needs.

Children who lack sleep may have difficulties performing regular tasks that would not normally be difficult to achieve. School performance can decline dramatically. Although a child may be able to stay awake in school, even if he or she is sleep deprived, the child may be much slower at accomplishing normal tasks and may be much more likely to make errors and mistakes in their work. If a child or teen is under pressure to perform certain tasks, such as by taking tests in school, they may perform poorly while under pressure and have an even harder time concentrating to finish.21

Adolescence is a time when sleep deprivation increases, typically without the presence of other sleep disorders. The National Research Council estimates that approximately 25 percent of high school and college students in the United States are chronically sleep deprived.21 Often, the increase in sleep deprivation is related to social relationships, increased pressure for performance in school and activities, and increased amounts of time in leisure pursuits, such as spending time on the computer, texting friends, or playing video games.

Unfortunately, adolescents who are sleep deprived are also at higher risk of making mistakes that can affect their judgment and can result in negative effects that can be long lasting. Fewer hours of sleep at night is associated with a lower academic performance among teens, and making changes in
sleep schedules to accommodate more sleep may help to improve memory and overall academic performance. A school district in Minnesota studied the effects of sleep time on high school students by delaying start times for school by 1.5 hours. The study showed that students who did not have to get up as early to attend school had improved sleep, better attendance, and were less likely to be depressed. Additionally, there was a non-significant improvement in overall grade performance among the students.²¹

Sleep is an essential component of learning new information because impaired memory due to lack of sleep will prevent a child or teen from retaining information that he or she has learned. According to Harvard University, there are basically three phases of use and storage of memory. Acquisition refers to taking in information, where the person hears, reads, or views new data and the messages are sent to the brain. Consolidation is the process where the information that has been sent to the brain is stored there to become part of memory. Recall is the ability to call upon the information that has been stored, and bringing it back at a later time when needed. Recall can be conscious, in which the person knows he or she is trying to remember something; or it may be unconscious, in which memories surface without planning or trying to bring them to the surface of consciousness.²²

Research shows that all three steps of memory are important and two of the steps, acquisition and recall, take place while a person is awake. Alternatively, consolidation, or the phase where the memory is stored in the brain, seems to take place more while a person is asleep. Sleep not only regenerates damage to muscle tissues that occur during the day with activities, but it also strengthens the connections within the nervous system that serve to store memory through consolidation. When a person does not
get enough sleep, consolidation of facts into memory suffers. Studies have shown that REM sleep is important for processing and consolidating both declarative and procedural memories. Declarative memory is memory that is learned about facts and information, as well as remembering events that occurred during the day. Procedural memory is that type of memory that involves remembering how to do something or in what order to perform certain tasks.22

When sleep is disrupted, and particularly when a person does not achieve adequate REM sleep, memory consolidation also becomes disrupted, causing lapses in memory later when the person is awake. Further, a sleep-deprived person has more difficulties with concentration and focus and may be less likely to take in the information needed for acquisition of memory during the day when he or she is awake. Also, after sleep deprivation, the body is unable to recall events as well as when a person is fully rested and awake, further hampering memory capacity.22 Clearly, a lack of sleep among children and teens places a large strain on the body’s abilities to take in information, store it in the brain, and then later recall important details.

**Behavior Problems**

The brains of growing children and teens are thought to be more pliable and changeable than those of adults. Children continue to undergo neurodevelopmental changes throughout childhood and into the teen years, and their brains are considered to have neuroplasticity, that is, they change and adapt because they are growing. A child who has endured a
traumatic event may be able to overcome some of the negative emotional and psychological impacts that occur in the brain because of this plasticity. The brain is actually more able to heal because of plasticity of the neural systems.

Alternatively, sleep changes may make problems worse for children and teens, whose brains are still growing and changing, and sleep deprivation can cause some significant behavioral effects among children who chronically do not get enough sleep. The effects of sleep on behavior may be difficult to quantify in some situations because it can be hard to measure in a child: are the behavior problems part of another underlying psychological stressor or disorder, or are they related to sleep deprivation? It may be hard to know if the child will have better behavior by improving sleep at night or if the behavior will worsen or stay the same because it is due to some other factor. Further, children who are sleep deprived are not always cognitively aware of it enough to tell their parents. They may feel tired and may be able to say this, but they are typically not able to understand the important bodily functions that go on while sleeping, the appropriate amount of sleep recommended for their ages, or the full effects of sleep deprivation on their bodies.

Sleep deprivation is associated with behavioral problems in children and in adolescents. A study in *Sleep Medicine Reviews* examined the effects of lack of sleep in several different areas on children and teens, including the effects of sleep deprivation on concurrent ADHD, and the impact of lack of sleep on aggression, conduct disorder, and addiction.

Sleep deprivation is associated with ADHD in that sleep problems are more commonly seen among children with underlying ADHD than children in the
general population. Children with ADHD are more likely to have difficulties going to sleep at night, resistance to caregivers and parents at bedtime, nighttime awakenings, breathing difficulties, such as sleep apnea, and periodic limb movement disorder.

Attention deficit hyperactivity disorder is a mental health disorder that develops in childhood and is characterized by difficulties with maintaining concentration, lack of impulse control, inattention, and hyperactivity. It may be classified as children who are mostly inattentive and have difficulties completing tasks, children who are mostly hyperactive and impulsive, and children who are classified as a mixture of both types. Based on the idea that decreased sleep due to sleep disorders can cause behavioral problems, it is suggested that underlying sleep problems can contribute to symptoms of ADHD.

Because sleep problems can be more prevalent in ADHD, it makes sense that sleep deprivation contributes to negative symptoms of the disorder. However, some children may be diagnosed with ADHD or other behavioral disorders when they are, in fact, sleep deprived. According to the National Sleep Foundation, one study found that children between the ages of 6 and 15 years who had sleep problems were more likely to demonstrate behavioral issues such as increased impulse control problems, hyperactivity, inattention, and oppositional behaviors. There may be cases when it can be difficult to determine the underlying cause of the behavioral issues: sleep deprivation or another behavioral disorder that is worsened by sleep deprivation.

Unfortunately, some common medications prescribed to control symptoms of ADHD may lead to a worsening of sleep problems for the children who take
the medicines. Some of the most commonly used medications for treatment of ADHD contain stimulants. It can be difficult for parents and caregivers of children and teens with ADHD to adjust the timing of medication administration for it to be effective for the child’s symptoms, yet not disruptive to sleep patterns. Some parents choose to try alternative treatment methods for ADHD instead of using medication.

Studies have shown that improving sleep can help with symptoms of ADHD in children and teens. One study, as reported by the National Sleep Foundation, showed that children with sleep-disordered breathing and ADHD showed improved behavioral symptoms after having surgery to remove enlarged tonsils and adenoids. The children were able to achieve better sleep patterns, were less sleep deprived, and therefore showed improvements in daytime behavior and a reduction in overt ADHD symptoms.

Avoiding sleep deprivation is not the cure for ADHD in all situations; however, many parents of children with the disorder may find that their children suffer from sleep irregularities that contribute to overall sleep deprivation. Working with their children to improve sleep habits and providing treatment for some types of sleep disorders that are present will not necessarily cure ADHD, but may help to improve some of its negative behaviors.

A study in *Sleep Medicine* showed that children who demonstrated aggressive behaviors such as bullying and fighting were more likely to be sleep deprived and sleepy at school. The study showed that sleep problems occurred twice as often in children with poor school behavior in the study. Many of the children snored at night while sleeping, which led researchers to believe that the behavioral problems were caused by sleep-disordered
breathing, such as sleep apnea. However, during the study, researchers found that overall sleepiness contributed more to the aggressiveness and bullying behavior, rather than just sleep-disordered breathing. This indicates that more than one cause may contribute to lack of sleep that results in behavioral aggression.26

As with children with ADHD, parents of children who are aggressive or who bully other children may not completely solve their children’s behavioral problems by correcting sleep disorders. However, it is important to know that sleep deprivation is linked with increased aggression among children and teens and parents of children with these problems may have some success in controlling behavior if they address potential sleep issues and strive to improve their child’s sleep overall.

**Mood Problems**

Emotional problems and mood disorders have also been associated with sleep deprivation among children and youth. Among some types of mood problems that may develop in children and teens who are sleep deprived include anxiety, depression, and stress.

Lack of sleep has been associated with increased levels of anxiety among children and adolescents. Anxiety is a disorder characterized by chronic worry, stress, and fear, coupled with an inability to relax or focus. Some children with anxiety may suffer from physical symptoms, such as abdominal pain, nausea, or heart palpitations. Symptoms of anxiety may keep affected children from concentrating on tasks in school, from establishing worthwhile friendships and relationships, and from participating in routine activities that other children without anxiety are normally part of.
It can be difficult to determine if anxiety is caused by chronic sleep deprivation or if sleep deprivation and sleep disorders occur as a result of anxiety. Some of the sleep disorders listed in this course have causes related to increased amounts of stress in a child’s life, including night terrors, sleepwalking, sleep talking, and nightmares. If these sleep disorders develop because of increased daytime stress and anxiety in a child, and then become so out of control that they significantly disrupt a child’s sleep habits to cause sleep deprivation, it can be said that anxiety is ultimately causing the sleep deprivation in these children. Additionally, significant worries, stress, and fears may literally keep some children awake at night, thinking and stewing over things that cannot be changed, ultimately causing sleep deprivation in this manner as well. One study detailed in the *Journal of Pediatric Psychology* showed that children with persistent anxiety took almost an hour longer to fall asleep when compared to children who were not fearful and did not have anxiety.³⁵

Alternatively, lack of sleep may actually cause increased anxiety in some children, whether it is thoughts and worries about getting to sleep or anxiety about other factors. Lack of sleep may contribute to increased levels of the hormone cortisol, which is also known as a stress hormone.²⁷ Many children struggle with anxieties and fears that are a normal part of everyday experiences; children may be afraid of the dark, they may be afraid of monsters or other creatures. Alternatively, unrealistic fears, such as fear for personal safety, incessant worrying about the health or safety of a loved one, or whether or not a parent or caregiver will be there in the morning to care for the child are not necessarily normal fears and should be addressed as symptoms of anxiety.
Anxiety may also be linked to depression, which can develop as a result of sleep deprivation. The symptoms of depression in children and adolescents can vary significantly when compared to depression symptoms in adults. Younger children who are depressed may be clingier with their parents or caregivers, they may become oppositional about going to school or going to bed at night, or they may be irritable and cranky. Adolescents who experience depression may be more likely to experience difficulties at school and they may develop more negative behaviors such as sulking, being irritable, or talking back to parents.\(^{35}\)

It was believed at one time that depression was a disease that only affected adults and that children and teens did not suffer from depression. Today, many studies have looked at the effects of depression on the behavior and outlook of children and teens and have come up with some significant forms of treatment that can be helpful for those young people who are struggling with feelings of depression.\(^{35}\)

As with anxiety, some children may become depressed because of a lack of adequate sleep, while other children may experience lack of sleep because of their depression. The exact connection and causation between the two conditions is individual among patients, and further testing and treatment modalities are often required. If the parents and caregivers can determine the cause of one or the other, whether the child is depressed due to sleep deprivation or whether lack of sleep is causing depression, the treatment of one or both conditions can significantly help the child with his or her mental health. Often, the most successful outcomes occur when caregivers provide
treatment for both conditions, such that regardless of which condition causes the other, both conditions are addressed and the child’s need for treatment and help are met.

Increased levels of stress may develop among some children who have difficulties with sleep and who do not get enough sleep. Stress occurs when a person does not respond in a manner that is most appropriate when he or she is facing threats in daily life. The threats that a child or teen faces today are not the same that people once faced. However, children still undergo feelings of stress when they feel threatened in other ways. For example, feelings of frustration may develop because of classroom assignments that threaten time for personal activities.

Some amount of stress can be beneficial and can stimulate people to accomplish certain goals. However, when stress is chronic and occurs as a result of sleep deprivation, it can lead to depression, decreased immune function, and poor development in children. Cortisol, a hormone produced while a person sleeps, has a primary effect on the stress response.

A study noted in the *Dartmouth Undergraduate Journal of Science* showed that sleep deprivation increased cortisol levels by up to 45 percent; these increased cortisol levels are then more likely to cause problems with immune function as well as problems with metabolism, memory, and concentration. Additionally, a child or teen that feels stress may feel overwhelmed, burdened, frustrated, irritable, and unhappy. Because cortisol levels are most often secreted during the night while a person sleeps, sleep deprivation can have a significant impact on the amount of cortisol the person secretes, thereby impacting stress levels.
As with other conditions, sleep disorders, and effects of sleep deprivation, parents must take time to recognize the negative effects of stress in the lives of their children. While some stress cannot be avoided, parents should know those times that their child is struggling with increased stress and understand the impact of sleep on stress levels. When a child seems to be struggling with more stress in his or her life, parents can take steps to not only improve stress levels and help him or her manage stress appropriately, but also promote good sleep habits, support sleep hygiene, and help the child or teen do whatever is possible to attain good sleep in order to counteract some of the stress that may be occurring.

**Accidents and Injuries**

Decreased response times and changes in cognition as a result of sleep deprivation can place the sleep-deprived child or teen at higher risk of becoming injured in an accident or mishap. Whether it is a car accident that occurs as a result of slowed response times or a mistake that happens and the child is injured as a result of impaired judgment, lack of sleep has been proven to be a factor in reduced safety among youth when it comes to accidents and injuries.

Adolescents who are driving may be at much higher risk of becoming injured or killed in car crashes when they drive while sleep deprived. According to the National Research Council, adolescents and young adults between the ages of 16 and 29 years are the population most likely to be involved in car crashes that occur when the driver falls asleep.\(^{21}\)
Driving while sleep deprived can have similar effects as attempting to drive after drinking alcohol.\textsuperscript{21} People who drive while they are sleepy tend to have slower reaction times, poor steering control, and are less watchful of what is going on in the road. One study conducted in North Carolina showed that the number of car accidents that resulted in serious injuries and fatalities when caused by driver sleepiness were similar to accidents that caused severe injury and death caused by driver intoxication. Another study of sleep deprived drivers on a closed course showed performance abilities to be similar to or as poor as those of people who had been drinking alcohol.\textsuperscript{21}

Many people are unaware of the consequences of driving while sleep deprived and do not recognize the level of impairment that sleep deprivation can produce in a driver. A young driver, such as a teen, may be at higher risk if he or she is new to driving or has not had a driver’s license for long. Teen drivers lack much of the experience and wisdom of older drivers that comes from driving through several different types of situations. This can put them at higher risk of making mistakes while on the road. When a teen driver is sleep deprived, the risks are further magnified.

Accidental injuries are one of the most common causes of death among children over one year old in developed countries. Some of the most common risk factors for accidental injuries among children include developmental age, male gender, and socioeconomic status. Of accidental injuries that occur, falls are the most common.\textsuperscript{28}

Another study in \textit{Sleep Medicine} showed that children who got less sleep at night were at higher risk of becoming injured through accidental falls. The age group with the most extensive injuries that was found during the study was children in the 3 to 5-year old range. Children who became injured as a
result of falls were those who were found to sleep less than 8 hours at night, based on a parent or caregiver questionnaire. The study also found that there was an increase in the amount of injuries among young children who had been awake longer than 8 hours, suggesting a benefit of daytime naps for many young children to continue to support and promote healthy sleep patterns.\textsuperscript{28}

Children may be at higher risk of injuries such as falls when they are sleep deprived because lack of sleep reduces neurocognitive function and slows reaction time. A child may have a slower response time to a pending accident or situation that would cause an injury, and he or she may be unable to protect themselves from getting hurt because of this slowed response. Motor skills are also more likely to be slower in children who are sleep deprived.\textsuperscript{28} Again, when a pending disaster is about to happen that can result in an injury to a child, slowed or delayed motor skills will prevent the child from responding in an adequate manner and putting out the protective mechanisms that would normally prevent some injury during an accident.

\textbf{Weakened Immune System}

Children and teens that are chronically sleep deprived may be more likely to develop illnesses and chronic diseases. The impact of sleep deprivation on the body is extensive, from disrupting the circadian rhythms and causing further progression of sleep disorders to altering levels of hormone production in the body. Sleep deprivation affects the body’s production of important substances, such as thyroid hormone, impacts liver function, and can disrupt regulation of glucose in the bloodstream.\textsuperscript{30} Chronic sleep deprivation among children and teens can be disastrous for the immune system, putting this group of people at high risk of illness and disease.
Normally, the body produces melatonin at night to induce sleep when the external environment is dark. When children or adolescents are awake more during the night — whether because of staying up too late, maintaining a challenging school or work schedule, or from other sleep-related disorders — the body’s circadian rhythm can become disrupted and melatonin production is suppressed. This suppression can impact regulation of other types of hormones in the body, which can alter immune response and lead to development of some types of diseases or illnesses.29

It has already been established that lack of sleep affects secretion of the stress hormone cortisol in the body, leading to similar reactions as elevated levels of stress in a child or adolescent. Additionally, appropriate amounts of sleep are essential to regulating the immune system and antibody production, which is important for a child exposed to viruses or bacteria.29 If the child does not get enough sleep and is unable to produce adequate amounts of antibodies, he or she can be at increased risk of infections from bacteria or colds. The child could be more likely to develop illnesses such as colds, upper respiratory infections, or influenza, among other types of conditions.

Lack of sleep contributes to changes in body temperature. Normally, a person’s body remains at or near the temperature of 98.6 degrees Fahrenheit, which is important to control bacteria in the body. When a bacterial infection develops, the body may develop a fever in which body temperature rises in response to the bacterial invasion. Alternatively, chronic sleep deprivation may cause an overall decrease in body temperature over time and can affect the body’s ability to maintain a consistent body temperature. This may not seem to be a major concern until a bacterial
infection develops and the body is unable to adequately protect itself. The lowered body temperature hampers the immune system.\textsuperscript{30}

Obesity may also be more likely to develop among children who are sleep deprived, possibly as a response to changes in body temperature associated with lack of sleep. Decreased amounts of sleep changes the body’s metabolism and the body uses energy at a faster rate. If body temperature has lowered overall from chronic sleep deprivation, the body responds by using energy more quickly in an attempt to raise internal body temperature. This sets a cycle that makes a child feel hungry and want to eat more to make up for temperature changes.\textsuperscript{30} Additionally, if the child feels tired or irritable from lack of sleep, he or she may be more likely to eat and find some comfort in the full feeling that comes with eating food, which can contribute to obesity if done on a regular basis.

Finally, sleep deprivation may also impact a child’s response to vaccinations. Normally, when a person receives a vaccine, his body produces an immune response that targets the specific antigen to produce antibodies against the disease. When immune response is lowered, the person may not be able to develop immunity against the disease the vaccine is intended to prevent. A study done by researchers at the University of California, San Francisco showed that people who were sleep deprived were far less likely to respond to vaccines when compared to people who got adequate sleep. The people who were sleep deprived were 11.5 times more likely to remain unprotected from the disease the vaccine was designed to prevent.\textsuperscript{29}
**Restricted Growth**

Nutrition, good eating habits, and good sleep are all essential components to proper growth and development among children and teens. Young children and adolescents are particularly vulnerable to growth restrictions from a number of causes, whether it is due to vitamin deficiencies, improper eating habits, lack of exercise, or decreased amounts of sleep. Unfortunately, in addition to the cognitive and behavior changes that occur in children who are sleep deprived and their increased risks of accidents and development of some types of diseases and infections, children who do not get enough sleep are also at greater risk of being stunted in physical growth.

Children and teens who do not get enough sleep may have problems maintaining appropriate muscle mass and may have poor muscle development. Normally, the body uses skeletal muscles throughout the day to perform a variety of tasks, whether it is exercising or performing mundane duties, such as washing the dishes or taking a shower. Muscle tissue breaks down throughout the day with repeated use, and sleep is an essential time of rest and regeneration of this tissue so that it can be adequately used again the next day.

In order to facilitate the regeneration and repair of muscle tissue, the body secretes growth hormone during the deepest time of sleep, the period of slow wave sleep. If a person is sleep deprived, he or she will be less likely to get the adequate slow wave sleep needed for secretion of growth hormone
and the rebuilding of muscle tissue. Over time, continued lack of growth hormone can reduce muscle mass and affect a child’s growth.\textsuperscript{30}

As the name implies, growth hormone is also important for appropriate growth. The body normally secretes growth hormone from the pituitary gland in the brain. Growth hormone is responsible for promoting growth in the body’s tissues. Not enough growth hormone produced by the body due to lack of sleep can cause stunted growth in a child. A child may also be more likely to have body aches, joint problems, and muscle pain, simply because the body is not repairing itself as it should during regular sleep.\textsuperscript{30}

**Impact On Families**

The impact of poor sleep among children on their families and caregivers cannot be overestimated in importance. While children who struggle with getting adequate sleep and managing sleep disorders may suffer greatly, their families and caregivers often suffer along with them. When a child or teen is sleep deprived or struggling with a sleep disorder, the family is often kept awake by helping the child to get to sleep, helping to meet his or her needs after having medical issues or episodes associated with diagnosed sleep disorders, or worrying about the impact on the child’s behavior and self esteem.

From an early age, parents are tasked with teaching their children how to achieve good sleep. Sleep habits start early, in infancy, when parents make decisions about where and how often their baby will sleep. Parents may read or try to learn the best methods for getting a child to sleep, they may worry that their child will not bond with them over decisions they have made, or they may wonder if their baby is either getting too little or too much sleep.
Because each child is different and sleep habits vary among children, the worries and concerns often continue when subsequent children are added to the family.

Many books and guides have been written for parents about how to best get their children to sleep while simultaneously reducing fear, promoting independence, and meeting physical needs. Parents often seek out these materials and look for advice from professionals because they are typically sleep deprived themselves when they have an infant in the house. A baby may have difficulties getting to sleep at night and then may awaken numerous times during the night, requiring parents to respond again and again. Often, parents desperately want to know that their child will eventually sleep on his or her own and that normal sleep patterns will resume in the house again.

As a child grows, they may become a better sleeper, particularly if parents have worked on establishing good sleep habits for getting them to bed at a regular time every night and developing a positive bedtime routine. However, if other issues arise, such as medical problems or sleep disorders that can cause sleep deprivation, parents again may be forced to take on much of the burden of helping their child to cope and find treatment for the situation. This is often true for parents of teens as well, although by the time a child has grown into a teen, parents may be less aware of his or her sleep habits and less likely to know if there is a problem with adequate sleep, particularly if the teen does not relay any information onto their parents about struggles with sleep.

There are many steps parents can take in helping their child to get adequate and restful sleep. One of the first aspects of understanding sleep in children
is to be aware of what a normal and appropriate amount of sleep is for a child of a certain age. Parents should learn that as a child grows, he or she will require less sleep, but this does not make good sleep habits any less important.

In order to establish good sleep habits for a child, parents should work on setting a positive bedtime routine and maintain the idea of sleeping as a positive and necessary activity for the child. Often, children do not want to go to sleep or do not like going to bed and have learned how to stall or otherwise get out of bedtime routines. While this is common, it can be avoided to some extent by making bedtime routines a fun and pleasurable experience that the child looks forward to as spending time with a parent.¹

The evening routine should prepare a child for going to bed and include quiet activities, such as a dim room, a story, or a light snack. Additionally, parents should try to ensure that their children are active during the day so that they will be more likely to be tired at night. Because light tells the brain where it is at in the sleep cycle, parents should use light to their advantage. The child should have an environment of low light at night before bed and then be exposed to bright or outside light after awakening.¹

**Treatments**

Everyone experiences sleep problems at one time or another, and there may be some children who have more difficulties sleeping when compared to other children of the same age. This is not necessarily abnormal, and it may become commonplace within a family to routinely manage a child’s sleep habits. However, if a child or teen’s sleep habits are seriously disrupting family life or the child is experiencing significantly negative symptoms
associated with sleep deprivation, including behavior problems, issues at school, or mental health problems, then treatment is warranted. Fortunately for many families, treatments are available to manage sleep issues and they often come in different forms, including therapeutic interventions, medications, or medical procedures.

**Behavior Modification**

Behavior modifications for sleep problems in children can range from parent intervention and assistance at bedtime to therapeutic techniques that require a licensed mental health professional. One of the most significant forms of behavioral modification techniques for sleep issues among children is parent management training (PMT). This involves the parent doing most of the work of helping their child to establish good sleep habits and to respond to sleep issues as they occur before they become out of control. In some cases, a therapist may act as a coach or guide for parents so that they first learn about the sleep problems and then understand how to respond.

Extinction is one form of behavior modification that includes putting the child to bed and not responding to his cries, unless the child is ill or in danger. Extinction has also been referred to as the “cry it out” method in which parents ignore their child’s cries until they learn to put themselves to sleep. This method is sometimes used as a recommendation for management of sleep-onset associations. Many parents have difficulties with the extinction method because they feel guilty for letting their child cry, often leading to inconsistencies with response. Parents may feel bad for letting their child cry and eventually go to them to offer comfort. However, the child learns through this method that the parent will eventually come if they cry long enough and so often starts a cycle of behavior that leads to further crying.57
Another method associated with extinction that may be easier for some parents to implement is known as *graduated extinction*. This method involves putting the child to bed and ignoring their tantrums and crying, but the parents periodically check on the child and provide soothing if necessary. The length of time between check-ins with the child may vary and parents may gradually extend the time between check-ins until the child is able to learn to put themselves to sleep. Graduated extinction may also be referred to as “sleep training,” because the child is being trained in better sleep habits. Parents often feel less guilt about using this method because they are still responding to their child. However, when the parents provide comfort during the times they check in with their child, the interactions should be brief and minimal.⁵⁷

*Scheduled awakenings* are another method of behavior modification that may be used in some circumstances where a child is awakening with sleepwalking, sleep talking, or night terrors. If the child seems to have these issues at approximately the same amount of time after falling asleep, parents can schedule awakenings 15 to 30 minutes before the event may most likely happen.⁵⁷ Scheduled awakenings allow the parent to wake up the child, provide soothing and gentle interaction during the awake time, and then allow him or her to go back to sleep.

The time that the child is awake should be kept short to avoid significant disruptions in the sleep schedule. The child may be less likely to have spontaneous awakenings at inappropriate times or engage in certain types of sleep disorder episodes, such as night terrors. Parents can slowly fade out scheduled awakenings over time if the child is having fewer sleep issues.
There are many parent education programs available that provide teaching for parents of children from the ages of newborns to teens who have difficulties with sleep. Behavior modification of the child with sleep issues requires that parents learn about what the best option for management of sleep problems is for their child and then take steps to consistently implement changes into their child’s sleep schedule. While behavior modification involves the child’s participation in the changes, many of the modifications are related to the parent’s actions as well.

**CPAP**

Continuous positive airway pressure (CPAP) is a treatment method used among children, teens, and adults with sleep disorders, most commonly among those with obstructive sleep apnea. CPAP may be a valid form of treatment for obstructive sleep apnea when other measures of treatment, such as through tonsillectomy or weight loss, have failed. Most children must be at least 7 years old and weigh 40 pounds to use CPAP, as these are the parameters set by the U.S. Food and Drug Administration (FDA).¹⁹

After a sleep study determines the need for CPAP, a physician will prescribe the type of CPAP and the amount of pressure to use, based on the child’s results during the sleep study. The child and family obtains the CPAP machine through a medical supply company to either rent or buy, along with associated equipment. The family must learn how to successfully use the CPAP machine, how to troubleshoot for any problems, and how to clean and maintain the machine to keep it functioning well.

The CPAP machine is typically kept at the child’s bedside where it can be used each night. Many CPAP machines are portable and can be taken with the child and family during travel. At bedtime, the CPAP machine is turned
on and set to the amount of pressure prescribed by the physician; the child places a mask over his or her face before going to sleep.

Continuous positive airway pressure works by providing continuous, pressurized air that is generated from the machine and travels through tubing to the mask that the child wears over his or her mouth and nose. The pressurized air is typically room air, although extra oxygen may be added to blend with the air of the CPAP. In some cases, humidity may be necessary to prevent drying of the airway passages. The mask is secured to the face by a strap that wraps around the back of the head. Because obstructive sleep apnea can cause some of the structures of the neck and pharynx to collapse on themselves, thereby leading to periods of apnea, the constant airflow through CPAP provides enough pressure to keep these structures open. This prevents the obstruction and subsequent apnea that can occur. Without the apneic episodes that can happen multiple times each night, the child is more likely to sleep well and not suffer from sleep deprivation.20

CPAP masks are often designed to cover the mouth and nose, but some children use different types of masks. Some masks cover the nose only, which are referred to as nasal or NCPAP. Young children may also use nasal prongs that fit inside of the nose. The CPAP is designed for use on a nightly basis. It may be difficult for the child to transition to wearing the CPAP at night, particularly if he or she is unaccustomed to the machine and the mask. Some children do not tolerate wearing a mask and become very
uncomfortable with it; additionally, the motor in the machine may make noise that the child is not used to.

It may help to have the child practice wearing the CPAP mask for short periods of time to adjust to wearing it, rather than expecting him or her to put it on just before going to bed for the first time. The child may start out by wearing the mask for brief periods to get used to the feeling of having it on their face. This can be done without turning on the machine. Once the child is accustomed to wearing the mask, he or she can try to turn on the machine to feel the airflow and slowly adjust to that feeling. It is important for parents to be patient when helping their child adjust to CPAP. It can be a difficult transition to learn to sleep with a mask and a machine every night. Once the child has adjusted to wearing the mask for short periods, he or she may have greater success with wearing it for longer periods at night until being accustomed to wearing it all night while sleeping.

It is important to remember that CPAP will not cure obstructive sleep apnea, it only helps to manage the condition and improve sleep for the child. The length of time that a child must use CPAP for treatment of sleep apnea depends on the child’s health and on each individual situation. Some children, with treatment of other conditions or through weight loss, are able to effectively stop using CPAP or use it at much lower settings than when it was originally prescribed. Follow up with a physician and with more sleep studies can help to determine how much the CPAP is still needed. For instance, the child may have lost weight over the course of six months, and a follow up sleep study may determine that CPAP is no longer necessary.

CPAP is one of the most effective forms of treatment for obstructive sleep apnea. CPAP has been shown to reduce snoring and reduce disruptions in
sleep, ultimately improving overall sleep and reducing daytime sleepiness for the child. This additionally can lead to improved behavior, better concentration and memory, and improved mood.²⁰

**Allergy Treatment**

Allergic rhinitis, or environmental allergies, causes nasal congestion, runny nose, and headaches in affected individuals. When a child or teen suffers from allergic rhinitis, the symptoms can be significant enough that they impede sleep, causing daytime sleepiness and overwhelming fatigue.⁵⁸

Allergies may occur throughout the year or they may be seasonal. Some children are allergic to substances in the air that are more likely during certain times of year, such as pollen or ragweed; other children are allergic to substances such as pet dander or dust, which can be present at any time of the year. When allergens are more prominent in the environment, children with allergies to these substances are more likely to suffer from allergy symptoms and then have more trouble sleeping.

Allergic rhinitis has also been linked to obstructive sleep apnea. When a child suffers from nasal stuffiness and congestion, he or she may be more likely to snore or have obstructed breathing due to increased fluid and mucous production and swelling of the nasal tissues. Often, CPAP is prescribed for children with obstructive sleep apnea however CPAP may not necessarily open airway passages if they are congested due to allergies.⁵⁸

Children with allergies often gain better sleep when they take medications for allergy treatment. Before taking medications to treat allergic symptoms, a child should see a healthcare provider for a physical exam and medical history. The provider may want to get a better idea of what substances the child is allergic to and what symptoms he or she is having in reaction to
certain items in the environment. The provider may also order some tests to determine if there are specific substances that are causing allergic reactions; if possible, identification of these substances can then help families to make changes in their home environment to reduce allergic responses in the child. For example, if a provider identifies that a child has specific allergies to pet dander, the family may consider re-homing their pet dog to minimize the allergic effects it has on the child.

*Medications for childhood allergies*

Over-the-counter medications may be an option for some families who have children with allergies; alternatively, more serious allergy symptoms may need treatment with prescription allergy medications. According to the U.S. FDA, there are five basic types of medications that are typically available for use among children with allergies. Corticosteroids are used to inhibit inflammation and swelling that may occur as a result of allergies. Among children, nasal corticosteroids are available as nasal sprays, which are sprayed into the nose on a daily basis to clear nasal passages and reduce symptoms. An example of a nasal corticosteroid that could be used is mometasone furoate (Nasonex®).

Some of the most commonly used medications for the treatment of allergies are oral antihistamines, such as diphenhydramine (Benadryl®) and fexofenadine (Allegra®). These drugs may be available over-the-counter or by prescription, depending on the strength and dose. Oral medications may
be needed on a daily basis or they may be taken during peak times when allergies are at their worst. A common side effect of these medications is daytime drowsiness, and some children who already have sleep difficulties due to allergies may not respond well to added drowsiness from medication, so these should be considered carefully. 59

Other nasal sprays that do not contain steroids are also available for use among children and teens. These medications often work by blocking histamines that would otherwise result in allergy symptoms. They are often needed several times a day for adequate relief. Examples of non-steroidal nasal sprays include cromolyn sodium (NasalCrom®) and ipratropium bromide (Atrovent®). 59

Decongestants may help to clear congestion associated with allergy symptoms. Decongestants used to be available in most pharmacies and supermarkets without a prescription, but some medications contained substances such as pseudoephedrine that were being abused. These drugs are still available but they are typically now kept behind the counter. One example of this type of decongestant is oral Sudafed®. 59

Finally, medications known as leukotriene receptor agonists work to control allergy symptoms when used on a routine basis, whether symptoms are present or not. Montelukast (Singulair®) is an example of this type of medication. It is taken daily to reduce wheezing and congestion among allergy sufferers. 59

For some children with severe allergies that do not respond to over-the-counter or prescription medications, allergy shots may be warranted. Allergy shots work in a manner similar to vaccinations, in that a child is given a
small amount of the allergen through an injection. He or she then builds immunity to the allergen and the body develops a tolerance for it so that the child eventually will not develop an allergic response when exposed to the allergen.\textsuperscript{59}

Allergy shots require testing of various allergens that the child may be exposed to, which determines the specific type of allergy shot that would be needed. According to the U.S. FDA, approximately 80 percent of people who start using allergy shots from a healthcare provider see a significant reduction in allergy symptoms and decrease in need for allergy medication within one year.\textsuperscript{59} For children and teens that do not respond to other forms of treatment, this type of allergy management may be a viable option that improves symptoms as well as overall sleep habits.

**Orthodontics**

Children who have obstructive sleep apnea may benefit from using some types of orthodontic appliances or undergoing certain dental or orthodontic procedures. These processes typically open the air passages in the child’s nose and/or mouth and facilitate easier breathing. They may be used when other forms of treatment fail or in some cases, as a substitute for other treatments, such as CPAP.

Rapid maxillary expansion (RME) is one type of orthodontic treatment that has been used successfully in children with obstructive sleep apnea. The procedure may be more commonly used among children who present with OSA and who have other conditions, such as malocclusion of the teeth, deviated nasal septum, or a narrow palate. RME widens and expands the upper palate in the mouth by placing an appliance that slowly expands the palate. The child is fitted with a type of brace that is placed in the roof of the
mouth and is connected to the teeth. The brace is adjusted periodically to slowly expand the palate by putting pressure on the teeth and jaw in an outward direction.60

Children who undergo RME may experience a widening of the roof of the mouth and the accompanying nasal structures above the palate in the nose. This widening may then increase the size of the airway to facilitate easier breathing.60

Oral appliance therapy is another alternative for treatment of obstructive sleep apnea. Oral appliance therapy is not an option for all children with OSA and is often used among older children and teens that have not benefitted from treatment with CPAP. Before wearing an appliance, a child must have a dental or orthodontic exam. The appliance is often created specifically for the child to fit the contours of his or her mouth and teeth. After the appliance is created, the child wears it at night when sleeping. It is designed to open the airway to avoid obstruction and breathing difficulties by repositioning the jaw and tongue so that they do not obstruct the airway.61

The advantages of using an oral appliance are that it is easy to use and the child often does not need other help with wearing it once he or she has adjusted to regular use. The appliance is often small and can be taken along with travel to be used if sleeping in a different location. Finally, the oral appliance is non-invasive: the child puts it into their mouth, similar to a retainer, at night before going to sleep and takes it out upon arising in the morning. Using this type of orthodontics can be an effective method of managing sleep disorders associated with obstructive sleep apnea or other disruptions associated with breathing while sleeping.61
ENT Surgical Treatment

When a child or adolescent snores enough that it disrupts sleep or causes obstructive sleep apnea, surgical treatment (by an ear-nose-throat or ENT) specialist may be necessary to correct the physical structures that are contributing to snoring. Because enlarged tonsils are one of the most common causes of sleep apnea in children, surgery to remove tonsils and adenoids may be one of the earliest forms of treatment in some patients.

Some physicians, when assessing a child who has breathing difficulties related to snoring and sleep apnea, may recommend a tonsillectomy first if the child has large tonsils. This may be recommended even before CPAP or other types of orthodontic appliances are used, because once the child has recovered from surgery, the results are typically permanent and do not require further medical intervention.

A study known as the Childhood Adenotonsillectomy Trial (CHAT) compared removal of tonsils and adenoids to supportive care measures or observation in the management of pediatric sleep apnea. The study was designed not only to observe the effects of ENT surgery on the child’s sleep apnea condition, but also to determine whether surgery resulted in more positive behaviors in the child. Among the children studied, those who had corrective surgery for sleep apnea were more likely to demonstrate better behavior and report better sleep habits. The children also showed signs of higher quality of life and 79 percent of participants experienced resolution of sleep apnea over the course of seven months when compared to those who went through observation or watchful waiting as sleep apnea management.⁶²

An adenotonsillectomy is a surgical procedure done to remove both the adenoids and the tonsils in the back of the mouth. The tonsils can typically
be seen when a child opens his mouth, as they are found on either side of the back of the mouth by the throat. When a child has enlarged tonsils, they may take up a large amount of space in the back of the mouth, potentially occluding the airway. The adenoids are also in the back of the mouth, but they cannot necessarily be seen when looking in an open mouth. The adenoids are found where the back of the nose meets the throat.

Many children have enlarged tonsils and adenoids, and recurrent infections in the tonsils may warrant surgical removal among some children. However, as a child grows into adolescence and then adulthood, the tonsils and adenoids tend to shrink to a smaller size. This is often why tonsil surgery is more commonly performed among children and less often in adults. Often, an adenotonsillectomy is performed because a child has tonsils and adenoids that are enlarged enough that they impede airflow and disrupt breathing, such as through obstructive sleep apnea. The child may demonstrate snoring and may have many other symptoms associated with sleep apnea, including multiple nighttime awakenings and chronic sleep deprivation. Although the tonsils and adenoids are part of the immune system, they can be safely removed as part of OSA treatment.\textsuperscript{63}

During the procedure, the surgeon removes both the tonsils and adenoids from the mouth. The recovery time is typically about 2 weeks, but may vary among children. Most children complain of a sore throat or neck following surgery. Despite the fact that the surgery requires anesthesia and may place the child at an increased risk of some complications, such as infection, an adenotonsillectomy can be quite successful in helping a child with obstructive sleep apnea to get better sleep because of better quality breathing. Studies have shown that of children who underwent an adenotonsillectomy for sleep apnea treatment, between 80 and 97 percent
of patients experienced a reduction or resolution in sleep apnea symptoms.63

**Summary**

Despite the essential nature of sleep, many children still struggle with attaining adequate sleep each night, which can disrupt their moods, abilities, and activities, and can have a significant impact on quality of life. The body undergoes certain patterns with sleep each night and most children and teens cycle through these patterns over and over while they are asleep. However, when sleep disorders develop, children and adolescents may have difficulties achieving appropriate sleep and may find that these patterns are consistently interrupted.

Sleep deprivation leads to problems with behavior, an increased risk of accidents and injuries, and a multitude of other negative consequences. Fortunately for many parents and caregivers, there are a number of treatment alternatives for children who have a difficult time with sleep. For those who need help with sleep disorders or chronic sleep deprivation, treatment measures can be a lifesaving option for both children and families, who will receive much-needed help for getting to sleep.

Please take time to help the NURSECE4LESS.COM course planners evaluate nursing knowledge needs met following completion of this course by completing the self-assessment Knowledge Questions after reading the article. Correct Answers, pg. 94
1. A person spends approximately _____ percent of his or her time asleep in the stage of NREM sleep.
   a. 10 to 20 percent
   b. 30 to 50 percent
   c. 75 to 80 percent
   d. 85 to 95 percent

2. Which process most likely occurs during rapid eye movement sleep?
   a. muscle atonia
   b. decreased blood pressure
   c. dilated pupils
   d. decreased respiratory rate

3. Once a child reaches 2 to 3 years of age, what is the recommended amount of sleep he should receive each night?
   a. 16 hours
   b. 13 hours
   c. 11 hours
   d. 8 hours

4. Which part of the body regulates cortisol production?
   a. pineal gland
   b. hypothalamic-pituitary-adrenal axis
   c. thyroid gland
   d. supra-chiasmatic nucleus

5. Which of the following is considered a potential cause of bedwetting?
   a. Prolonged periods of stage 4 sleep
   b. Decreased fluid intake in the morning
   c. Increased periods of rapid eye movement sleep
   d. Low levels of anti-diuretic hormone
6. **Which is a true statement regarding obstructive sleep apnea in children?**
   a. Obstructive sleep apnea most commonly occurs in children who were born prematurely.
   b. Obstructive sleep apnea in children is most often caused by enlarged tonsils and adenoids.
   c. Obstructive sleep apnea most often develops between the ages of 11 and 15 years.
   d. Obstructive sleep apnea is more commonly seen in children who are underweight and developmentally delayed.

7. **Which best describes the most appropriate treatment for delayed sleep phase syndrome?**
   a. lorazepam
   b. supplemental oxygen
   c. CPAP
   d. morning phototherapy

8. **Which best describes the difference between night terrors and nightmares in children?**
   a. The child typically remembers nightmares but does not remember night terrors
   b. Night terrors occur within the first hour of sleep but nightmares occur after 2 to 3 hours of sleep
   c. Parents can awaken a child who is having a night terror but they often cannot awaken a child from a nightmare
   d. There is no difference; night terrors and nightmares are essentially the same
9. An episode of sleep paralysis that occurs just as a child is falling asleep is known as:
   a. chronological
   b. hypnagogic
   c. confusional
   d. hypnopompic

10. Sleep talking that occurs more than once a week but not every night is classified as _____ severe.
   a. mildly
   b. moderately
   c. significantly
   d. profoundly

11. The process where the information that has been sent to the brain is stored there to become part of memory is called:
   a. acquisition
   b. acknowledgement
   c. consolidation
   d. recall

12. Children with ADHD more likely have difficulties with:
   a. going to bed at night.
   b. swallowing medication.
   c. establishing REM sleep.
   d. waking up in the morning.

13. Which best describes how depression may be manifested in a child?
   a. Weight loss
   b. Increased amounts of sleep
   c. Clingy behavior
   d. Slowed metabolism
14. Which of the following is a true statement regarding growth in sleep-deprived children?
   a. Sleep-deprived children are more likely to be taller but may weigh less than their peers.
   b. Children who are sleep-deprived experience more bone fractures and joint dislocations than their counterparts.
   c. A sleep-deprived child may be unable to repair and regenerate muscle tissue while sleeping.
   d. Children who are sleep deprived exhibit a hyperactive response to vaccinations.

15. According to the National Research Council, which age group is most likely to be injured in car crashes that occur as a result of sleep deprivation?
   a. Infants and toddlers
   b. 3 to 9-year-old children
   c. 14 to 18-year-old teens
   d. 16 to 29-year-old young adults

16. An example of behavior modification used in treating sleep problems is:
   a. extinction
   b. absolution
   c. delectation
   d. fulmination

17. According to the U. S. FDA, a child must be _____ years old before adequately using CPAP for sleep apnea.
   a. 2 years old
   b. 5 years old
   c. 7 years old
   d. 12 years old
18. Which is an example of a nasal corticosteroid that may be used to treat allergic rhinitis?
   a. montelukast
   b. ipratropium bromide
   c. cromolyn sodium
   d. mometasone furoate

19. A type of orthodontic treatment that has been successfully used among children with obstructive sleep apnea is a:
   a. palatoplasty
   b. rapid maxillary expansion
   c. pharyngeal flap
   d. expansion sphincter pharyngoplasty

20. Imipramine is most commonly used to treat which type of sleep disorder?
   a. sleepwalking
   b. obstructive sleep apnea
   c. bedwetting
   d. delayed sleep phase disorder
Correct Answers:

1. [C] 75 to 80 percent
2. [A] muscle atonia
3. [C] 11 hours
4. [B] hypothalamic-pituitary-adrenal axis
5. [D] Low levels of anti-diuretic hormone
6. [B] Obstructive sleep apnea in children is most often caused by enlarged tonsils and adenoids.
7. [D] morning phototherapy
8. [A] The child typically remembers nightmares but does not remember night terrors
9. [B] hypnagogic
10. [B] moderately
11. [C] consolidation
12. [A] going to bed at night
13. [C] Clingy behavior
14. [C] A sleep-deprived child may be unable to repair and regenerate muscle tissue while sleeping.
15. [D] 16 to 29-year-old young adults
16. [A] extinction
17. [C] 7 years old
18. [D] mometasone furoate
20. [C] bedwetting
Footnotes:


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