Pediatric Sleep Education in Primary Care: Parental Receipt, Compliance and Children’s Sleep Problems

by

Jenna Patricia Mullarkey
Florida Institute of Technology

Bachelor of Arts
Psychology
St. John’s University
2012

Master of Arts
Applied Developmental and Educational Psychology
Boston College
2014

Master of Science
Clinical Psychology
Florida Institute of Technology
2016

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We the undersigned committee, having examined the submitted doctoral research project, “Pediatric Sleep Education in Primary Care: Parental Receipt, Compliance and Children’s Sleep Problems” by Jenna Patricia Mullarkey, M.A., M.S. hereby indicate its unanimous approval.

________________________________________
Vida L. Tyc, Ph.D., Committee Chair
Professor, School of Psychology

________________________________________
Patrick J. Aragon, Psy.D., Committee Member
Assistant Professor, School of Psychology

________________________________________
Catherine Nicholson, Ph.D., BCBA-D, Committee Member
Assistant Professor, School of Behavior Analysis

_______________________________________
Lisa A. Steelman, Ph.D.
Professor and Dean
College of Psychology and Liberal Arts
Abstract

Title: Pediatric Sleep Education in Primary Care: Parental Receipt, Compliance and Children’s Sleep Problems

Author: Jenna Patricia Mullarkey, M.A., M.S.

Committee Chair: Vida L. Tyc, Ph.D.

Sleep is important for children, as inadequate sleep can result in a number of poor outcomes in terms of cognitive, psychosocial, and somatic functioning. The American Academy of Pediatrics (AAP) has recommended that all pediatric providers educate parents about the necessary sleep duration for optimal functioning and healthy sleep hygiene practices for their children. The present study sought to examine the proportion of parents who receive pediatric sleep education from their child’s providers, the rates of compliance with these recommendations, and the effects that receiving this information has on frequency and severity of the child’s sleep problems. This cross-sectional study was conducted via an online pediatric sleep survey completed by parents of children between the ages of three and 12. A total of 305 parent participants were enrolled in the study. Of the parents who chose to provide their child’s demographic information, the mean age of children in the sample was 6.33 years (SD= 2.643; range= 3-12 years) and the gender distribution was 50.2% male (n=157) and 47.3% female (n=148). Only 28.8% (n=90) of parents reported that sleep was discussed at their child’s most recent visit to a medical provider. The results also indicated that
only 6.7% (n=21) of parents were fully compliant with the all of the AAP’s recommendations for sleep duration and sleep hygiene. When examining compliance with sleep duration recommendations, a significant effect was found for severity of sleep problems, $F(1, 286)= 10.554, p=.001$, eta squared= 0.04, with children who were not sleeping the recommended number of hours experiencing significantly more sleep problems. These results reveal that a significant percentage of parents do not receive sleep education from their pediatric providers, which can lead to increased severity of sleep problems in children. Findings from this study will be used to inform provider-delivered interventions for parents and families to promote healthy pediatric sleep.
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Review of the Literature

Prevalence

By age 18, children have spent approximately 40% of their lives asleep (Honaker & Meltzer, 2016). Sleep is important for promoting good overall physical health, increasing a child’s ability to learn at school, and assisting with regulation of emotions and behaviors (McDowall, Galland, Campbell, & Elder, 2017). A number of causes have been identified for deficient sleep in children including health problems, lifestyle factors, (Blunden & Galland, 2014), poor parenting styles (Blunden, Lushington, Lorenzen, Martin, & Kennedy, 2005) and other environmental factors (Milan, Snow, & Belay, 2007). Sleep issues occur along a continuum and range from problems such as poor sleep hygiene, bedtime problems, night waking, and insufficient sleep to those that meet diagnostic criteria for a disorder and include obstructive sleep apnea, insomnia or narcolepsy (Meltzer, Plaufcan, Thomas, & Mindell, 2014). Despite the importance of sleep, the prevalence of sleep issues is relatively high, ranging from 1-3% for obstructive sleep apnea to 20-30% for pediatric insomnia (Honaker & Meltzer, 2016) and even higher for undiagnosed or occasional sleep problems.

A large, national poll conducted with over 1400 parents of children ≤10 years in the U.S. revealed that approximately 10% of parents of preschool and school-aged children reported their child had a sleep problem (Mindell, Meltzer, Carskadon, & Chervin, 2009). This study also found that poor sleep hygiene
practices, particularly a late bedtime and having a parent present when the child fell asleep, were associated with sleep difficulties across several age ranges. Similarly, other research reported approximately 25% of children experienced a sleep problem at some point during their childhood (Owens, 2007). Data from the National Survey of Children’s Health, a large-scale national survey of parents, allowed researchers to examine trends in sleep problems in US children aged 6-17 across three different time periods and revealed the prevalence of sleep problems increased significantly between 2003 and 2012. The number of children who experienced sleep problems at least one day per week increased from an estimated 15.1 million in 2003 to 20.5 million in 2012 (Singh & Kenney, 2013). A study based on the guidelines developed by the National Sleep Foundation and conducted with a convenience sample of caregivers of children between three months and 12 years found that only 66% of children were getting the recommended amount of sleep for their age group (Owens, Jones & Nash, 2011). Sleep hygiene problems also occurred at high rates, with results showing that 23% of children did not have regular bedtimes, 23% of children had electronics in their bedroom, and 5% of children consumed caffeine every day (Owens, et al., 2011).

The variability in prevalence estimates of children’s sleep issues across published studies may be related to sample size or other methodological limitations of this research. While there have been some large-scale surveys of nationally representative samples (Mindell, et al., 2009; Singh & Kenney, 2013), the majority
of studies on pediatric sleep have been conducted with smaller community samples (Alfano, Zakem, Costa, Taylor, & Weems 2009; Biggs, Lushington, Van Den Heuvel, Martin, & Kennedy, 2011; Owens & Dalzell, 2005; Owens, et al., 2011) or include families who visit their pediatric providers for multiple concerns (Blunden, et al., 2005; Meltzer, et al., 2014). It is also important to note that reported estimates of children’s sleep problems may depend on the respondent completing the study assessments. Most studies employ parent reports of their child’s sleep problems which may differ from those provided directly by the child or the healthcare provider (Owens, 2008). Child-report may be more accurate in terms of sleep onset delays or night wakings (Owens, 2008), but may not be reliable in younger participants. In general, rates of provider-reported sleep problems are typically lower than parent-reported rates (Honaker & Meltzer, 2016), which may be impacted by low rates of screening practices among providers. Lastly, there is little consistency across studies with respect to the outcome measures used to assess sleep problems. This largely results from the lack of consensus among researchers regarding how to evaluate optimal sleep in children, which may be variably defined in terms of sleep onset, night wakings, sleep duration, or other measures (Blunden & Galland, 2014). Development of standardized protocols to evaluate pediatric sleep and its correlates across different age groups is certainly warranted to address this methodological weakness.
Screening and Treatment Practices of Providers

Most children attend well-child visits at a pediatrician’s office on a regular basis throughout their childhood, which allows providers the opportunity to screen for sleep problems and educate both parents and children about the importance of sleep (Honaker & Meltzer, 2016). In a review of the literature on sleep-related practices in pediatric care settings, Honaker and Meltzer (2016) found that in three studies, most pediatricians reported less than 25% of their patients had problems with sleep (Bruni, et al., 2004; Mindell, Moline, Zendell, Brown, & Fry, 1994; Owens, 2001); in another study that asked directly about behavioral sleep problems (i.e. bedtime resistance, difficulty falling asleep), more than half of pediatricians reported they encountered children with behavioral sleep problems on a daily or weekly basis (Davis, et al., 2012). This suggests that estimates of sleep problems based on provider reports may depend on the method of query used for data collection. Problems with sleep were also identified as one of the top concerns raised by parents during well-child visits (Honaker & Meltzer, 2016). Similarly, another study reported that 14% of the parents in their sample wanted to talk to their child’s healthcare provider about their child’s sleep (Owens, et al., 2011).

Despite the finding that parents seek guidance about pediatric sleep issues from their providers, examination of provider screening practices for childhood sleep disturbances indicates relatively variable, yet low rates of screening among providers across studies (Honaker & Meltzer, 2106). Research by Faruqui et al.
(2011) examined screening practices, knowledge about sleep problems, and the barriers faced when screening for sleep problems among a national sample of providers (n=346) who were members of the American Academy of Pediatrics. This study distributed a questionnaire to pediatricians to assess their perceptions and practices; questionnaire items were based on a comprehensive review of the literature in order to establish face validity of the items. The results found that 96% of pediatricians agreed they should discuss sleep with patients and their caregivers, yet only 18% had received formal education about sleep disorders. Additionally, they found that 10% of pediatricians did not routinely screen for sleep problems in school-aged children at well-child visits. Those who did not screen for sleep problems spent significantly less time with their patients and perceived significantly more barriers to screening. While this study was impressive in its sample size, the results are limited by the potential bias for pediatricians to respond in socially-desirable ways (Faruqui, et al., 2011). These findings are relatively consistent with those presented in Honaker and Meltzer’s (2016) review which showed that the majority of pediatricians asked parents only a single question to screen for sleep concerns, and rarely asked children or adolescents directly about their sleep. Additionally, few providers use screening tools or standardized interview questions to examine pediatric sleep problems in their primary care practices (Honaker & Meltzer, 2016).
Owens and Dalzell (2005) examined the screening practices of pediatric residents in a children’s teaching hospital to explore whether a sleep screening tool, the BEARS, would improve the likelihood of residents asking about sleep. The BEARS was developed to prompt medical staff to inquire about the most common sleep problems in children across five domains including bedtime problems like trouble going to bed and falling asleep, excessive daytime sleepiness, awakenings during the night, regularity of sleep/wake cycles (bedtime, waketime), sleep duration, and snoring (Owens & Dalzell, 2005). The study sample included 195 school-aged children, equally distributed by gender, with a range of ethnicities. Investigators examined the child’s medical records to determine if sleep information was recorded for the medical visit in the five BEARS domains and compared the documentation for visits before and after implementing the screening tool.

Results showed that before the addition of the screening tool, 87.7% of the medical records included general information about sleep, while 98.5% of the records included general sleep information after the screening tool was implemented. In addition, only 7.7% of medical records included information about bedtime issues before use of the screening tool, while 93.3% of records included information about bedtime issues after the screening tool was introduced. Similar results were found for excessive daytime sleepiness, awakening at night, sleep duration, and snoring, which all significantly increased after the screening
tool was introduced. These findings demonstrated that use of a simple screening tool not only increased the frequency with which pediatric providers screened for childhood sleep issues, but also improved documentation of sleep-related information during medical visits. However, standardized screening procedures must be consistently and widely used across settings to significantly impact clinical practice.

Another example of poor provider compliance with pediatric screening guidelines was demonstrated by Erichsen and colleagues (2012) who found low adherence to guidelines for routine screening of snoring and sleep disordered breathing (SDB). Per these guidelines, developed by the American Academy of Pediatrics, screening for snoring should be part of every well-child visit and should be documented and followed up on given its sensitivity as a marker for sleep-disordered breathing. A review of the electronic medical records of 1,032 children between four and 17 years of age seen in primary care clinics, indicated that only 24.4% of patients were asked about snoring during their well-child visits. Whether lack of adherence to recommended guidelines was related to the comfort level of providers caring for children with SDB or whether providers were aware of the availability of these guidelines was not assessed in this study. This study showed that despite the presence of guidelines for pediatric providers, screening practices are still largely inadequate and may detrimentally affect detection and timely
treatment of children at risk for health-related morbidities (Richards & Ferdman, 2000).

In addition to limited screening, there are also significant shortcomings in the treatment of pediatric sleep issues in pediatric primary care practice. Meltzer, et al. (2014) examined the medical records of 750 pediatric patients, ≤18 years, from primary care practices affiliated with a large children’s hospital. They divided their sample into those with diagnosed sleep disorders, those with sleep problems, and those with no sleep problems and inspected the recommendations made for each group. Findings indicated that only five percent of patients diagnosed with a sleep disorder or an identified sleep problem received a sleep-related treatment recommendation from their provider in a pediatric primary care setting. These recommendations primarily included a discussion about behavioral strategies (51.2%), followed by referral for further evaluation (34.1%). These results are consistent with the review by Honaker & Meltzer (2016) that reported that many children with identified sleep problems do not receive a recommendation, treatment, or a referral. When recommendations are provided, providers often endorse evidence-based sleep management strategies such as extinction and stimulus control strategies, yet little is known about the effectiveness of these approaches when delivered in the primary care setting (Honaker & Meltzer, 2016). Clearly, despite the high prevalence of sleep problems in children,
screening, identification, documentation, and treatment of these difficulties by primary care providers are limited and less than optimal.

Effects of Inadequate Sleep

Insufficient sleep can result in a variety of negative outcomes for children, including cognitive difficulties, psychosocial and behavioral problems, and health problems. These will be outlined in the sections that follow.

Cognitive.

Sleep is an essential behavioral process for the child’s developing brain, particularly for new learning, skill acquisition, and academic success (Peirano & Algarín, 2007). In healthy children, sleep problems, ranging from shorter sleep duration to sleep interruptions and behavioral sleep problems, have been associated with reduced cognitive performance across several domains including attention (Blunden, et al., 2005; Simola, Liukkonen, Pitkäranta, Pirinen and Aronen, 2012, Vriend et. al, 2013), intelligence (Blunden et al., 2005), memory (Blunden et al., 2005), executive functioning (Blunden, et al., 2005; Vriend et al., 2013) and academic skills (Vriend et al., 2013). Children with neuropsychological conditions and greater cognitive deficits often experience higher rates of sleep disturbance than typically developing healthy children (Aishworiya, Chan, Kiing, Chong, & Tay, 2016; Dorris, Scott, Zuberi, Gibson & Espie, 2008), lending further support to the association between sleep disruption and cognitive dysfunction. Sleep
problems, particularly youth-reported insomnia symptoms, have also been found to predict lower school grades, youth’s perceptions that they were struggling in school, and negative attitudes toward teachers and school (Perfect et al., 2014).

Although the specific neural mechanisms of how poor sleep affects cognition and behavior have not been determined, children’s sleep difficulties have been linked to increased cortisol levels (El-Sheikh, Buckhalt, Keller, & Granger, 2008; Hatzinger, et al., 2008), increased levels of glucocorticoids that inhibit neurogenesis in the hippocampus (Mirescu, Peters, Noiman, & Gould, 2006), and increased activity of the prefrontal cortex which has been found to play a role in executive functioning (Horne, 1993). Sufficient and good quality sleep are critical for memory consolidation and disrupted sleep may affect neurotransmitter activity required for daytime cognitive processing (Hobson & Pace-Schott, 2002; Stickgold, 2005). Children with sleep disordered breathing who experience hypoxia or upper airway obstruction and frequent arousals during sleep may also experience negative cognitive sequelae (Kim, et al., 1997; Rhodes, et al., 1995).

In one of the first studies to examine the role of comorbid sleep problems on neuropsychological outcomes in children, Blunden, et al. (2005) compared children between the ages of 6 and 16 with a history of behavioral sleep problems, a history of snoring, a history of both behavioral sleep problems and snoring, and a control group. The Sleep Disturbance Scale for Children (SDSC) was used to screen for snoring and behavioral sleep problems (i.e. difficulties falling asleep,
staying asleep, bedtime resistance, sleep anxiety, etc.) as based on parent report. All children completed a battery of tests that assessed intelligence (Wechsler Abbreviated Scale of Intelligence; WASI), memory (Children’s Memory Scale; CMS), and attention (Auditory Continuous Performance Test; ACPT and the Test of Everyday Attention in Children; TEA-Ch). Children in the combined snoring and behavioral sleep problem group as well as the snoring only group scored lower on intelligence and attention measures when compared with children in the behavioral sleep problems group and the controls. Findings suggest that the combination of behavioral sleep disorders and snoring resulted in significantly greater cognitive deficits than when they occurred separately, but each adversely affected functioning in different domains. Higher snoring scores on the SDSC were moderately related to reduced IQ and attentional abilities, while higher behavioral sleep problem scores on the SDSC were moderately related to impaired short-term/working nonverbal memory. These findings also suggest that the association between cognitive functioning and comorbid sleep problems may be dose-dependent and point to the need for screening of co-existing problems in children identified as snorers, given their potential clinical impact on the child’s neuropsychological development.

Using a population-based longitudinal study design that allowed examination of children’s sleep problems over time, investigators found a significant association between persistent sleep problems and attention difficulties,
as measured by the Child Behavior Checklist (CBCL), a parent report of their child’s psychosocial and behavioral functioning (Simola, et al., 2012). In this study, persistent sleep problems were defined as scores above the 75th percentile of the total sleep disturbance scale on the SDSC at both baseline testing during preschool and follow up testing at school-age. The risk of attentional problems was found to be 13 times more for children with persistent sleep problems compared to children without identified sleep problems. These findings were similar to those reported in prior cross-sectional studies that reported an association between sleep problems and poor attention (O’Callaghan et al., 2010; Paavonen et al., 2010). Although the strength of this study was its longitudinal approach to evaluating sleep problems, the study was limited by a small sample size and a low parent response rate. It is possible, therefore, that parents who completed the follow-up measures were motivated to respond because their children had more problems than those who did not respond. This response bias may have resulted in stronger associations between sleep and measured outcomes than would be obtained for other samples with better response rates, thereby limiting the generalizability of the results. This study also highlights the importance of early intervention for children with sleep problems, as the persistence of sleep problems can contribute to further developmental difficulties.

In an effort to demonstrate the effects of sleep duration on cognitive functioning in children, Vriend et al. (2013) manipulated sleep duration by using
the child’s baseline sleep diary and actigraphy data to adjust their bedtimes and create two different sleep schedules. Prior to group assignment, children wore actigraphs for 3 weeks to determine their typical bedtime and waketimes. Actigraphs are devices with an accelerometer worn on the child’s wrist to objectively measure movement as an indirect method of sleep and waking. Children, ages 8-12 years, were then randomly assigned to receive either long sleep times (bedtimes were one hour earlier than usual) or short sleep times (bedtime adjusted one hour later than usual) for 4 consecutive nights. After the children completed the assessments in one sleep duration group, they were switched to the other sleep duration group and re-assessed.

Utilizing the Digit Span task (from the Wechsler Intelligence Scale for Children, Fourth Edition) and the Finger Windows task (from the Wide Range Assessment of Memory and Learning, 2), investigators found that children performed worse on measures of short-term and working memory when they had less sleep (Vriend, et al., 2013). They also utilized several measures of attentional abilities, including the Conners’ Parent Rating Scale-Revised (CRS-R:L), the Attention Network Test-Interaction (ANT-I), and the Children’s Colour Trails Test (CCTT) that is composed of two tasks; the CCTT-1 measures perceptual tracking, sustained attention and graphomotor skills and the CCTT-2 measures the same skills and adds divided attention, sequencing skills, and inhibition/disinhibition. Results revealed that shorter sleep duration can impair some aspects of attention,
including parent report of inattention on the CRS-R:L and the CCTT-2 task, although no significant differences were found for reaction time on the ANT-I task or the CCTT-1 task. Math fluency was also assessed utilizing the Math Fluency Task from the Woodcock Johnson Tests of Achievement-III, and children were found to perform significantly worse on math fluency when they were in the short sleep duration group. Although limited by its small sample size, the importance of the study is its finding that even small changes in sleep duration over a few days can affect children’s cognitive performance. This further highlights the need to educate children and their parents about good sleep hygiene and suggests that children who experience poor cognitive performance be screened for sleep problems.

Together, these studies have highlighted some of the domains of cognitive functioning that can be impaired by sleep problems. There have been few longitudinal studies, making it difficult to understand the long-term cognitive consequences of persistent poor sleep. The varying strength of the association between sleep and cognitive functioning noted across studies may reflect the cognitive demand of different cognitive tasks employed in each and/or the differing sensitivity of tasks to detecting effects of sleep deficits (Paavonen et al., 2010). Additionally, some cognitive tasks may be more resistant to sleep disturbances than others. Further, studies have typically examined the relationship between sleep and only one aspect of cognitive functioning which may not be representative of the
profile of cognitive dysfunction that emerges after restricting sleep. Lastly, moderators of the link between sleep and cognitive functioning such as child age, race, socioeconomic status, and environmental factors have not been consistently examined and should be the focus of future research that informs the development of targeted interventions to improve cognitive performance (Buckhalt, El-Sheikh, Keller, 2007).

**Psychosocial/Behavioral/Mental Health.**

Preschool and school-age are important periods for a child’s psychosocial and behavioral development. Inadequate sleep can affect this critical period of development in a variety of ways, and research has consistently demonstrated a link between inadequate sleep in children and negative psychosocial and behavioral outcomes, poor impulse control, and risk taking behavior in both non-clinical and clinical samples (Alfano & Gamble, 2009; Alfano, et al., 2009; Biggs, et al., 2011; Blunden et al., 2005; Leahy & Gradisar, 2012; Simola et al., 2012; Vriend et al., 2013). There is considerable empirical evidence that supports a significant link between sleep problems and symptoms of anxiety and depression among school-aged children (Alfano, et al., 2009; Leahy & Gradisar, 2012; Simola et al. 2012). In a community sample of children aged six to 17 years, sleep problems were found to be moderately correlated with scores on each of the scales on the Revised Child Anxiety and Depression Scales (RCADS), which includes Generalized Anxiety, Panic and Agoraphobia, Separation Anxiety, Social Anxiety, and Obsessive-
Compulsive symptoms (Alfano, et al., 2009). A significant association between sleep problems and an increased score on the Children’s Depression Inventory (CDI) was also reported, indicating that children with elevated depressive symptoms were more likely to report sleep difficulties (Alfano et al, 2009). Simola et al. (2012) similarly found that the risk of having an anxious or depressed mood, as rated on the CBCL, was greater for children with persistent sleep problems compared to children with no sleep problems.

High rates of sleep problems have also been noted among clinical samples of children with various mental health disorders (Alfano & Gamble, 2009; Ivanenko, Barnes, Crabtree & Gozal, 2004; Leahy & Gradisar, 2012). In a number of cases, adolescents who report insomnia have also been found to meet criteria for a mental health diagnosis (Ivanenko, Barnes, Crabtree & Gozal, 2004). This raises the issue that has been debated in the extant literature regarding the bidirectional and reciprocal relationship between sleep and affective functioning, an association which may be complex and not easily addressed by cross-sectional studies (Alfano et al., 2009; Leahy & Gradisar, 2012). With regards to anxiety, there is some preliminary evidence identifying childhood sleep problems as a precursor to later development of anxiety symptoms in adulthood, although there is less conclusive support for findings in the opposite direction (Leahy & Gradisar, 2012). Further longitudinal research will need to be conducted to examine the effects of sleep problems on the trajectory of anxiety symptoms as children age (Leahy & Gradisar,
2012). The clinical implication of these findings is that providers should address ongoing sleep complaints in children who present with mental health concerns and behavioral difficulties.

Consistent with these findings, Biggs and colleagues (Biggs, et al., 2011) found that increased behavioral problems were related to short sleep duration and inconsistent sleep schedules in children five to ten years of age recruited from primary schools in South Australia. Using the South Australian Paediatric Sleep Survey (SAPSS) to assess sleep habits and behavior, researchers identified earliest, normal, and latest bedtimes as well as the usual, earliest, and latest wake time for participants on both school days and non-school days. Specifically, results showed that bedtime variability, differences in school night bedtime and non-school night bedtimes, and wake time variability were associated with an increase in internalizing behavior, hyperactive behavior, and overall total problem scores on the Strengths and Difficulties Questionnaire (SDQ), a parent-reported measure of a child’s behavioral functioning. Children with a bedtime variability of greater than two hours were six times more likely to score in the 95th percentile for hyperactivity. Although the value of using bedtime and sleep duration as primary measures of healthy sleep has been debated in the literature (Biggs et al., 2011), the findings from this study support the importance of a consistent bedtime routine and stable sleep schedule for better behavioral functioning among school-aged children.
Unlike the previous study, Blunden et al. (2005) examined psychosocial functioning in children whose parents reported varying levels of sleep disturbance. Children with a history of behavioral sleep problems (including bedtime resistance, difficulty falling asleep, and night-waking) were compared to children who snore, children with both behavioral sleep problems and snoring, and controls. Parents of children in the behavioral sleep problems group and those in the combined snorers + behavioral sleep problems group reported significantly more problematic behaviors and reduced social competency (measured by the CBCL) than children with a history of snoring or the control group. Similarly, Simola et al. (2012) found a significantly increased risk of psychosocial problems in children with sleep problems that persisted from preschool age to school age. Children with persistent sleep problems had a 16-fold risk of a total problem score on the CBCL in the subclinical/clinical range when compared to children without sleep problems. Those with sleep problems were more likely to be aggressive, have difficulty with socializing, and experience anxious/depressed mood. These findings highlight the effects that poor sleep quality can have on a child’s psychosocial functioning over time, and the importance of intervening as soon as problems are identified.

Using a unique study design that involved experimental manipulation of children’s sleep duration, Vriend et al. (2013) examined the effects of sleep duration on children’s emotional regulation. In this study, parents completed an Emotion Questionnaire (EQ-P), a survey that examined their views of their child’s...
emotional reactions with regard to anger, fear, positive emotions, and sadness in response to daily situations. Researchers also utilized an Affective Response Task (ART) to assess both positive and negative affective responses from children to a series of images meant to evoke different emotions. Both tasks were administered to children once under a short sleep condition (bedtimes one hour later than usual) and again under a long sleep condition (bedtimes one hour earlier than usual). The results revealed that children in the shorter sleep duration condition demonstrated less positive affective response on the ART task and their parents reported poorer emotional regulation on the EQ-P relative to the long-sleep condition. This study is unlike other studies because it utilized a within-subject design and manipulated sleep durations in the same children under different conditions in order to avoid the potential confound of individual differences in sleep needs. While this study demonstrates the significance of sufficient sleep for good emotional regulation, it is not clear how more extreme or sustained sleep loss would affect emotional functioning in children and to what extent early presentations of sleep disturbance would impact later psychosocial functioning and psychopathology.

**Health/Somatic.**

Inadequate sleep can impair a child’s overall physical health, and lead to an increase in accidental injuries, increased cardiovascular risks, compromised immune system functioning, and metabolic changes resulting in obesity and diabetes (Flint, et al., 2007; Gruber, Cassoff, & Knäuper, 2011; Owens, 2007) that
can persist into adulthood if not treated. In particular, reduced sleep duration has been associated with greater body mass index (Chaput, Brunet & Tremblay, 2006). Obstructive sleep apnea and snoring in children have also been linked to more frequent pulmonary hypertension, cardiac issues, changes in vascular tone, and somatic growth problems (Tarasiuk, et al., 2007).

As a likely result of the physical consequences of inadequate sleep, Meltzer, et al. (2014) reported that children with identified sleep disorders or sleep problems had significantly more sick visits and provider contacts than children without sleep difficulties, particularly among infants and adolescents. Additionally, preschool to school-aged children with persistent sleep problems have been shown to have an increase in somatic complaints, as measured by the Somatic Complaints scale on the CBCL (Simola, et al., 2012). Similarly, children with behavioral sleep problems were also found to have more somatic complaints, as rated by the CBCL, compared to a control group (Blunden, et al., 2005). Addressing problematic sleep issues during medical visits is important for reducing health care utilization, particularly for those age groups who commonly experience sleep disturbances.

**Pediatric Sleep Guidelines**

A literature review was conducted by Matricciani, Olds, Blunden, Rigney, and Williams (2012) to examine the historical trends in sleep duration recommendations for children. Their review found 32 sets of recommendations,
the oldest of which was from 1897 and the most recent from 2009. Results indicated that during this time, on average, the recommendations for sleep duration decreased over time at a rate of -0.71 minutes per year. The rates of change were greatest for younger children; for example, the rate of change in sleep duration recommendations for five-year-old children was -1.17, meaning that it decreased approximately 1.17 minutes per year from 1897 to 2009. Previous recommendations, however, have been made primarily based on subjective opinion and loose observation, and as such, the optimal amount of sleep for children has not been clearly established.

As such, the National Sleep Foundation’s updated recommendations (2015) and the American Academy of Sleep Medicine’s updated recommendations (Paruthi, et al., 2016) both improve on previous methodologies by using the RAND Appropriateness Method to develop their recommendations based on review of published scientific studies. The RAND Appropriateness Method is a model for healthcare decisions which involves a thorough search of the empirical literature, reviewed by a panel of experts, who then derive a collective consensus statement on a given topic (Fitch et al., 2001). The guidelines published by the National Sleep Foundation in 2015 were the first of their kind, as they were based on a systematic review of the literature (National Sleep Foundation, 2015). When the American Academy of Sleep Medicine published their guidelines, they followed
this trend and developed their guidelines based on the empirical literature (Paruthi, et al., 2016).

Current recommendations, published by the American Academy of Sleep Medicine, describe the number of hours children should sleep based on their age (Paruthi, et al., 2016). The recommendations state that school-aged children should sleep between nine and 12 hours per 24-hour period and children between the ages of three and five should sleep 10 to 13 hours per 24-hour period, including naps to promote good health. In 2016, the American Academy of Pediatrics (AAP) issued a statement encouraging pediatricians to discuss healthy sleep habits with parents and patients at every well-child visit ("American Academy of Pediatrics Supports Childhood Sleep Guidelines," 2016). This statement adopted the 2016 American Academy of Sleep Medicine guidelines for sleep duration for different age groups from infants to teenagers. The AAP guidelines additionally recommend that sleep hygiene factors, such as no screens in the bedroom and establishing a bedtime routine, are discussed with parents. These guidelines updated the previous guidelines for sleep duration published by the National Sleep Foundation in 2015 (Hirshkowitz, et al., 2015), and are now considered best evidence-based practice for pediatricians.
Parent Variables that Affect Pediatric Sleep Education

Parents have been shown to be moderately accurate reporters of their child’s sleep problems. Urfer-Maurer, et al. (2018) examined the correspondence between parental report of their child’s sleep and in-home sleep electroencephalography (EEG). In this study, The Children’s Sleep Habits Questionnaire (CSHQ) was completed by parents and a sleep diary was completed by the parents and child together and compared to EEG results. Unlike other studies that have examined only one sleep outcome, this study evaluated multiple objective outcome variables related to sleep problems, including total sleep duration, sleep onset latency (time it takes to fall asleep) and sleep efficiency (total sleep duration/time spent in bed) that were assessed with in-home EEG reports. A unique feature of this study was that children’s sleep was assessed in their natural home environment, thereby more reliably assessing their usual sleep patterns and increasing the ecological validity of the findings. Sleep questionnaire data completed by mothers was found to moderately correspond with objective measures of total sleep time, sleep onset latency, and sleep efficiency. Father questionnaire reports of sleep onset latency were found to be moderately associated with objective sleep onset latency measures, but fathers were less accurate in their reports of total sleep time. Both mother and father questionnaire reports of sleep problems were similarly correlated with children’s diary reports. These findings demonstrate that parents are reliable informants of their child’s sleep problems and highlight the importance of using
parent report measures when more objective measures like actigraphy or EEG are unavailable.

**Knowledge.**

Overall, studies have shown that parental knowledge about healthy sleep practices is generally low, which in turn limits a parent’s ability to recognize when their child is experiencing sleep difficulties. In a study by Owens and Jones (2011), parental knowledge about healthy sleep practices for their children was evaluated. The results of their study showed that 76% of parents underestimated how much sleep their child needed, but only 8% of parents reported their child was getting inadequate sleep. Additionally, the overall knowledge of the parents regarding healthy sleep was found to be low, particularly regarding both the recommended sleep duration and the warning signs of inadequate sleep. Research by Schreck and Richdale (2011) revealed that fewer than 10% of parent respondents to their survey assessing knowledge of pediatric sleep answered 50% of their questions correctly, with the average score on their measure being only 32%. Owens, et al. (2011) found a correlation between low levels of parental knowledge about sleep and unhealthy sleep practices for their children. Lack of knowledge about healthy sleep is also likely to significantly impact a parent’s likelihood or ability to accurately report a sleep problem to their provider (Schreck & Richdale, 2011). If parents are not knowledgeable about the topic of sleep, they are less likely to recognize when their child’s sleep practices are problematic and
significantly less likely to initiate the conversation about sleep with their child’s provider. Untreated childhood sleep problems are also a significant source of distress for caregivers and may be exacerbated if not effectively managed by their parents (Owens, 2008). These collective findings highlight the importance of the provider’s role in initiating educational efforts about healthy sleep with families seen in primary care.

**Demographic Factors.**

Demographic variables have also been found to affect parental knowledge of and application of healthy sleep practices. Parents of younger children are more likely to recognize their child’s sleep problems than parents of older children, potentially related to normal developmental patterns and the tendency for parents of younger children to be more involved in their child’s sleep routines (Owens, 2007). Parents from different cultures have also been found to variably define children’s sleep problems which may affect their inclinations to seek guidance from their providers. A study by Sadeh, Mindell and Rivera (2011) examined cultural differences and found that parents from predominantly Asian countries were more likely to characterize their child’s sleep habits as problematic when compared to parents from predominantly Caucasian countries. They also found that lower parental education, lower levels of parental employment, and younger parental age were significant predictors of the parent’s characterization of their child’s sleep problems as severe.
Ethnicity can also contribute to differences in parental knowledge about healthy sleep practices. For example, Owens, et al. (2011) revealed that Hispanic parents answered fewer sleep knowledge questions relating to sleep needs, bedtime routines, and sleep hygiene correctly compared to Caucasian, African American, or Asian parents. Research examining the concerns of parents from different ethnic groups found that Caucasian mothers were generally more concerned about their children having difficulty falling asleep and seeming overly tired than African American and Hispanic mothers (Milan, et al., 2007). In addition, higher level of parent education is another factor that was generally associated with improved sleep quality for their children, and children of older parents generally received less sleep than children of younger parents (Sadeh, Raviv & Gruber, 2000). Similarly, children of parents with lower levels of perceived economic well-being were found to exhibit shorter sleep duration and more variability in sleep onset (El-Sheikh, et al., 2013). Findings across studies suggest that socio-cultural and contextual factors may influence children’s sleep behaviors and parental perceptions of their child’s sleep problem, which may in turn influence whether or not parents initiate a conversation with their child’s provider about sleep. Future research is needed to address cross-cultural differences in assessment and health care delivery for pediatric sleep problems in primary care.
Comfort and Satisfaction.

Comfort and satisfaction with primary care providers also affects the likelihood of a parent initiating a discussion about sleep at a healthcare visit. Halfon, Inkelas, Mistry, and Olson (2004) examined the satisfaction of parents regarding their well-child care for their young children. Results revealed that 94% of parents felt they were able to ask all of their questions about their child’s health during their most recent well-child visit, and 88% found they received an adequate amount of time with their provider. This indicated that overall, parents felt their child’s provider was generally responsive, despite providers’ perceptions that they do not have sufficient time to provide anticipatory guidance and necessary sleep information to parents (Boerner, Coulombe & Corkum, 2015; Faruqui et al., 2011). Additionally, they found that Hispanic parents were overall less satisfied with the care their child received, indicating that ethnicity differences may impact this outcome.

Kinder (2016) more recently examined parental satisfaction with their nurse practitioner’s communication skills, competence, caring behaviors, and decisional control in pediatric primary care and its relationship to parent’s intent to adhere to the recommendations made by the nurse practitioner. While this study did not specifically address sleep education, it showed that parents were generally satisfied with their child’s health care visits, and satisfied with their nurse practitioner’s communication skills, clinical competence, caring behavior, and decisional control.
They also found that parents’ perception of their nurse practitioner’s clinical competence explained 18.5% of the variance in parental intent to comply with their recommendations. Approximately 47% of parents in this sample believed that the nurse practitioner was the best health educator, 47% rated both the nurse practitioner and physician as equally good, and 6% reported the physician was the best health educator. These findings suggest there are differences in parental comfort levels in receiving education from various providers, which may in turn, affect their adherence to sleep education.

**Physician Variables that Affect Pediatric Sleep Education**

One of the most common barriers to the provision of sleep education by primary care providers is lack of knowledge or training about pediatric sleep. Research has found that, overall, pediatricians receive very little formal education about sleep, which results in their failure to adequately address sleep in primary care settings (Honaker & Meltzer, 2016). While physicians, in general, acknowledge the importance of educating children and parents about sleep, the majority of pediatricians (82%) in one study reported they never received formal training about pediatric sleep disorders (Faruqui, et al., 2011). Physicians who were younger than 50 years old were significantly more likely to have had formal training in pediatric sleep disorders. The majority of health care professionals who endorsed receiving training in pediatric sleep gained this training through
continuing education or self-directed learning (Boerner, Coulombe, & Corkum, 2015). In a survey completed by providers who were members of the American Academy of Pediatrics, medical knowledge questions about bedwetting and snoring, two common sleep problems in children, were answered correctly by 29% (bedwetting) and 13% (snoring) of pediatricians (Faruqui, et al., 2011), indicating that overall, knowledge about common sleep problems by pediatricians is low. This is alarming given that these two childhood sleep problems are commonly encountered in pediatric primary care and parents depend on their providers to give them appropriate information regarding diagnosis and treatment.

In addition to limited knowledge and training, providers also cite the lack of time, practice/institutional limitations, and the individual’s professional orientation (i.e. believing sleep to be outside of their scope of practice or not identifying sleep as a priority) (Boerner, Coulombe & Corkum, 2015) as significant concerns that interfere with provision of quality sleep education to families. Physicians have reported the major barrier to providing sleep education to parents is their presumption that parents would volunteer information about sleep if there was a problem; approximately 12% of pediatricians reported they did not believe they needed to screen for sleep problems in children at well-child visits because parents would initiate a conversation about sleep if there was a problem (Faruqui, et al., 2011). The second most common concern of providers was that if they addressed sleep, they would not have ample time to address other health problems during the
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child’s medical visit (Faruqui, et al., 2011). Collectively, these studies suggest that both providers and parents must work collaboratively to ensure that children practice healthy sleep habits at home. Providers must ask the important questions and educate parents about best evidence-based sleep practices and parents must ask for assistance when necessary to promote appropriate change.

Rationale for Study

Sleep is important for children, in that it is necessary for their health, learning, and executive functions (Owens, 2007). Negative consequences of insufficient sleep include cognitive problems (Blunden, et al., 2005; Simola, et al., 2012; Vriend, et al., 2013), psychosocial difficulties (Blunden, et al., 2005; Simola, et al., 2012), and somatic complaints (Meltzer, et al., 2014; Simola, et al., 2012). Despite the significance of healthy levels of sleep, parents are often provided with little information about sleep from their pediatricians, largely due to lack of adequate provider training about pediatric sleep issues as well as time and resource constraints (Boerner, Coulombe, & Corkum, 2015). Consequently, this gap in pediatric clinical practice may result in limited implementation of healthy sleep practices by parents at home and sleep and behavioral problems in their children.

Guidelines for healthy sleep habits in children have been developed (Hirshkowitz, et al., 2015; Paruthi, et al., 2016), however, many parents are not aware of recommended healthy sleep behaviors when this information is not
adequately conveyed by their pediatric providers. The American Academy of Pediatrics (AAP) adopted the guidelines proposed by the American Academy of Sleep Medicine for sleep duration across age groups and added that all screens should be turned off at least 30 minutes prior to bedtime, screens should not be in children’s bedrooms, and a consistent bedtime routine should be established (American Academy of Pediatrics Supports Childhood Sleep Guidelines, 2016). These guidelines are the most recent available to address healthy sleep in the pediatric population and are empirically based. As such, these updated guidelines should guide pediatricians in the provision of sleep education to parents.

Previous studies have shown that pediatric healthcare professionals are inconsistent in their provision of sleep education to parents (Honaker & Meltzer, 2016). A number of factors have also been identified to affect parental understanding or application of healthy sleep practices for their children, including demographic factors as well as comfort and satisfaction with their provider. The present study built on previous research by exploring the factors that impact whether parents receive information from their pediatric providers that is consistent with the most recent AAP guidelines about healthy sleep practices. Unlike prior studies, the current study examined whether parental compliance with these guidelines impacts the sleep practices for their children and related sleep difficulties. Information obtained in this study will be useful to inform effective
provider-delivered screening and education efforts that improve parental awareness of healthy pediatric sleep habits.

**Study Objectives**

- **Objective 1:** To determine the proportion of parents who receive pediatric sleep education from their primary pediatric providers, as based on parent report.
  
  o Hypothesis 1.1: Few parents (<50%) will receive sleep education from their pediatric providers.

- **Objective 2:** To examine rates of parental compliance with provider-delivered pediatric sleep guidelines.
  
  o Hypothesis 2.1: Low rates of parental compliance (<50%) with pediatric sleep guidelines will be reported.
  
  o Hypothesis 2.2: Parents who do not receive sleep education will be less compliant with sleep guidelines.

- **Objective 3:** To examine the relationship between parental compliance with sleep guidelines and the frequency/severity of pediatric sleep difficulties.
  
  o Hypothesis 3.1: Parents who are less compliant with sleep guidelines will endorse more frequent and more severe sleep problems for their children.
Objective 4: To evaluate factors that influence parent receipt of healthy sleep education from pediatric providers. Variables that were examined included demographic characteristics of the child and parent, prior medical diagnosis/diagnosed sleep disorder of the child, reason for pediatric referral, and number of visits to the pediatric provider in the last year.

- Hypothesis 4.1: Demographic characteristics of the child and parent will influence parent receipt of sleep education from their providers.
- Hypothesis 4.2: Reasons for the child’s referral to the pediatric provider will influence parent receipt of sleep education from their providers.

Methods

Participant Selection

The participants in this study were parents/guardians of children (ages 3-12 years). This age range was selected as this is the time when parents are more actively involved in the management of their child’s sleep behaviors (Owens, 2007). A total of 305 participants were enrolled in the study. Participants were recruited via the internet, through social media. Parents/Guardians were asked to choose the child in their home who most recently visited the pediatrician as their focus for the survey. Only one parent per household completed the survey. Children did not participate in the study. Participants were excluded from the study if they had not visited a medical provider in the previous year, were not able to read
the survey, were not living in the United States, or did not have a child between the ages of three and 12 years. At the completion of data collection, there were 386 total responses, of which 305 were deemed usable based on the inclusion/exclusion criteria and the participant completing a sufficient amount of the questions for analysis. The response rate for the survey was 79%.

**Procedures**

Approval from the Florida Institute of Technology Institutional Review Board (IRB) was obtained prior to participant recruitment. Parents were asked to complete an online survey about their child’s sleep habits and sleep education delivered by their child’s provider. Research has shown that parent report of their child’s sleep habits is moderately accurate in terms of sleep duration and types of sleep problems (Urfer-Maurer, et al., 2018). Information about the survey was distributed via the internet (Facebook, twitter, and email) and flyers distributed at parent-friendly locations (e.g. childcare centers, health centers, and schools). Informed consent was obtained on the first page of the survey prior to study enrollment. Participant names were not collected as part of this study. The information that was collected was entered into a HIPAA-compliant database and all personally identifying information was de-identified with minimal risk of breaching confidentiality. Participants had the option to enter into a raffle for a $50 gift card after completing the survey.
Outcome Measures

This study utilized a questionnaire that was developed for the purposes of this study and is based on AAP sleep guidelines, common sleep problems as described by the BEARS screening tool (Owens & Dalzell, 2005), and components of healthy sleep education programs for children as defined by the literature (Gruber, et al., 2011). The survey contains 47 questions, tapping the domains of demographics, sleep habits and problems, communication with the primary care provider, and compliance with guidelines. Survey items asked about parent demographic information (10 questions), child demographic information (3 questions), child medical information including previous physical and mental health diagnoses and medication (2 questions), sleep behaviors (11 items), knowledge of healthy sleep practices (2 items), provision of sleep education by primary care providers (7 items), the child’s most recent visit to their primary care provider (3 items), and barriers to adhering to healthy sleep practices (2 items). The survey targeted parents of school-aged children. Items were evaluated in terms of categories, and individual items were also evaluated qualitatively for greater descriptive value. Completion of this measure took approximately 20 minutes.

The primary outcomes in the current study included:

a. Receipt of sleep education from providers: This component was evaluated via one question regarding whether sleep was discussed by the provider
with the parent during the child’s most recent medical visit. Receipt of information was scored as yes/no.

b. **Sleep problems:** The presence of sleep problems was measured on a Likert scale (0=never, 4=always) and based on the content of the BEARS sleep screening tool, a measure developed for pediatric providers to increase the rates at which they discuss important aspects of sleep with their patients (Owens & Dalzell, 2005). The BEARS screening tool outlines the areas providers should inquire about to obtain the most complete assessment of potential child sleep problems and has been shown to be effective in improving informed communication about sleep issues with families (Owens & Dalzell, 2005). Sleep problems were evaluated separately in terms of frequency (total number of sleep problems endorsed; ranging from 0 to 12) and severity (based on the Likert scale ratings and ranging from 0 to 48) and categorized into no (severity scores of 0-3), mild (severity scores of 4-16), moderate (severity scores of 17-32), or severe sleep problems (severity scores of 33-48). The total severity score was used in the final analyses.

c. **Parent compliance with AAP guidelines:** Level of compliance was measured in terms of child sleep duration and child sleep hygiene and then categorized as compliant, partially compliant, or noncompliant. A composite score was calculated for compliance, ranging from 0 to 5, with
points being earned for compliance with the age-appropriate duration recommendations and each of the four sleep hygiene factors (consistent bedtime routine, brushing teeth, reading book, and no screens in the bedroom) identified by the AAP. Compliant was defined as the child’s sleep duration falling within the recommended number of hours and following all of the sleep hygiene guidelines endorsed by the AAP (compliance score= 5); partially compliant will be defined as any combination of compliance with sleep duration and/or sleep hygiene guidelines resulting in a score between 1 and 4; and noncompliance will be defined as not complying with the sleep duration guidelines and the sleep hygiene guidelines (compliance score= 0).

d. **Demographic information:** Child information obtained included age, gender, and grade in school. Parent demographic information included age, gender, race/ethnicity, annual household income, and education. Child medical information was also addressed, including previous physical, sleep, and mental health diagnoses, prescribed medications, and information about the child’s most recent visit to their pediatric provider.

**Research Design and Analysis Plan**

This study utilized a cross-sectional design. Data were collected via an online survey, which was published using the Qualtrics software program. This
survey was available through FIT’s partnership with Qualtrics, and the survey was maintained on the Qualtrics website. The first page of the survey provided a description of the survey along with the informed consent.

Descriptive statistics including means, standard deviations, and frequencies were calculated for child and parent demographic variables, for the primary outcomes (parental receipt of sleep education, parental compliance with sleep guidelines and child sleep problems), and all covariates. Chi square testing was conducted to examine the relationships between receipt of sleep education and compliance with guidelines. Analyses of variance (ANOVA) was used to examine the relationship between compliance and frequency of sleep problems and also to examine the relationship between compliance and severity of sleep problems. Logistic regression models were constructed to examine the predictors of parental receipt of provider-delivered sleep information. Preliminary analyses were conducted to examine the relationship between covariates and our primary outcomes and those that are significant were controlled for as covariates in our selected analyses. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) –version 25.

Results

Participants

A total of 305 participants were enrolled on the study. Of the parents who chose to provide their demographic information, 93% of the sample was female
(n=291), while 3.5% (n=11) was male, and 1% (n=3) identified as non-binary. Approximately 86% of the sample (n=270) were between the ages of 25 and 44 years. Full demographic characteristics of the parent sample are presented in Table 1. Of the parents who chose to provide their child’s demographic information, the mean age of the children was 6.33 years (SD= 2.64; range= 3-12 years). The gender distribution of children in the sample was 50.2% male (n=157) and 47.3% female (n=148). Full demographics of the children sampled are presented in Table 2.

**Sleep Problems in Children**

Sleep problems in children were evaluated separately in terms of frequency (total number of sleep problems endorsed; ranging from 0 to 12) and severity (based on the Likert scale ratings and ranging from 0 to 48). The mean frequency of sleep problems endorsed by parents was 5.30 (SD=2.40). The mean severity of sleep problems endorsed by parents was 9.39 (SD= 5.47). Further analysis comparing sleep problems for the two age groups (ages 3-5 yrs vs. ages 6-12 yrs) revealed a significant difference between groups for both frequency ($F(1, 284)= 17.88, p<0.001$), eta squared = 0.06, and severity ($F(1, 284)= 17.28, p<0.001$), eta squared = 0.06 with the younger age group (ages 3-5 yrs) experiencing both more frequent and more severe sleep problems than the older age group (ages 6-12 yrs). In addition, the younger age group (ages 3-5 yrs) experienced significantly more
problems (more frequently endorsed “sometimes” or greater) with difficulty staying asleep or waking during the night, $X^2 (1, N=284) = 5.41, p = 0.02$, needing to take naps during the day, $X^2 (1, N=282) = 64.19, p < .001$, and wetting the bed, $X^2 (1, N=284) = 4.30, p = 0.04$. The most frequently endorsed sleep problem for both age groups was bedtime resistance, with 37.7% of the sample reporting their child resists bedtime at least once per week. Further results for frequencies of sleep problems are presented in Table 3.

**Relationship Between Receipt of Sleep Education and Compliance**

Only 28.8% (n=90) of parents reported that sleep was discussed at their child’s most recent visit to a medical provider. Of the parents who reported that sleep was discussed, 71.9% (n=64) reported the conversation about sleep was initiated by the medical provider, while 28.1% (n=25) reported they initiated the conversation themselves.

A composite score was calculated for compliance, ranging from 0 to 5, with points being earned for compliance with the age-appropriate sleep duration recommendations and each of the four sleep hygiene factors (consistent bedtime routine, brushing teeth, reading book, and no screens in the bedroom) identified by the AAP. Compliant was defined as the child’s sleep duration falling within the recommended number of hours for their age and following all of the sleep hygiene guidelines endorsed by the AAP (compliance score= 5); partially compliant was
defined as any combination of compliance with sleep duration and/or sleep hygiene guidelines resulting in a score between 1 and 4. The survey revealed that only 6.7% (n=21) of parents were fully compliant with the AAP’s recommendations for both sleep duration and sleep hygiene, while there were no parents who were fully non-compliant (scores of 0). Further analysis revealed that 83.4% (n=261) of parents were compliant with the AAP’s recommendations for sleep duration, while only 7.7% (n=24) were compliant with all four components of the AAP’s guidelines for sleep hygiene. Sixteen percent (n=50) of children have televisions or computers in their bedroom, and 6.4% (n=20) do not have consistent bedtime routines. Twenty-four percent (n=75) of children do not read a book before bedtime, while 13.7% (n=43) do not brush their teeth before bedtime. A chi-square test of independence was performed to examine the relationship between overall compliance and receipt of sleep education. The relation between these variables was not significant, \(X^2 (1, N=285) = 2.06, p = 0.72\).

Further analysis revealed that 4.5% (n=13) of the parents who completed the survey were not the person primarily responsible for their child’s bedtime routine. Chi-square testing revealed that being the parent responsible for the bedtime routine was significantly related to overall compliance, \(X^2 (1, N=286) = 4.96, p = 0.03\), with parents who are primarily responsible for bedtime reporting greater compliance with AAP guidelines compared to parents who are not primarily responsible for their child’s bedtime. Additionally, a significant difference was
found in terms of overall compliance when examining the two age groups, $X^2 (1, N=280) = 7.92, p = 0.005$, with older children (ages 6-12 yrs) being more compliant with AAP guidelines than younger children (ages 3-5 yrs). Further analysis revealed that older children were significantly more compliant with the recommendations for sleep duration, $X^2 (1, N=282) = 9.52, p = 0.002$, per their parent report.

**Relationship Between Compliance and Sleep Problems**

A one-way analysis of variance was conducted to examine the effect of compliance on both frequency and severity of the child’s sleep problems. Of parents who were fully compliant with all AAP recommendations, the mean number of sleep problems endorsed was 4.90 (SD=2.57), while for the parents who were partially compliant, the mean number of sleep problems endorsed was 5.37 (SD=2.40). No significant effect was found for compliance on the frequency of the child’s sleep problems $F(1, 284) = 0.74, p = 0.39$. Similarly, the effect of compliance on the severity of the child’s sleep problems was not significant $F(1, 284) = 1.76, p = 0.19$.

Further examination of compliance with sleep duration recommendations via a one way ANOVA revealed a significant effect on severity of sleep problems, $F(1, 286) = 10.55, p = 0.001$, eta squared = 0.04, demonstrating a small effect size. with children whose sleep duration fell within the recommended number of hours
for their age experiencing significantly less severe sleep problems. The effect of compliance with duration recommendations was marginally significant for the frequency of sleep problems endorsed by parents, $F(1, 286)=3.80, p=0.052$. Full results regarding the effect of compliance on sleep problems are presented in Table 4.

Factors That Influence Receipt of Sleep Education

A logistic regression analysis was performed to assess the impact of a number of factors on the likelihood that parents reported receipt of sleep education from their child’s pediatric provider. Preliminary analyses were performed to decide which variables would be included in the model. Chi square analyses were used to determine the significant variables that were included in the final regression. The model contained estimated household income (less than $30,000; $30,000-$99,999; and $100,000 and greater), parent marital status (not married vs. married), child age in years, child’s gender (male vs. female), acute illness as reason for referral, and number of visits to the pediatric provider in the last year (1-2 visits, 3-4 visits, 5-6 visits, or 7 or more visits). The full model containing all predictors was statistically significant, $\chi^2(9, N=275) = 59.58, p < .001$, indicating that the model was able to distinguish between parents who received pediatric sleep education from those who did not. The model as a whole explained between 19.5% (Cox and Snell $R^2$) and 27.4% (Nagelkerke $R^2$) of the variance in receipt of
education, as correctly classified in 71.6% of the cases. As shown in Table 5, only five of the independent variables made a unique statistically significant contribution to the model (income less than $30,000, income greater than or equal to $100,000, being married, acute illness as reason for referral, and visiting the pediatric provider 5-6 times in the last year). The strongest predictor of receipt of sleep education was acute illness as reason for referral, as demonstrated by an Odds Ratio of 14.82. This indicated that when acute illness was the reason for referral, parents were 14.82 times more likely to discuss sleep with their child’s provider than when acute illness was not the reason for referral, controlling for all other factors in the model.

**Discussion**

**Impact of Study**

Previous studies have shown that pediatric healthcare professionals are inconsistent in their provision of sleep education to parents (Honaker & Meltzer, 2016), an outcome that was confirmed in the present study, with only 28.8% of parents reporting that their pediatric providers discussed their child’s sleep with them at their most recent pediatric visit. These rates are discouraging as the low likelihood that providers will deliver important health information to parents leaves a large gap in pediatric clinical practice and potential negative impacts on children’s health outcomes that are affected by sleep. As the barriers to delivery of sleep information in the pediatric setting are well known, (i.e. time demands, lack
of knowledge), efforts to address those barriers are an important step in assisting providers in incorporating healthy sleep education. Use of available evidence-based screening tools and multiple ready-to-use information sources by the provider, involvement of the medical team as extenders during the clinical encounter, and continuing education of providers about practice guidelines (Gruber et al., 2011), may help to overcome some of these barriers and improve dissemination of information to parents.

Examination of factors that influenced the likelihood that parents received sleep education indicated that the child’s visit for an acute illness was the strongest predictor of whether sleep was discussed at the visit. This finding may be explained by the fact that children’s sleep may be more apt to be disturbed when they are ill and/or that children require more sleep during an illness, such that sleep issues are more salient at that time. However, the AAP clearly recommends that pediatric providers inquire about the quantity and quality of a child’s sleep at every well-child visit, and not only when the child is sick. Additionally, parents from lower income levels and those who were married were more likely to report receipt of sleep education, while parents from higher income levels were less like to report receipt of sleep education from their providers. The impact of income levels and marital status on the types and sources of information available to parents about sleep, how parents engage with their provider, and how parents access and understand new information is a focus for future research (McDowall et al., 2017).
Similar to previous studies (Mindell, et al., 2009; Owens, 2007; Singh & Kenney, 2013), many parents in the present study reported sleep problems in their children. The observed age group differences in reported sleep problems align with what would be expected of children developmentally, with younger children experiencing a greater need to take naps and more frequent bed-wetting than the school-aged group. The most commonly experienced problem in our sample was the child’s resistance to bedtime at least once per week, which was endorsed by almost 38% of parents. As caregivers may be more reluctant to raise behavioral sleep concerns with their providers (Williams, Klinepeter, Palmes, Pulley, & Jane, 2004), it is likely that parents would not receive guidance or information about specific strategies to address their child’s bedtime behaviors including bedtime resistance or bedwetting. This further highlights the necessity of providers to initiate discussion of both behavioral as well as medical sleep concerns with their patients.

Contrary to our hypothesis, a significant relationship between parental receipt of education and compliance with sleep guidelines was not found. This was inconsistent with other studies that have demonstrated that greater caregiver knowledge about children’s sleep issues was correlated with the practice of better sleep practices (Owens, et al, 2011; Owens & Jones, 2011; Schreck & Richdale, 2011). There are several plausible explanations for the lack of a significant finding. First, this study did not allow for evaluation of the specific content or type of
information delivered by the provider to the parent during the medical visit.

Additionally, the authors chose to measure compliance using a derived score based on the five components of the AAP recommendations. However, there was limited variability in the responses obtained using this outcome which may have restricted our ability to identify meaningful differences in compliance levels. Lastly, parents are likely to report that their child engaged in some of the sleep practices including brushing their teeth or having a consistent bedtime routine to present themselves in a socially desirable way, which may not accurately reflect their compliance.

In light of these methodological concerns, less than 10% of parents reported full compliance with the AAP guidelines regarding both sleep duration and sleep hygiene. In terms of compliance with recommended sleep duration, one prior study with a comparable sample size revealed that only 66% of children were sleeping the recommended number of hours (Owens, Jones & Nash, 2011), while the present study revealed 83.4% of children were sleeping the recommended number of hours per the AAP guidelines. These results are promising given the well demonstrated link between sufficient sleep and physical, emotional, and cognitive health (Biggs, et al., 2011; Blunden, et al., 2005; Chaput, et al., 2006; Hobson & Pace-Schott, 2002; Simola, et al., 2012; Stickgold, 2005; Vriend et. al, 2013). Of importance is the finding that children who did not sleep the recommended number of hours were found to experience more frequent and severe sleep problems. This indicates that while the AAP guidelines endorse the importance of sleep hygiene, it appears that
sleep duration is a contributing factor to better sleep. However, it should be noted that study data do not distinguish between the child’s actual sleep time vs. time in bed. Therefore, the sleep duration estimates may reflect parental reports of the child’s time in bed which is often greater than the child’s actual time asleep (Hirshkowitz et al., 2015).

Surprisingly, older children were significantly more compliant with the AAP guidelines, including the recommendations for sleep duration. This is surprising due to the fact that parents are typically more involved in younger children’s bedtime routines, which should ensure greater compliance. The greater compliance with recommended sleep duration of older children may be due to the fewer hours of sleep required by older children, making it easier to be compliant.

In contrast to the higher estimates of compliance with sleep duration guidelines, few parents in our study reported compliance with all sleep hygiene components recommended by the AAP guidelines. However, parents reported higher rates of compliance with screens not being in the bedroom and consistent bedtime routines than previous studies (Owens & Jones, 2011; Owens, et al., 2011). These differences could be the result of the participants in the present study attempting to present themselves in a more positive way. Alternatively, our sample was predominantly white and middle income compared to another survey sample that was more racially diverse and low income (Owens & Jones, 2011) and another that was similar in terms of income but more racially diverse (Owens, et al. 2011).
As unhealthy sleep practices are more likely to be reported among children from poor and minority families, including having a screen in the child’s bedroom, (Dennison, Erb, & Jenkins, 2002; Spilsbury, et al., 2004), it is possible that the greater compliance with no screens in our sample may reflect the potential effect of social-cultural factors on sleep practices.

The fact that not all parents in our study were found to uniformly implement good sleep hygiene practices and adhere to sleep duration recommendations suggests that parents may encounter unique challenges to implementing these practices in their homes. Anticipatory guidance from their child’s medical provider, which occurs at infrequent rates, is critical to laying the foundation for parents to begin a dialogue about their child’s sleep issues. As this is the first study to evaluate parental compliance with the 2016 AAP guidelines for pediatric sleep, the collective results suggest that children’s sleep continues to be an area that is under-addressed in routine pediatric primary care. Standard parent education efforts in evidence-based practices that keep pace with new and emerging pediatric sleep guidelines are warranted to improve children’s sleep.

Limitations of the Study

In addition to the limitations already discussed, there are several limitations for the current study that are inherent in pediatric sleep research. First, the primary outcomes in this study were based solely on parent report. It is possible that the
rates of parental receipt of information may be influenced by parental perceptions and recollection of the experience with their child’s provider and may not accurately reflect whether sleep information was actually delivered by the provider. Future studies should consider inclusion of provider reports of the interaction and/or observational data regarding the visit to supplement parent report. In addition, this study relied on parent report of their child’s sleep duration, which is a major outcome of this study. While there might be questions about the accuracy of parent report in terms of sleep duration, past studies have shown moderate correlations between parental report of total sleep duration with EEG (Urfer-Maurer et al. 2018). Ideally, inclusion of objective sleep measures, such as actigraphy to measure exact sleep durations, would improve the validity of parent reports.

Another challenge for the study was that the parent/guardian who accompanied the child to medical visits (and eligible to participate in this study) was not always the parent in control of the child’s bedtime. The authors attempted to control for this in the survey by asking who was responsible for putting the child to bed; however, respondents were not excluded from the study if they did not put the child to bed. In this study, 4.5% of the sample were the parent who accompanied the child to the medical provider but were not the parent who was primarily in control of the child’s bedtime. As our results suggested, involvement in the child’s bedtime routine may impact compliance with AAP guidelines. This
also prevented a direct examination of the association between parental receipt of information and translation of that information into implementation of behavioral sleep practices at the child’s bedtime. In order to better control for this in future studies, inclusion criteria would require that parent participants both accompany their child to their medical visit and manage their child’s bedtime routine for most accurate reporting.

Additionally, it must be recognized that there are individual differences in a child’s need for sleep. The ranges endorsed by the American Academy of Pediatrics for recommended sleep duration are guidelines, and as such, it is possible that individual children could fall outside of the recommended range. The child’s need for sleep can also be affected by other factors, including sleep disorders or medications. Questions about these factors were included in this survey, however, it was difficult to determine how they influenced children on an individual basis. Methodologically, the study’s cross-sectional design also limited the evaluation of persistent sleep problems over time which may require more intensive preventative efforts in addition to provider education. Lastly, the sample size for this study was relatively small and not very racially diverse which may limit its generalizability to the general population. Research has shown the impact that race and ethnicity can have on factors like parental characterization of sleep habits as a problem or concern (Milan, et al., 2007; Sadeh, et al., 2011) and parental knowledge about sleep (Owens, et al., 2011), which could impact the results of the
present study. Due to the limited racial diversity of the study, the effect of socio-cultural factors on sleep education could not be fully explored, and it will be important for future studies to have a more diverse sample so these factors can be explored. Future research should also examine sleep education in special populations, including children with autism or developmental delays, children with medical problems and other at-risk populations.
Table 1: Frequencies and percentages for parent demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample (N=305)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11 (3.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>291 (93.0%)</td>
</tr>
<tr>
<td>Non-binary</td>
<td>3 (1.0%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>3 (1.0%)</td>
</tr>
<tr>
<td>25-34</td>
<td>104 (33.2%)</td>
</tr>
<tr>
<td>35-44</td>
<td>166 (53.0%)</td>
</tr>
<tr>
<td>45-54</td>
<td>29 (9.3%)</td>
</tr>
<tr>
<td>55-64</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>282 (90.1%)</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td>Black/African-American</td>
<td>5 (1.6%)</td>
</tr>
<tr>
<td>Asian/Asian-American</td>
<td>4 (1.3%)</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>6 (1.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (2.2%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>17 (5.4%)</td>
</tr>
<tr>
<td>Not Hispanic/Latino</td>
<td>284 (90.7%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>32 (10.2%)</td>
</tr>
<tr>
<td>Married</td>
<td>231 (73.8%)</td>
</tr>
<tr>
<td>Separated</td>
<td>12 (3.8%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>24 (7.7%)</td>
</tr>
<tr>
<td>Remarried</td>
<td>5 (1.6%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>High School Graduate/GED</td>
<td>8 (2.6%)</td>
</tr>
<tr>
<td>Some College</td>
<td>53 (16.9%)</td>
</tr>
<tr>
<td>Associate’s Degree</td>
<td>23 (7.3%)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>65 (20.8%)</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>58 (18.5%)</td>
</tr>
<tr>
<td>Doctoral Degree</td>
<td>97 (31.0%)</td>
</tr>
</tbody>
</table>

(continued)
(Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample (N=305)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
</tr>
<tr>
<td>Less than $30,000</td>
<td>27 (8.6%)</td>
</tr>
<tr>
<td>$30,000-$59,999</td>
<td>46 (14.7%)</td>
</tr>
<tr>
<td>$60,000-$99,999</td>
<td>87 (27.8%)</td>
</tr>
<tr>
<td>$100,000 or greater</td>
<td>143 (45.7%)</td>
</tr>
</tbody>
</table>

*Note.* Some parents elected to not provide specific demographic information such that frequencies may not reflect the total sample.
Table 2: Descriptive statistics for child demographic and medical variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample (N=305)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Age</td>
<td>6.33</td>
</tr>
<tr>
<td>Frequency (%)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>157</td>
</tr>
<tr>
<td>Female</td>
<td>148</td>
</tr>
<tr>
<td>Insurance Coverage</td>
<td></td>
</tr>
<tr>
<td>Private Insurance</td>
<td>245</td>
</tr>
<tr>
<td>Public Insurance (Medicaid, etc.)</td>
<td>52</td>
</tr>
<tr>
<td>Uninsured</td>
<td>3</td>
</tr>
<tr>
<td>Don’t Know/Prefer not to say</td>
<td>4</td>
</tr>
<tr>
<td>Previous Diagnoses</td>
<td></td>
</tr>
<tr>
<td>Allergies</td>
<td>50</td>
</tr>
<tr>
<td>Attention-Deficit/Hyperactivity</td>
<td>39</td>
</tr>
<tr>
<td>Anxiety/Panic Attacks</td>
<td>27</td>
</tr>
<tr>
<td>Asthma</td>
<td>31</td>
</tr>
<tr>
<td>Previous Sleep Diagnoses</td>
<td></td>
</tr>
<tr>
<td>No Previous Sleep Disorder Diagnosis</td>
<td>259</td>
</tr>
<tr>
<td>Sleepwalking/Sleep Terrors</td>
<td>13</td>
</tr>
<tr>
<td>Snoring</td>
<td>7</td>
</tr>
<tr>
<td>Sleep Apnea</td>
<td>6</td>
</tr>
<tr>
<td>Sleep Talking</td>
<td>4</td>
</tr>
<tr>
<td>Reason for Referral</td>
<td></td>
</tr>
<tr>
<td>Check up/Well Visit</td>
<td>202</td>
</tr>
<tr>
<td>Acute Illness</td>
<td>84</td>
</tr>
<tr>
<td>Acute Behavioral Problems</td>
<td>5</td>
</tr>
<tr>
<td>Chronic Illness</td>
<td>7</td>
</tr>
<tr>
<td>Chronic Behavioral Problems</td>
<td>5</td>
</tr>
<tr>
<td>Sleep Problems</td>
<td>5</td>
</tr>
<tr>
<td>Number of Medical Visits in Last Year</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>178</td>
</tr>
<tr>
<td>3-4</td>
<td>84</td>
</tr>
<tr>
<td>5-6</td>
<td>18</td>
</tr>
<tr>
<td>7 or more</td>
<td>5</td>
</tr>
</tbody>
</table>

Note. Some parents elected to not provide specific demographic or medical information such that frequencies may not reflect the total sample.
Table 3: Frequency of child's sleep problems endorsed as “sometimes” or greater

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample (N=305) Frequency (%)</th>
<th>Ages 3-5yrs (n=142) Frequency (%)</th>
<th>Ages 6-12yrs (n=155) Frequency (%)</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resist going to bed</td>
<td>118 (37.7%)</td>
<td>63 (45.7%)</td>
<td>53 (36.1%)</td>
<td>2.72</td>
</tr>
<tr>
<td>Difficulty falling asleep</td>
<td>114 (36.4%)</td>
<td>55 (40.1%)</td>
<td>57 (39.6%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Difficulty staying asleep or waking during the night</td>
<td>89 (28.4%)</td>
<td>51 (37.2%)</td>
<td>36 (24.5%)</td>
<td>5.41*</td>
</tr>
<tr>
<td>Difficulty waking in the morning</td>
<td>101 (32.3%)</td>
<td>43 (31.4%)</td>
<td>56 (38.1%)</td>
<td>1.41</td>
</tr>
<tr>
<td>Sleepiness during the day</td>
<td>71 (22.7%)</td>
<td>38 (27.5%)</td>
<td>29 (19.7%)</td>
<td>2.41</td>
</tr>
<tr>
<td>Need to take naps during the day</td>
<td>81 (25.9%)</td>
<td>68 (50.4%)</td>
<td>11 (7.5%)</td>
<td>64.19**</td>
</tr>
<tr>
<td>Falling asleep in school</td>
<td>7 (2.2%)</td>
<td>4 (2.9%)</td>
<td>3 (2.0%)</td>
<td>0.23</td>
</tr>
<tr>
<td>Sleepwalking or sleep talking</td>
<td>36 (11.5%)</td>
<td>18 (13.0%)</td>
<td>18 (12.2%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Wetting the bed</td>
<td>44 (14.1%)</td>
<td>27 (19.7%)</td>
<td>16 (10.9%)</td>
<td>1.30*</td>
</tr>
<tr>
<td>Nightmares or night terrors</td>
<td>32 (10.2%)</td>
<td>16 (11.6%)</td>
<td>15 (10.2%)</td>
<td>0.14</td>
</tr>
<tr>
<td>Snoring</td>
<td>42 (13.4%)</td>
<td>20 (14.7%)</td>
<td>22 (15.0%)</td>
<td>0.004</td>
</tr>
<tr>
<td>Stopping breathing during sleep</td>
<td>3 (1.0%)</td>
<td>0 (0%)</td>
<td>3 (2.0%)</td>
<td>2.83</td>
</tr>
</tbody>
</table>

Note. Some parents elected to not provide specific information such that frequencies may not reflect the total sample.
*P<.05, p<.001
Table 4: Frequency and severity of child’s sleep problems in relation to parental compliance with AAP guidelines (N=285)

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Mean (SD)</th>
<th>F</th>
<th>Severity</th>
<th>Mean (SD)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Compliance</td>
<td>0.74</td>
<td>4.90 (2.57)</td>
<td>1.76</td>
<td>7.90 (5.35)</td>
<td>10.55**</td>
<td></td>
</tr>
<tr>
<td>Total Compliance</td>
<td>0.74</td>
<td>5.37 (2.40)</td>
<td></td>
<td>9.56 (5.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial Compliance</td>
<td>0.74</td>
<td>5.37 (2.40)</td>
<td></td>
<td>9.56 (5.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>3.80</td>
<td>3.80</td>
<td></td>
<td>10.55**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant</td>
<td>4.06*</td>
<td>5.24 (2.39)</td>
<td>3.72</td>
<td>9.08 (5.24)</td>
<td>6.90</td>
<td></td>
</tr>
<tr>
<td>Non-compliant</td>
<td>4.06*</td>
<td>6.19 (2.48)</td>
<td></td>
<td>12.63 (6.90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consistent Bedtime</td>
<td>4.06*</td>
<td></td>
<td></td>
<td>3.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant</td>
<td>6.35 (2.56)</td>
<td>5.24 (2.38)</td>
<td>3.72</td>
<td>9.22 (5.33)</td>
<td>6.87</td>
<td></td>
</tr>
<tr>
<td>Non-compliant</td>
<td>6.35 (2.56)</td>
<td>6.19 (2.48)</td>
<td></td>
<td>12.63 (6.90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screens in Bedroom</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant</td>
<td>0.00</td>
<td>5.30 (2.25)</td>
<td></td>
<td>8.76 (5.14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-compliant</td>
<td>0.00</td>
<td>5.30 (2.25)</td>
<td></td>
<td>8.76 (5.14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading at Bedtime</td>
<td>1.69</td>
<td>5.40 (2.43)</td>
<td></td>
<td>2.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant</td>
<td>1.69</td>
<td>5.40 (2.43)</td>
<td></td>
<td>9.61 (5.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-compliant</td>
<td>1.69</td>
<td>4.95 (2.28)</td>
<td></td>
<td>8.46 (4.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brushing Teeth at</td>
<td>0.47</td>
<td>0.47</td>
<td></td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedtime</td>
<td>0.47</td>
<td>5.27 (2.48)</td>
<td></td>
<td>9.26 (5.62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant</td>
<td>0.47</td>
<td>5.58 (1.61)</td>
<td></td>
<td>10.26 (4.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-compliant</td>
<td>0.47</td>
<td>5.58 (1.61)</td>
<td></td>
<td>10.26 (4.03)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. No parents in the sample were non-compliant for overall compliance. Some parents elected to not complete survey items such that data is based on parents that provided complete survey data only.

*p<0.05, **p<.01
Table 5: Logistic Regression Results for factors influencing receipt of sleep education

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>SE</th>
<th>Odds Ratio (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income &lt;30,000</td>
<td></td>
<td></td>
<td></td>
<td>0.02*</td>
</tr>
<tr>
<td>Income 30,000-99,999</td>
<td>-0.67</td>
<td>0.61</td>
<td>0.51 (0.15, 1.70)</td>
<td>0.27</td>
</tr>
<tr>
<td>Income &gt;99,999</td>
<td>-1.46</td>
<td>0.65</td>
<td>0.23 (0.07, 0.83)</td>
<td>0.03*</td>
</tr>
<tr>
<td>Married</td>
<td>1.21</td>
<td>0.44</td>
<td>3.35 (1.43, 7.87)</td>
<td>0.01*</td>
</tr>
<tr>
<td>Child Age</td>
<td>0.07</td>
<td>0.06</td>
<td>1.07 (0.95, 1.20)</td>
<td>0.28</td>
</tr>
<tr>
<td>Child’s Gender - Female</td>
<td>0.04</td>
<td>0.29</td>
<td>1.04 (0.59, 1.85)</td>
<td>0.89</td>
</tr>
<tr>
<td>Reason for Referral - Acute Illness</td>
<td>2.70</td>
<td>0.52</td>
<td>14.82 (5.35, 41.08)</td>
<td>.000**</td>
</tr>
<tr>
<td>Number of Visits (1-2)</td>
<td>0.18</td>
<td>0.34</td>
<td>1.20 (0.61, 2.35)</td>
<td>0.52</td>
</tr>
<tr>
<td>Number of Visits (3-4)</td>
<td>0.18</td>
<td>0.34</td>
<td>1.20 (0.61, 2.35)</td>
<td>0.60</td>
</tr>
<tr>
<td>Number of Visits (5-6)</td>
<td>-1.68</td>
<td>0.66</td>
<td>0.19 (0.05, 0.68)</td>
<td>0.01*</td>
</tr>
<tr>
<td>Number of Visits (7+)</td>
<td>0.60</td>
<td>1.24</td>
<td>1.82 (0.16, 20.46)</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Note. $R^2 = 0.20$ (Cox & Snell), 0.27 (Nagelkerke). Model $\chi^2(9) = 59.58, p < .001$

*a reference group for income is <$30,000; b reference group is not married; c reference group is male; d reference group is other reason for referral; e reference group is 1-2 visits.

*p<0.05, **p<0.001
References


Hobson, J. A., & Pace-Schott, E. (2002). The cognitive neuroscience of sleep:


doi:10.1016/j.smrv.2015.01.004


