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In this issue of the Sleep Health*Centers* Newsletter…

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Sleep Health*Centers*® Newsletter

Lawrence J. Epstein, MD, Editor ..... Fall 2007

Dear Colleague,

In this issue of the Sleep Health*Centers* Newsletter, our feature article on ADHD and Sleep Disorders is written by Craig Canapari, MD, who is the Director of the Pediatric Sleep Laboratory at Newton-Wellesley Hospital and an Attending in the Pediatric Pulmonary and Critical Care Unit at Massachusetts General Hospital.

Dr. Canapari discusses the intriguing relationship between ADHD, sleep and sleep disorders. Only recently has study started in this area but already knowledge of sleep is helping to clarify the abnormalities in ADHD and there appears to be an overlap between ADHD and primary sleep disorders.

In the CEO Corner, Paul Valentine discusses the opening of our first pediatric sleep center at Massachusetts Eye and Ear Infirmary, the introduction of the "Sleep and You" patient education initiative, and our next Sleep Apnea Awareness meeting.

As a reminder, Tufts Health Plan has implemented a new policy requiring pre-certification for sleep studies and initiation of CPAP/Bilevel PAP therapy. This should be done by the referring physician prior to requesting these services. If you would like Sleep Health*Centers* to help with the process, a history and physical describing the findings prompting the evaluation must accompany the requisition form for patients being referred for sleep studies or PAP setups. Delay in starting this process delays our ability to provide your patients with timely sleep evaluations and treatment.

If you have any questions about sleep disorders, our services, our affiliations or Tufts' new pre-certification policy, please feel free to contact us

Sincerely,
Lawrence J. Epstein, MD
Medical Director
Sleep Health*Centers* LLC

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Attention Deficit Hyperactivity Disorder, Sleep Disorders and School Problems

Craig Canapari, MD

Director, Pediatric Sleep Laboratory at Newton-Wellesley Hospital
Instructor, Harvard Medical School; Attending Physician in Sleep Disorders and Pediatric Pulmonology at Massachusetts General Hospital; Board Certified in Pediatrics

Introduction

Attention deficit-hyperactivity disorder (ADHD) is the most common psychiatric disorder of childhood, with an estimated prevalence of 5-10%. It is comprised of symptoms of inattention, hyperactivity, and/or impulsivity. Primary sleep disorders are also among the more common medical issues in the pediatric population. Recently, there has been significant interest in the relationship between ADHD and sleep disorders, for several reasons. 1) Parents of children with ADHD frequently note issues with the initiation and maintenance of sleep. 2) The behavioral manifestations of some sleep disorders may independently compromise the functioning of children in academic and social settings. 3) There appears to be a bidirectional relationship between ADHD and sleep disorders. Thus, treatment of sleep disorders may improve concurrent ADHD and ADHD treatment may affect sleep disorders such as insomnia and bedtime resistance.

ADHD and Disrupted Sleep

Sleep-related problems are commonly reported by the parents of children with ADHD. However, empiric evidence supporting this is mixed at best. This suggests that parents of children with behavioral issues may be more likely to label fairly normal behaviors as problematic. Most of the objective studies have failed to find consistent differences in sleep quality or quantity when comparing ADHD subjects and controls. One of the few consistent findings has been on actigraphic studies, which use a lightweight activity monitor worn on the wrist or ankle. ADHD children have more activity during sleep and more night-to-night variability in sleep. Increased sleep fragmentation could produce daytime sleepiness, interfering with alertness. This is supported by studies using the Multiple Sleep Latency Test (MSLT), a measurement of sleepiness consisting of five structured nap periods offered during a day. Children with ADHD consistently have increased objective sleepiness as compared to children without ADHD. Although this seems paradoxical at first glance, it is consistent with a deficit in arousal. This theory is supported by the fact that most children with ADHD respond to stimulant therapy. A recent study by Gruber et al examined the relationship between sleep efficiency, the percentage of time-in-bed spent sleeping, and stimulant efficacy. The results suggested that children with poor sleep efficiency were more likely to benefit from stimulant therapy. Thus, daytime hyperactivity and inattention may be the result of low arousal during the day. This low arousal may be the result of subtle sleep fragmentation at night; alternatively, the low arousal during the day and frequent arousals from sleep at night may both be due to the underlying etiology of ADHD.

The prevalence of sleep disorders is also increased in children with ADHD. The prevalence of snoring, the most significant marker for sleep disordered breathing, may be as high as 25% in children with ADHD. Moreover, children with ADHD have higher apnea-hypopnea indices than control children, a finding consistent with obstructive sleep apnea hypopnea syndrome (OSAHS). Restless leg syndrome (RLS), another common sleep disorder, is more common in children with ADHD; in clinical samples, 44% of subjects with ADHD have RLS or RLS symptoms, greatly increased over the prevalence in the normal population.

Sleep Disorders and School Difficulties

Primary sleep disorders have also been independently associated with cognitive and behavioral sequelae in children.

Sleep disordered breathing (SDB): As in adults, SDB runs the gamut from primary snoring (prevalence of 10%) to OSAHS (1-3% of children). SDB consists of variable degrees of airway obstruction which may produce sleep fragmentation and oxyhemoglobin desaturation. SDB has been clearly associated with deficits in attention, memory, and executive function, as well as poor academic performance. Interestingly, the severity of sleep apnea is not predictive of the neurocognitive deficits. In fact, primary snoring may be as significant as OSAHS in terms of school performance. One study by Gozal and Pope showed that a history of snoring in early childhood was predictive of worse academic performance in eighth grade. (continued on page 2)

(continued from page 1) **Restless Leg Syndrome:** RLS is a common condition affecting approximately 10-15% of the adult population. It is characterized by an irresistible urge to move the extremities, usually accompanied by uncomfortable sensations that are relieved by motion. It may cause sleep deprivation by delaying sleep onset. It may also be accompanied by periodic limb movements of sleep (PLMS) which can cause sleep fragmentation. RLS is usually diagnosed in adults but increasing evidence suggests that it begins in middle to late childhood. The largest study looking at children, the Pediatric REST study, showed an estimated prevalence of 2% of definite RLS, and found that the presence of RLS correlated with sleep disruption and negative mood. Although there are no studies of the relationship between pediatric RLS and school performance, adult data suggests that cognitive sequelae may be significant.

Recommendations for Practitioners

Obviously, not every child with school difficulties and/or ADHD requires diagnostic polysomnography or evaluation by a sleep specialist. However, the prevalence of ADHD, obstructive sleep apnea, and chronic sleep deprivation indicate that we can safely make several recommendations.

- All children and their families, especially those with difficulty in school, should be counseled regarding appropriate sleep hygiene. Some basic sleep hygiene tips include:
  - A cool, dark, quiet sleep room.
  - Avoidance of caffeine in the afternoon or evening.
  - Avoidance of television or computer in the child's bedroom.
  - Provision of an age appropriate sleep opportunity for children.
    - » School age: 10-11 hours of sleep
    - » Teenage years: 9-10 hours of sleep
- Children presenting with symptoms of inattention, hyperactivity, and/or daytime sleepiness in the presence of apnea symptoms such as snoring, gasping, choking, or witnessed apneas, may benefit from diagnostic polysomnography to look for obstructive sleep apnea.
- The presence of sleep symptoms such as insomnia, restless leg symptoms, nocturnal awakenings, or any other sleep symptoms should be investigated by a detailed sleep history. If there are further concerns, referral to a pediatric sleep specialist may be indicated. A simple sleep history in children can be remembered by the acronym BEARS (from Judy Owens, MD):
  - **B**edtime: Does the child resist bedtime or have delayed sleep onset?
  - **E**xcessive daytime sleepiness: Is the child difficult to awaken in the morning? Does the child seem drowsy or "overtired" during the day?
  - **A**wakenings: Does the child frequently awaken for prolonged periods late at night or early in the morning?
  - **R**egularity, pattern, and duration of sleep: Usual bedtime and wake up time for school nights and weekends; usual nightly duration of sleep.
  - **S**noring: Does the child snore frequently, have apneic pauses, or sweat a lot at night?

Case Study

JS is a five year old male who was referred to the Pediatric Sleep Clinic for evaluation of nocturnal snoring. He has a history of chronic cough and multiple upper respiratory infections. Further history reveals that his teachers in preschool and kindergarten have expressed concerns that he has trouble sitting still during "circle time" and has difficulty waiting his turn in class. His mother also notes that he tends to fall asleep in the car, even on short trips, and in front of the television in the evenings. On physical exam, he is mildly overweight, and has a crowded oropharynx with 3+ tonsils.

JS underwent diagnostic polysomnography and was found to have moderate obstructive sleep apnea. He was treated with adenotonsillectomy and repeat polysomnography showed resolution of his apnea. He no longer falls asleep in the car or in front of the television. Although there was some improvement in his impulsivity in class, he still had difficulty paying attention for long periods of time. He was referred to a pediatric neurologist who diagnosed ADHD and treated him successfully with methylphenidate.

Chronic sleep deprivation – a special case: Multiple studies have pointed to a disturbing trend across age groups of insufficient sleep. Children and teenagers who are chronically sleep deprived may present with daytime sleepiness, fatigue, difficulties with concentration, and negative mood.

Possible Mechanisms

Both primary sleep disorders and ADHD have a significant degree of overlap in terms of daytime symptoms such as sleepiness, inattentiveness, hyperactivity, and mood lability. There is considerable overlap in areas of the brain which regulate attention/arousal, and those which regulate sleep, notably the brainstem reticular activating system, and certain regions of the thalamus. Moreover, sleep disruption seems to cause decreased glucose metabolism in the prefrontal cortex, which explains the consequent impairment in executive function and behavioral disinhibition. Although these data are of largely theoretical significance, they provide an intriguing biological link between sleep disorders and ADHD.

Conclusions

There is a complex interrelationship between ADHD and sleep disorders. ADHD seems to cause subtle but significant changes in arousal during wakefulness and may predispose to sleep disorders. Moreover, primary sleep disorders may present with neurocognitive symptoms consistent with ADHD. Finally, disordered sleep clearly worsens ADHD symptoms in affected children. These relationships clearly require further elucidation, but they indicate the importance of recognizing disrupted sleep in children with behavioral or cognitive issues. In addition, it is important to recognize that treatment for ADHD, such as stimulant therapy, may worsen sleep quality.

Selected Readings:

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4. Moore M, Allison D, Rosen CL. A review of pediatric nonrespiratory sleep disorders. *Chest*. 2006 Oct;130(4):1252-62. Review.
5. Owens JA. The ADHD and sleep conundrum: a review. *J Dev Behav Pediatr*. 2005 Aug;26(4):312-22. Review.
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7. Banks S, Dinges DF. Behavioral and physiological consequences of sleep restriction. *J Clin Sleep Med*. 2007 Aug 15;3(5):519-28. Review.
8. Gruber R, Grizenko N, Schwartz G, Bellingham J, Guzman R, Joober R. Performance on the continuous performance test in children with ADHD is associated with sleep efficiency. *Sleep*. 2007 Aug 1;30(8):1003-9.

CEO Corner

Paul S. Valentine
President and
Chief Executive Officer

We are thrilled to announce the opening of our first pediatric sleep center at Massachusetts Eye and Ear Infirmary. The new two-bedroom diagnostic sleep lab is one of only a few in the area that specialize exclusively in children up to 18 years of age. We are currently in discussions to provide clinic services in association with the center, which will make the Sleep Health*Center* at Massachusetts Eye and Ear Infirmary one of a limited number of comprehensive pediatric sleep centers in the country.

In mid-November, our Worcester center will be relocating to 102 Shore Drive. Detailed information about this new four-bed sleep center will be sent out to our referring providers in that area.

The Sleep Health*Center* affiliated with Southcoast Hospitals Group is now offering CPAP clinic services. The new clinic is located at 88 Faunce Corner Road, North Dartmouth, in the office of Dr. Arun Rajan, Medical Director of the Sleep Health*Center* affiliated with Southcoast Hospitals Group. For more details or if you would like to refer one of your patients, please call our scheduling office at 877-SLEEPHC (877-753-3742).

For our last facility update, we are now targeting January 2008 for the opening of a new center affiliated with Marlborough Hospital in Marlborough, MA. Details will be in our winter newsletter.

We would also like to take this opportunity to introduce you to our new educational outreach program, "Sleep and You". As has been discussed in our past newsletters, impaired sleep habits can have serious long-term health effects. Most sleep disorders are chronic diseases and many of the co-morbidities associated with sleep disorders are chronic. Recent research supports the integration of sleep medicine and disease management programs related to obesity, diabetes, cardiovascular disease, stroke, and others.

"Sleep and You" targets both referring physicians and patients to accomplish the following goals:

- Improve awareness about the interplay between sleep and chronic diseases, as well as how it relates to specific patient populations.
- Help patients better understand how sleep can affect their individual lives.
- Educate patients and referring physicians to understand that sleep needs to be evaluated due to certain chronic diseases or biological changes in the natural course of patients' lives.
- Incorporate new clinic and lab-based activities to support these programs while providing physicians with additional patient care service offerings.

The "Sleep and You" program includes a new website (www.sleepandyou.com), a series of brochures, physician presentations, and other educational outreach activities. Initial topics include Sleep and Diabetes, Sleep and Cardiovascular Disease, Sleep and Weight Management, Sleep and Surgery/Anesthesia, Sleep and Stroke, and Sleep and Menopause. We welcome your questions and interest in learning more about "Sleep and You".

Finally, we have been receiving excellent feedback from attendees of our Sleep Apnea Awareness meetings. We encourage you to invite your patients who have been diagnosed with sleep apnea to attend. The next meeting is scheduled for November 7, 2007, 6:30-8:00 PM at the Melrose Wakefield Hospital (Perkins Hall), 585 Lebanon Street, Melrose, MA. Special Guest Speaker is Douglas B. Kirsch, MD, Regional Medical Director, Sleep Health*Centers*.

We are happy to continue to provide sleep medicine services to your patients. Please do not hesitate to contact us if you have any questions.

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Research Activities

Sleep Health*Centers* is proud to work with some of the premier sleep researchers in the country. The following research studies are currently underway in conjunction with our partners. To take part in a study or for more information, please contact us toll free at 877-SLEEPHC (877-753-3742).

Portable Monitoring for Sleep Apnea Sleep Health*Centers* is evaluating several portable monitors which will eventually be used in the patient's home to diagnose obstructive sleep apnea. During the course of the study, the monitor will be assessed for efficacy in the sleep laboratory and in the patient's home. The patient will evaluate the monitor's comfort and ease of use. *Please contact Melissa Maywalt at 617-783-1441 or 617-783-1496 x298 (voicemail).*

Middle of the Night Insomnia
This study is looking at how an investigational medication works when taken in the middle of the night by adults who wake up and can't get back to sleep. *Please contact Melissa Maywalt at 617-783-1441 or 617-783-1496 x298 (voicemail).*

Operation Healthy Sleep
This innovative research project is funded by the National Institute of Justice and is designed to examine and evaluate the impact of sleep disorders and treatment of sleep disorders on the safety, health and performance of Massachusetts State Police and the City of Philadelphia Police. *Please contact Conor O'Brien at 617-998-8836.*

Tufts Health Plan Sleep Study Pre-Certification Policy

As of July 1, 2007, Tufts Health Plan (Tufts) has instituted a new policy requiring pre-certification for sleep studies and CPAP/Bilevel PAP set-ups. For patients being referred for sleep studies, a history and physical must accompany the requisition form. This is required in order to pre-certify these services. Sleep Health*Centers* will then obtain the necessary pre-certification from Tufts.

We appreciate your cooperation in providing the history and physical at the time the requisition is submitted so that we can make this a smooth process and prevent unnecessary delays in scheduling your patients.

If you have any questions regarding this new policy, please contact our reimbursement department at 978-774-7243.