Disorders of Sleep and Pediatric Mental Health

Molly Faulkner, PhD, CNP, LISW,
Division of Behavioral Health

Nurse Practitioner UNM
Dept of Psychiatry
Division of Community Behavioral Health

Objectives

- Identify 3 types of sleep disorders in children and adolescents
- Understand the multifactorial approach to diagnosis of sleep apnea
- Realize the association between sleep, cognitive development/abilities and behavior in children

Epidemiology

- 15 million children in US do not get enough sleep
- 70 % HS students less than 8 hr sleep weeknight
- Adolescents- insufficient sleep = greater use > social media technology,
- Younger children-
  - depressive symptomatology
  - family disagreements
  - safety issues around home
  - School, neighborhood

- Short sleep duration (<7 hours of sleep per night) + poor sleep quality

- Are associated with cardiovascular morbidity & metabolic disorders
  - Glucose intolerance
  - Can lead to obesity, diabetes, heart disease, and hypertension

Disorders of Sleep and Pediatric Mental Health

- Circadian Rhythm Disorders
  - Advanced and Delayed
- Obstructive Sleep Apnea (OSA)
- Restless Legs Syndrome
- Parasomnias
- Early recognition and referral

Sleep Complaints and Psychiatric Symptoms in Children Evaluated at a Pediatric Mental Health Clinic

Anna Ivanenko, M.D., et al

Study Objectives:

- Examine *association* of sleep problems with psychiatric symptoms in children

- Sample population- children evaluated at a university based outpatient child psychiatry clinic

Methods:

- N= 174 parents of children in psychiatric services

Childhood Sleep Questionnaire 47-item

Behavioral Assessment System for Children.

Psychiatric diagnosis was obtained through retrospective chart review.

Controls: data from sleep habits surcey of
174 children without psychiatric hx

Sleep Characteristics Compared Among 4 Diagnostic Categories

1)attention-deficit/hyperactivity disorder (ADHD) alone (n=29)

2)ADHD with comorbid mood and anxiety disorders (ADHD+; n=50),

3) mood and anxiety disorders alone (n=67)

4) other psychiatric disorders (n= 28).

Results:

Children w/psychiatric disorders had *significantly higher* prevalence of sleep complaints compared with nonpsychiatric controls.

Children w/ADHD

- F*requent nocturnal awakenings, bad dreams, and bedtime struggles*
- *Leg jerks during sleep more freq in patients than other psychiatric do*

Children w/Mood and Anxiety Disorders

- More frequent nighttime awakenings

Sleep duration and sleep latency strongly correlated with aggression, hyperactivity, and depression.

- Restless sleep scores highly correlated with all psychiatric symptoms.

Conclusions:

•Sleep problems are highly prevalent among children with psychiatric disorders.

- Children with ADHD and comorbid anxiety or mood disorders are more likely to report sleep disturbances.

- Restless sleep, long sleep latency, short sleep duration, and frequent nocturnal awakenings correlate with the *severity* of psychiatric symptoms.

Circadian Rhythm in Sleep

- Innate, daily fluctuation of sleep-wake states, generally linked to the 24 hour daily dark-light cycle.
- A circadian pattern in sleep-wake alternation is usually apparent by 6 weeks of age and becomes stable by 3 months of age
- Most common cause of problems is due to extrinsic issues with scheduling
- Rare causes of circadian disorders include hypothalamic dysfunction due to malformation or tumor, and *blindness*

Circadian Rhythm Sleep Disorders

- Regular but inappropriate schedules

- Sleep phase shifts
  - Delayed sleep phase
  - Advanced sleep phase

Advanced Sleep Phase

- Mainly in infants and toddlers
- Relatively uncommon
- Early bedtime and early awakening
- "Morning Larks"
- Treatment
  - Gradual delay of bedtime
  - Delay naps and mealtimes
  - Bright light at night, dim light in the morning

Delayed Sleep Phase

- Delay in sleep onset, late awakening
- "Night owls"
- Onset in adolescence
- Male predominance
- Sleep itself **quantitatively and qualitatively** normal
- Genetic predisposition

Delayed Sleep Phase

- Defined as circadian rhythm disorder that effects timing of sleep, peak period of alertness
- Differentiate from school avoidance, other sleep disorders such as sleep apnea
- Diagnosis by sleep logs and actigraphy

Delayed Sleep Phase

- Treatment
  - Bright light therapy 20-30 minutes upon awakening (8,000-10,000lux)
  - Strict sleep-wake schedule!
  - Melatonin 3 to 4 hours prior to desired sleep time

Causes of Sleepiness

- Insufficient sleep
- Schedule disorders
- Obstructive sleep apnea
- Epilepsy
- Narcolepsy
- Kleine-Levin Syndrome
- Idiopathic Central Nervous System Hypersomnia

Insufficient Sleep

- **Most common cause of sleepiness at all ages!**
- Homework, television, and after-school employment and activities compete with the need for sleep
- Parental influence on bedtime hour decreases from 50% at 10 years to <20% at 13 years*
- Despite decreasing total sleep time, adolescents often need more sleep than do younger children

*Carskadon MA: Patterns of sleep and sleepiness in adolescents. Pediatrician 17:5, 1992

Clinical Manifestations of Sleepiness

- Excessive daytime somnolence
- Falling asleep in inappropriate places and circumstances
- Lack of relief of symptoms after additional sleep
- Daytime fatigue
- Inability to concentrate
- Impairment of motor skills and cognition
- Symptoms specific to etiology

Sleep Requirements

- School age: 10+ hrs
- High School/College: 9+
- Average: 7 hrs/ sleep deprivation
  (cell phones, MP3"s, computers)
- Impact: MVA, risk taking behavior, school dysfunction, poor dietary choices, disciplinary problems

Behavioral Treatment of Inadequate Sleep

- Eliminate identifiable causes (sleep apnea, environmental disturbances)
- Teach good sleep hygiene
- Focus on target behaviors that interfere with sleep (erratic schedules, late night television, oppositional behavior)
- Eliminate caffeine and stimulants in diet
- Relaxation techniques, positive imagery at bedtime

Disorders of Arousal

- Underlying process one of incomplete arousal
- Seen more commonly in children than in adults

  - ✓ Sleepwalking
  - ✓ Confusional Arousals
  - ✓ Sleep Terrors

Sleepwalking

- Very common—40% in some studies
  - 12% can persist for over 10 years
- Individual gets up and walks about for short time (1-10 minutes)
- Hard to discern if child is asleep
- Inappropriate behavior is common (urinating in the corner or next to the toilet)
- Child can be easily led back to bed
- Older children usually awaken as event terminates
- Agitation can occur
- Amnesia common
- Often + family history

Klackenberg G: Somnambulism in childhood—prevalence, course and behavioral correlations. Acta Paediatr Scand 71:495, 1982

Confusional Arousals

- Typically seen in toddlers and preschool age children
- Often confused with sleep terrors
- Arousal typically starts with movements and moaning→progesses to crying and calling out, intense thrashing in the bed or crib
- Can appear bizarre and frightening to parents
- Child appears confused, agitated, or upset

Common Features of Arousal Disorders

- Misperception of and unresponsive to environment
- Automatic behavior
- Retrograde amnesia
- 60% have positive family history
- Pathophysiology
  - Occurs at transition from slow wave sleep to next sleep cycle

Constitutional and Precipitating Factors for Arousals

- Constitutional
  - Genetic
  - Developmental
  - Sleep deprivation
  - Chaotic sleep schedule
  - Psychologic
- Precipitating
  - OSA
  - GERD
  - Seizures
  - Fever

Arousal Disorders-Treatment

- Proper diagnosis and reassurance
  - Most cases benign and self-limited
- Basic safety precautions
- Regular sleep/wake schedule
- Avoid sleep deprivation
- No forcible intervention
- Psychological stressors should be identified
- Rarely: medications (benzodiazepines and tricyclic antidepressants) and relaxation and mental imagery

Sleep Terrors

- Uncommon in very young children
- Seen more often in older children and adolescents
- Events begin precipitously, with crying and screaming
- Eyes usually wide open, with tachycardia and diaphoresis
- Facial expression of "fear"
- Child may leave the bed and injure him or herself
- Last only a few minutes
- Most have amnesia; can have brief memory of event

Common Features of Sleep Terrors

- Episodes can last up to 40 minutes (typically 5-15 minutes)
- Begin gradually
- The child does not recognize his/her parents
- Vigorous attempts to awaken the child may not be successful—best not to intercede
- Incidence 5-15% of children
- Family history typical

Sleep Talking (Somniloquy)

- Common disorder
- Can arise from REM or NREM sleep
- May have a genetic component
- Rarely of clinical significance

Parasomnias

- Unpleasant or undesirable motor, autonomic, or experiental phenomena that occur predominantly or exclusively during the sleep state
- May be induced or exacerbated by sleep
- Two types:
  - Primary
  - Secondary

Primary Parasomnias

- Disorders of arousal
- REM sleep behavior disorder
- Recurrent Hypnagogic Hallucinations/Sleep Paralysis
- Bruxism
- Rhythmic movement disorder
- Periodic Limb movement disorder
- Sleep starts
- Sleeptalking

Secondary Parasomnias

- Neurologic
  - Seizures
  - Consider with stereotypical movements, recurrent dreams, unusual autonomic symptoms (stridor, choking, coughing)
  - Headaches
  - Muscle cramps

American Academy of Pediatrics Practice Guidelines April, 2002

- All children should be screened for snoring
- Sleep hx for snoring should be a part of routine health care hx

Obstructive Sleep Apnea

- Prevalence OSAS 2% Children
- 3-12% " Primary Snoring"
- Peak incidence Preschoolers (4-6yo) (tonsils/adenoids largest in relation to airway size overall)
- 25-30% snoring children have OSAS

Definition OSA

- "Disorder of breathingduring sleep characterized by prolonged partial upper airway obstruction and/or intermittent complete obstruction that disrupts normal ventilation during sleep and normal sleep patterns". Pediatrics Vol 109 No.4 April 2002

Risk Factors

- African-American 4 X risk
- Obesity – prepubertal 5 x teens
- Hx Prematurity - 3 X risk
- ?? Prior T&A
- Positive Family Hx
- Cerebral Palsy / Syndromes

Definition
Primary Snoring

- Snoring without obstructive sleep apnea , frequent arousals from sleep, or gas exchange abnormalities

- Healthy, thriving kids. Rested in AM. Active. Growing. Reasonable behavior.

Morbidity OSA

- Behavioral/ Mood Disturbances/ ? ADHD
- Inattention/ Poor Memory/Hyperactivity
- School Problems : Low IQ
- Family Disruption
- Reduced quality of life
- Pulmonary Hypertension/Elevated Diastolic /Increase left Ventricular wall thickness / Increased healthy expenses

Neurobehavioral Consequences

- Deficits in learning, memory , vocabulary
- IQ loss of 5 points or more
- Apneic events inversely related to memory and learning performance
- Treatment of OSA likely improves behavior, attention, quality of life, neurocognitive functioning.

Metabolic Consequences

- Incidence: type 2 Diabetes 30% OSA patient vs. 18 % no OSA

- Increase glucose intolerance and insulin resistance

Causes

- Craniofacial Abnormalities ie:Choanal Atresia/Cleft Palate
- Hypertrophic Tonsils and/or Adenoids (Most common)
- Obesity
- GERD (Laryngeal/pharyngeal edema)
- Neuromuscular Disorders : MD
- Achondroplasia
- Mucopolysaccharidosis
- Nasal Polyps (CF)

Craniofacial Disorders

- Down syndrome
- Crouzon
- Aperts
- Treacher-Collins
- Pierre-Robin sequence
- Nager's Syndrome
- Goldenhar's Syndrome
- Choanal Atresia

OSA and ADHD

- These 2 problems share many of the same behavioral manifestations.
- In any child where a diagnosis of ADHD is being considered, please think about the possibility of underlying OSA

OSA and Enuresis

- Bedwetting present in 1/3 of kids with OSA
- Proposed factors include:

1. Decreased arousal response
2. Impaired Urodynamics—Increased abdominal pressure leading to increased bladder pressure
3. Affects secretion of ADH

OSA and OBESITY

- Narrowing Upper airway
- Increase pharyngeal floppiness
- Limitation diaphragm movement – restrictive effect
- Increased abdominal and chest wall mass – decrease lung volume

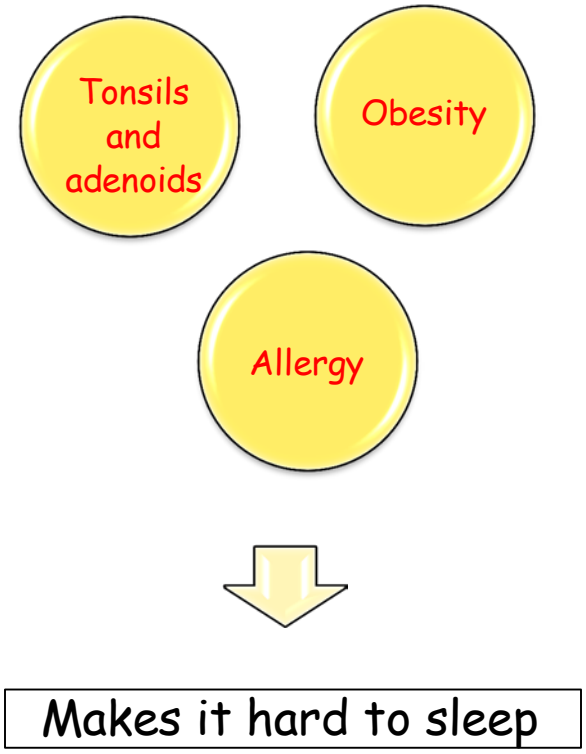
Diagnosis OSA

- Caregiver Obervations
- Sleep Study Required to confirm Dx (Exam findings limited correlation)
- Limited consensus what is “abnormal:
- Sleep centers use different scoring criteria
- Adult OSA criteria not applicable to children
- Must use age related criteria for OSA:

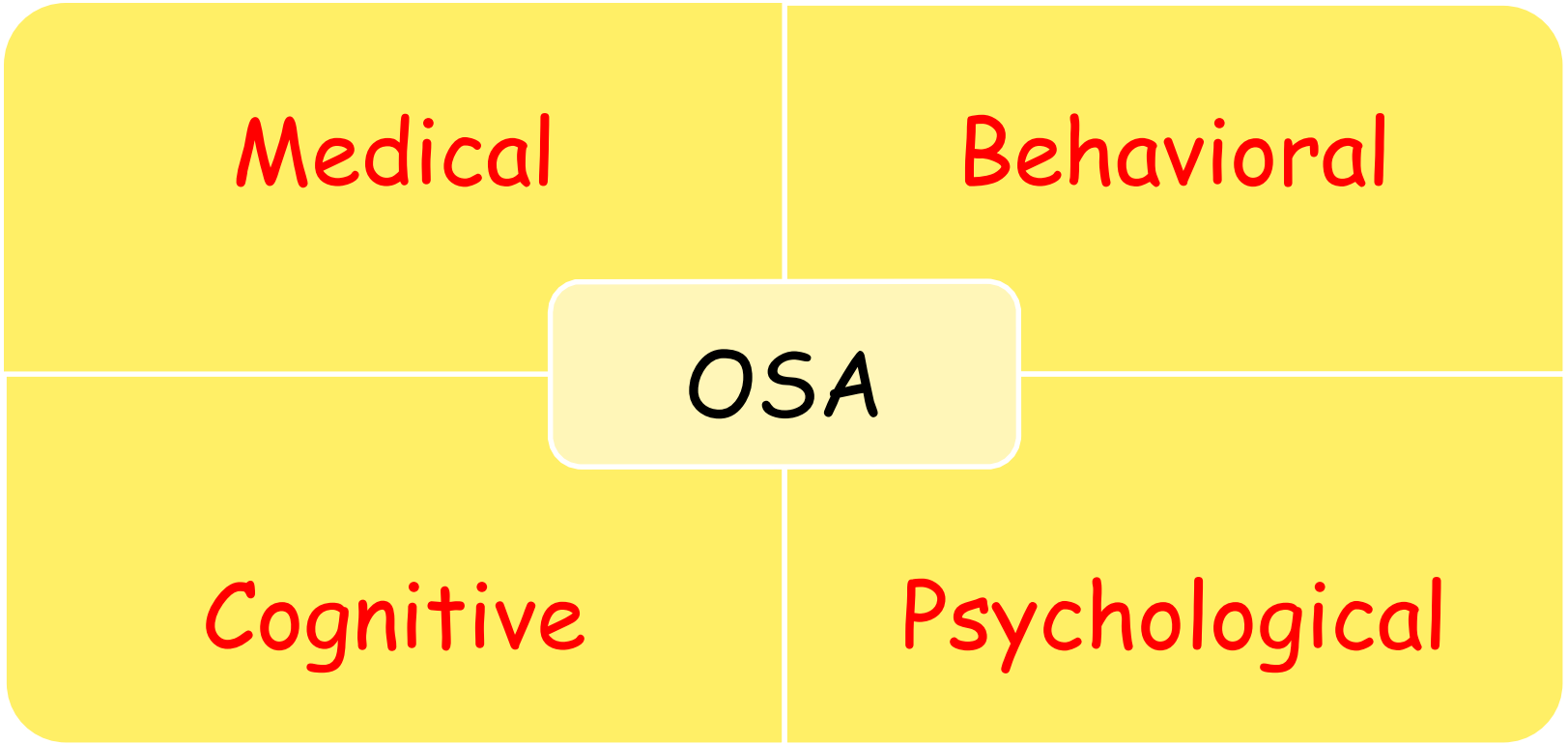
Caregiver Observations

- Snoring/ Arousals/ Agitated sleep
- Labored breathing
- Neck Hyperextension
- Excessive daytime sleepiness/ naps
- Hyperactivity or aggressive behavior
- Enuresis

OSA often Multifactorial



Sequelae of OSA

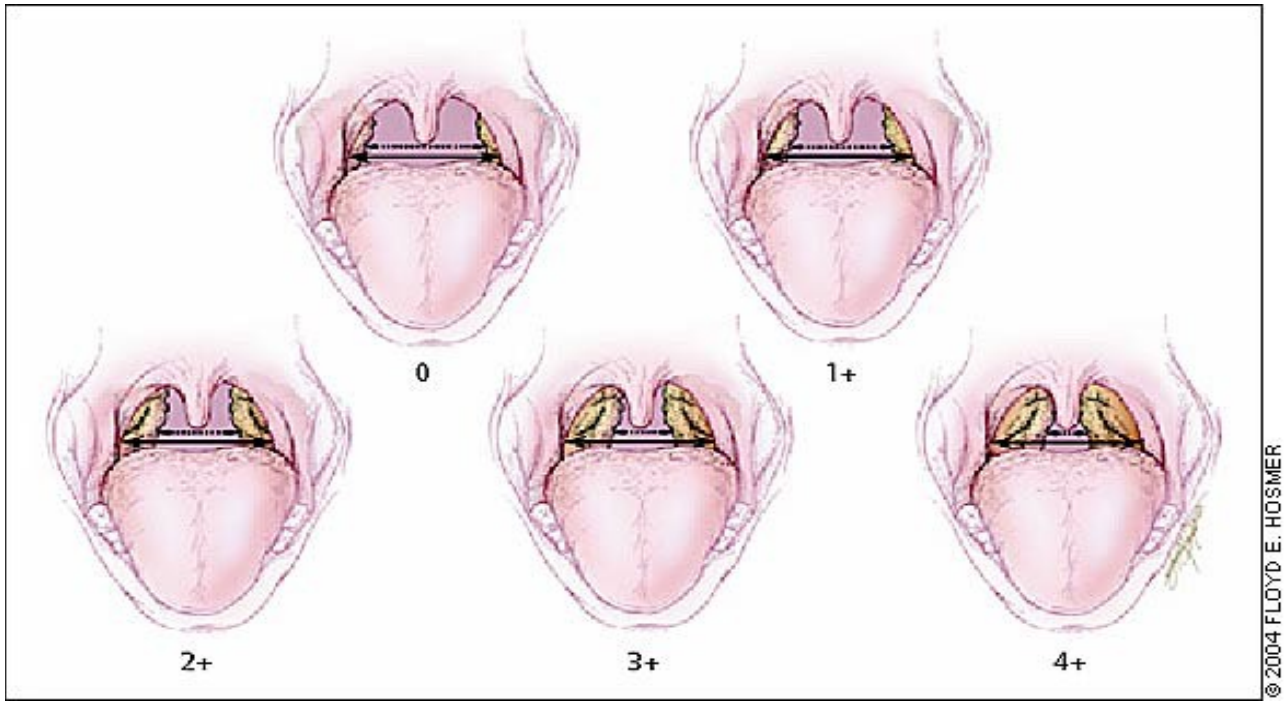


Polysomnography Gold Standard for Diagnosis

- Can be performed in children of any age
- Should be scored and interpreted using age-appropriate criteria[1]
- Can distinguish OSAS from primary snoring
- Determines severity of OSAS and related gas exchange and sleep disturbances
- May help determine operative risk

1 American Thoracic Society. Standards and indications for cardiopulmonary sleep studies in children. *Am J Resp Crit Care Med*. 1996; 153:866-878.

How to Grade Tonsils



Study: Sleep Disordered Breathing in Children

- Introduction
  - ADHD comorbidity
- Prospective Study
  - Adenotonsillectomy (AT) cohort and surgical control
  - N=78, Children 5-13 yrs of age
  - Mild-Moderate severity
  - 57% male
  - 95% f/u rate
  - Measurements
- Results
  - AT group
    - Higher scores for hyperactivity, inattention, sleepiness, ADHD at baseline and improved to control rate 1 yr after surgery
    - However, only sleepiness correlated with PSG

Chervi et al. Sleep disordered breathing, behavior, and cognition in children before and after adenotonsillectomy. *Pediatrics*. 117(4) 2006 e769-e778.

~CHAT~
Childhood Adeno Tonsillectomy Study

- NIH- sponsored multi-site study ages 5-9yr
- Early T&A vs Watchful Waiting
- Measure efficacy of tx:

✓ Neuro-cognitive outcomes

✓ Respiratory outcomes (AHI)

✓ Behavior, growth, QOL, BP

Tonsillectomy and OSA

- Tonsillectomy effective 60-70% of children with significant tonsillar hypertrophy
- Tonsillectomy produces resolution of OSA in only 10-25% of obese children
- Tonsillectomy is not curative in all cases of OSA

History by Caregiver

- Snoring and labored breathing
- Arousals
- Neck Hyperextension
- Excessive daytime sleepiness, naps
- Hyperactivity or aggressive behavior

Signs and Symptoms

- Snoring "like a train"
- Irritability
- Hyperactivity, inattention, impulsivity (ADHD triad)
- Temper Tantrums
- Poor school performance due to poor concentration
- Enuresis
- Nightmares
- Failure to Thrive
- Elevations in insulin and CRP levels

Ten Most Common Indications for Tonsillectomy: 2010

- Infections
- Swallowing problems
- Look ugly
- Halitosis
- Snoring
- Obstructive Sleep Apnea

Key Points

- Large tonsils and adenoids do not indicate the presence of OSA
- Loudness of snoring does not correlate with degree of OSA
- A formal sleep study remains the gold standard in diagnosing OSA and other sleep related disorders.

Sleep Study (Polysomnogram)

- Apnea: Cessation of breathing 10+sec
- Hypopnea: (hypoventilation) O2 desaturation 3-4% 10sec or more
- AHI: apnea/hypopnea index:
- #apnea + # hypopnea = AHI
- RDI: #apnea + #hypopnea / total sleep time

Treatment

- Weight loss/ ? Bariatric Surgery: Major Risks
- CPAP – use will increase in future: obese teens
- T&A (? 10-20% residual OSAS)
- Mandibular Advancement

Therapy

- T&A
  - Remains first line
- Weight loss
  - Very helpful
- Allergy
  - Treat underlying allergy

Summarize

- Recognize that OSA is becoming more common
- Screen kids for snoring
- Refer to PCP or Psychiatrist as they can order a sleep study
- Please consider OSA in patients with **bedwetting**
- Please consider OSA in patients with ADHD

American Academy of Oto/Hd & Neck surgery

- Clinical Practice Guideline: Polysomnography for Sleep- DisorderedBreathing Prior to Tonsillectomy in Children

- July, 2011

Questions to Ask in Assessment

- Any problems with sleep?
- How many hours of sleep does the child get?
- Time it takes for child to fall asleep?
- Does the child sleep all night without interruption?
- If they do wake up how often and for what length of time? Check for waking with panic or breathlessness.
- Does the child have a bedtime routine and if so, what is it?
- Do they have beverages with caffeine in the late afternoon, early evening, Mountain Dew, "energy drinks", hot chocolate etc?
- Snoring, restless sleep, perspiring?
- Nightmares?
- Tonsils? Sinus problems and/or congestion?
- Obesity?
- Family History of sleep issues?

Periodic Limb Movement Disorder (PLMS)

- Prevalence and significance unknown in childhood
- Characterized by periodic (every 20-40 seconds) and sustained (0.5-4.0 seconds) contractions of one or both anterior tibialis muscles
- Often associated with unperceived arousals
- Usually benign
- Has been associated with metabolic disorders and childhood leukemia
- Recent reports show linkage with ADHD
- Associated with iron deficiency

Picchietti Sleep 1999

Restless Legs Syndrome (RLS)

- Sensory-motor disorder involving the legs
- Prevalence approximately 4% of the population
- Age of onset can occur at any age
- Results in sleep disturbance with difficulty initiating and/or maintaining sleep
- Can be exacerbated by pregnancy, caffeine, or iron deficiency

RLS in Children

- Study by Chervin et al*:
  - Community based survey of 866 children ages 2 to 13.9 years
  - Relationship found between significant hyperactivity and periodic limb movement scores, and between hyperactivity and restless legs
- Study of 11 children referred to a pediatric neurology clinical with a diagnosis of growing pains--10/11 met clinical criteria for RLS**

* Chervin et al. Associations between symptoms of inattention, hyperactivity, restless legs, and periodic leg movements. *Sleep* 2002;25:213-8.

**Rajaram et al *Sleep* 2004

RLS-Diagnosis

- Criteria
  - **Major**
    - Desire to move the limbs, usually associated with paresthesia or dysesthesia
    - Motor restlessness
    - Worsening of symptoms at rest, with at least partial relief with activity
    - Worsening of symptoms at night time
  - **Ancillary:**
    - Involuntary movements
    - Neurologic examination
    - Clinical course
    - Sleep disturbance
    - Family history

RLS-Treatment

- Correct underlying medical cause, if present
  - Diabetes, uremia, anemia
- Dopaminergic agents
  - Pramipexole (Mirapex)
  - Cardidopa-levodopa (Sinemet)
- Benzodiazepines
- Opiates

Pharmacologic treatment of Insomnia

- Centuries ago opium-based laudanum given to children to keep babies quiet
- Antihistamines
- Benzodiazepines
- Zolpidem (Ambien)—not approved for pediatric usage
  - Interacts with GABA-benzodiazepine receptor complexes

Good Sleep Hygiene

- Measures that promote sleep
  - Avoidance of caffeinated beverages, alcohol, and tobacco in the evening
  - No intense mental activities or exercise close to bedtime
  - Avoid daytime naps and excessive time spent in bed
  - Adherence to a regular sleep-wake schedule

Melatonin

- Hormone synthesized from serotonin in the pineal gland
- Provides human brain with signal for darkness
- Suppressed by bright light
- Regulates sleep-wake cycle
- Has been shown to have sleep phase shifting properties
  - May be helpful in circadian rhythm disturbances
  - Has been used to regulate circadian rhythms in blind adults

Melatonin

- Production unregulated—considered a food product
  - Dose: 1-5 mg PO QHS
  - **Safety and efficacy not established in any age group**
- Ramelteon—newly approved melatonin agonist, not studied in children
  - Dose: 8mg PO QHS

When to Refer to Pediatrician?

- Child chronically sleepy despite good night's sleep
- Extreme temper tantrums, irritability
- Parents report loud snoring
- Not achieving academic potential

Differential Diagnosis

- Infants: Apnea Prematurity: caffeine/theo
- Apnea Infancy: sporadic pauses 20sec or more (central, obstructive, mixed)
- Periodic breathing :3-6sec pauses, gradual desat (Immature pattern)
- Syndromic children
- Neuro-developmental delay
- Central / cortical component
- Seizures
- Parasomnias : night terrors/ sleep walking

Final Thoughts

- Childhood sleep disorders are common and can be associated with significant impairment of quality of life
- Teachers, therapists, counselors, physicians, nurse practitioners and physician assistants play an important role in screening for and treating common pediatric sleep disorders
- CHILD SLEEPS WELL=PARENT SLEEPS WELL=HAPPY PARENT AND CHILD

Conclusion

- Pathophysiology Pediatric OSAS likely combination of anatomical and neuromuscular factors
- ?? Threshold for treatment
- Does T&A "cure" OSA and do neurobehavioral problems resolve
- ?? Natural Hx of benign snoring/mild OSA
- It's OK to Snore!!!

References

- Stores, G. (2002). Sleep Disorders in Children and Adolescents. Cambridge University Press.
- Chervin et al. Sleep disordered breathing, behavior, and cognition in children before and after adenotonsillectomy. *Pediatrics.* 117(4) 2006 e769-e778.

Chervin et al. Associations between symptoms of inattention, hyperactivity, restless legs, and periodic leg movements. *Sleep* 2002;25:213-8.

Rajaram et al *Sleep* 2004

American Thoracic Society. Standards and indications for cardiopulmonary sleep studies in children. *Am J Resp Crit Care Med*. 1996; 153:866-878.

Klackenberg G: Somnambulism in childhood—prevalence, course and behavioral correlations. Acta Paediatr Scand 71:495, 1982

*Carskadon MA: Patterns of sleep and sleepiness in adolescents. Pediatrician 17:5, 1992

Sleep Complaints and Psychiatric Symptoms in Children Evaluated at a Pediatric Mental Health Clinic
Anna Ivanenko, M.D., et al

References

- Perry GS, Patil SP, Presley-Cantrell LR. Raising Awareness of Sleep as a Healthy Behavior. Prev Chronic Dis 2013;10:130081. DOI: http://dx.doi.org.libproxy.unm.edu/10.5888/pcd10.130081.
- Hoban 2013 Sleep Disorders in Children. Continuum (Minneap Minn) 2013;19(1):185-198.