Disorders of Sleep and Pediatric Mental Health

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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
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 survey 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
• Frequent 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 meal times
  - 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 (8,000-10,000 lux)
  – 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

Confusional Arousals

• Typically seen in toddlers and preschool age children
• Often confused with sleep terrors
• Arousal typically starts with movements and moaning ➔ progresses 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 experiential 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 breathing during 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 Observations
- 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

- Tonsils and adenoids
- Obesity
- Allergy

Makes it hard to sleep
Sequela of OSA

Medical

Behavioral

Cognitive

Psychological
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

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

~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% 10 sec 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**

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**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!!!
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