Disorders of Sleep and Pediatric Mental Health

Molly Faulkner, PhDc, CNP, LISW,
Nurse Practitioner
UNMHSC
Children's Psychiatric Center
Outpatient Services

Epidemiology

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

Facts

- For instance, short sleep duration (<7 hours of sleep per night) and poor sleep quality are associated with cardiovascular morbidity and metabolic disorders such as glucose intolerance, which may 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)
- RLS
- 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:**
- To examine the association of sleep problems with psychiatric symptoms in children evaluated at a university based outpatient child psychiatry clinic

Methods:

Parents of 174 children attending psychiatric services completed a 47-item Childhood Sleep Questionnaire and the Behavioral Assessment System for Children. Psychiatric diagnosis was obtained through retrospective chart review.

Sleep characteristics were compared among 4 diagnostic subcategories:

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), and
4) other psychiatric disorders (n= 28).

Data from sleep habits survey of 174 community children without reported psychiatric history served as controls.

Results:

- Children with psychiatric disorders had a *significantly higher* prevalence of sleep complaints compared with nonpsychiatric controls.
- Children with ADHD had *frequent nocturnal awakenings, bad dreams, and bedtime struggles. In addition, the presence of leg jerks during sleep was particularly frequent in patients with ADHD compared with any other psychiatric disorder.*
- More frequent nighttime awakenings were present in children with mood and anxiety disorders.
- 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
- Treatment
  - Strict sleep-wake schedule!
  - Melatonin 3 to 4 hours prior to desired sleep time

Delayed Sleep Phase

- Differentiate from school avoidance, other sleep disorders
- Diagnosis by sleep logs and actigraphy
- 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

Sleepiness

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 bizzare 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
- Incidence approximately 1% of children
- 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

- 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
- Associated with amnesia
- 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
- If any concern, check oropharynx and look for large tongue, small oropharynx

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

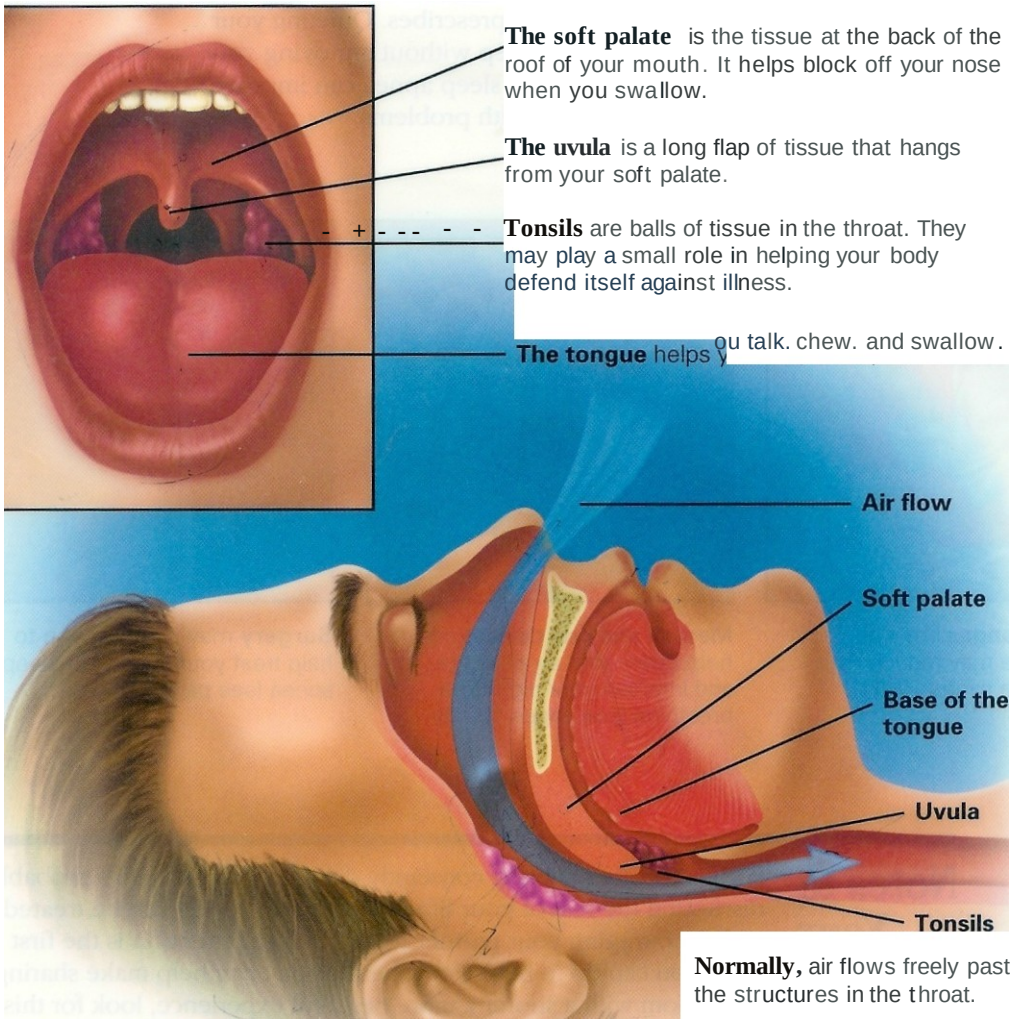
- Increase glucose intolerance and insulin resistance

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



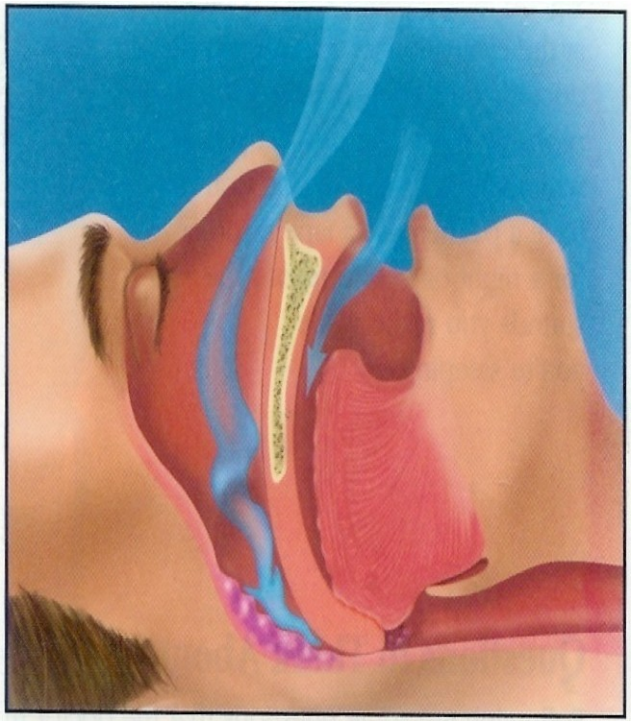
The soft palate is the tissue at the back of the roof of your mouth. It helps block off your nose when you swallow.

The uvula is a long flap of tissue that hangs from your soft palate.

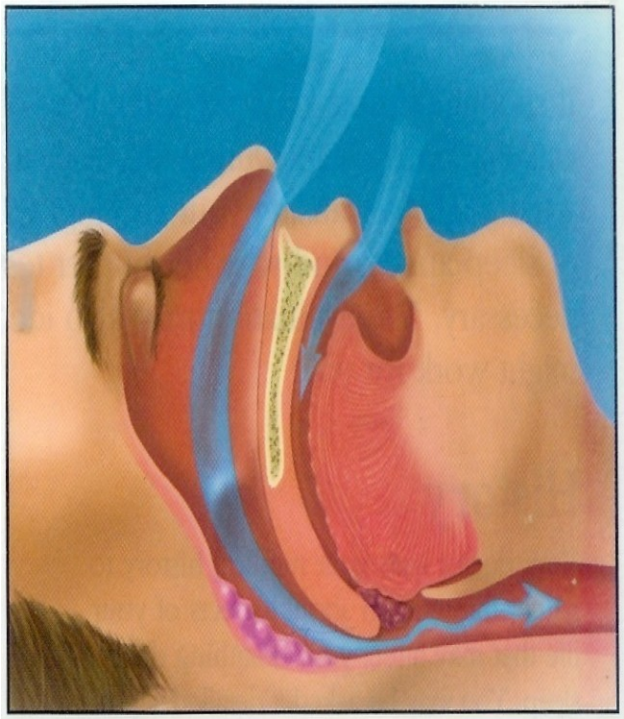
Tonsils are balls of tissue in the throat. They may play a small role in helping your body defend itself against illness.

The tongue helps you talk, chew, and swallow.

Normally, air flows freely past the structures in the throat.



During sleep apnea, air flow is completely blocked.



During snoring, air flow is partially blocked.

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

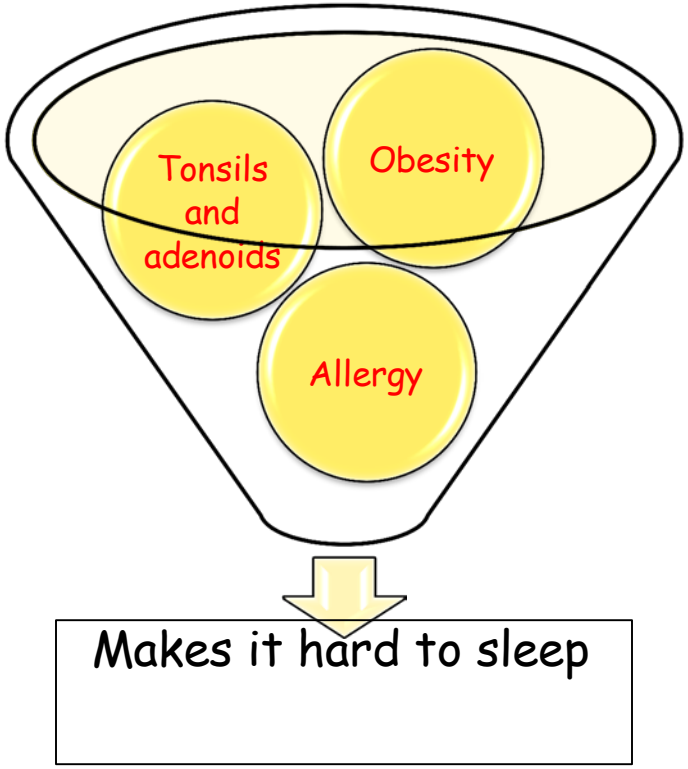
Diagnosis OSA

- 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:

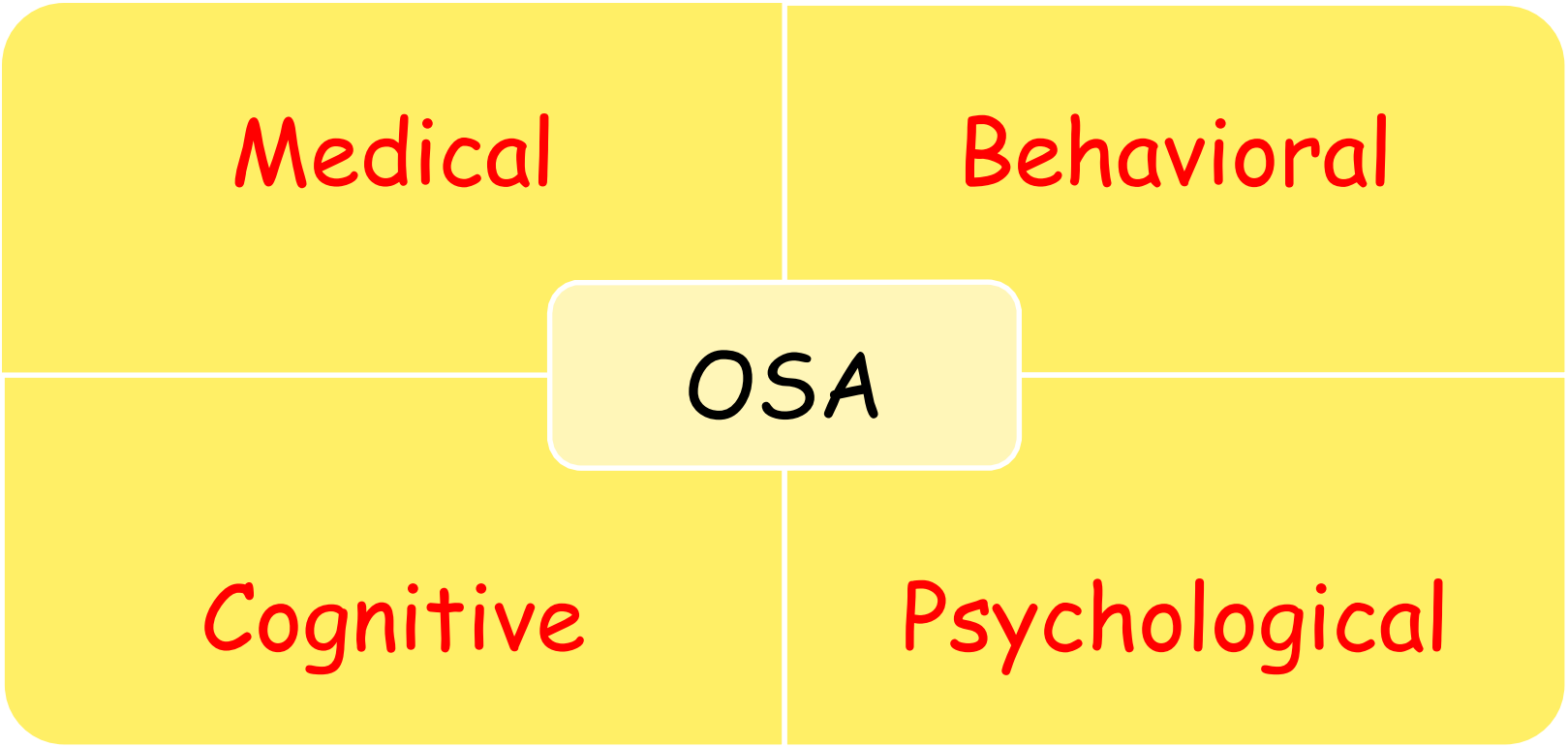
Caregiver Observations

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

OSA often Multifactorial



Sequelae of OSA

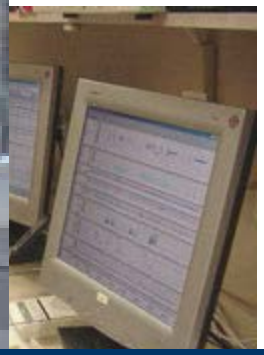


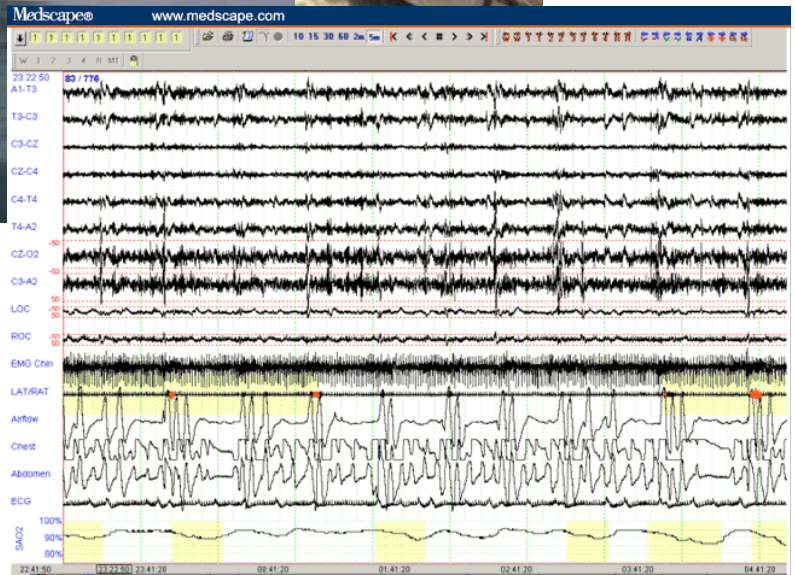
Polysomnography
Gold Standard for Diagnosis

- 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.

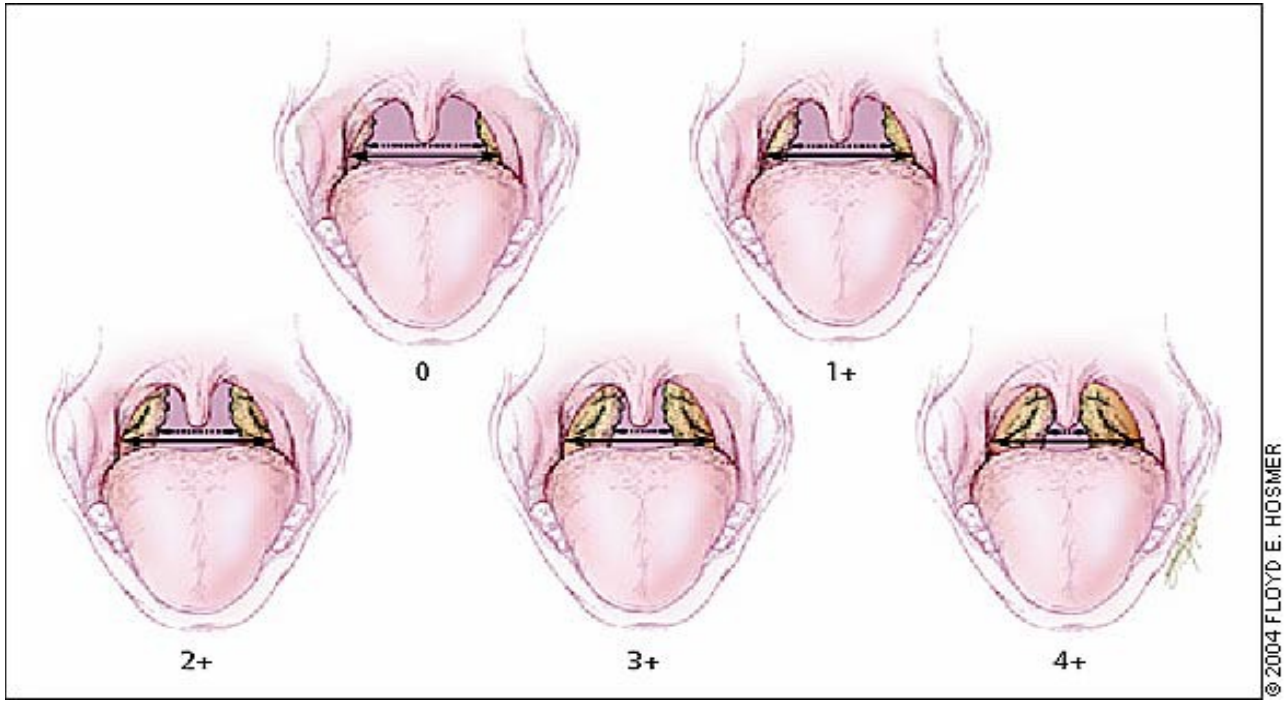
Sleep Laboratory





Deep sleep helps kids grow

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

Chervin 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.

Therapy

T&A

- Remains first line

Weight loss

- Very helpful

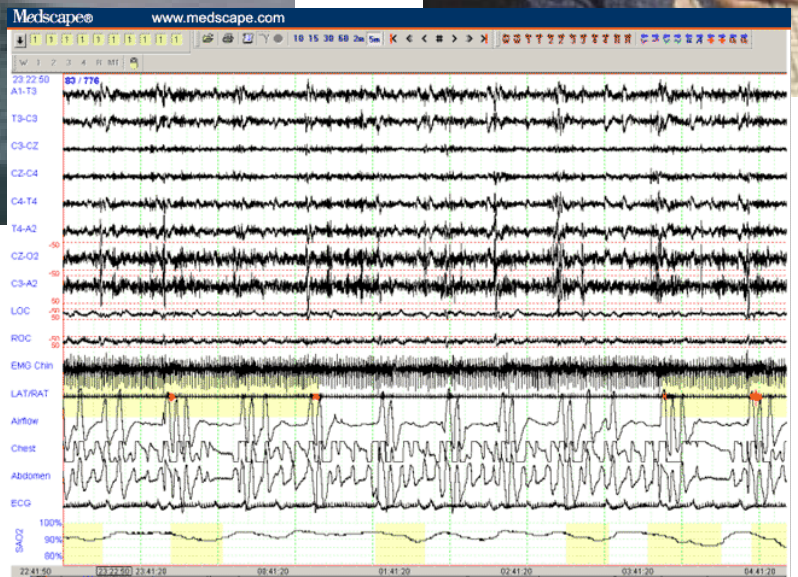
Allergy

- 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

Sleep Laboratory



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

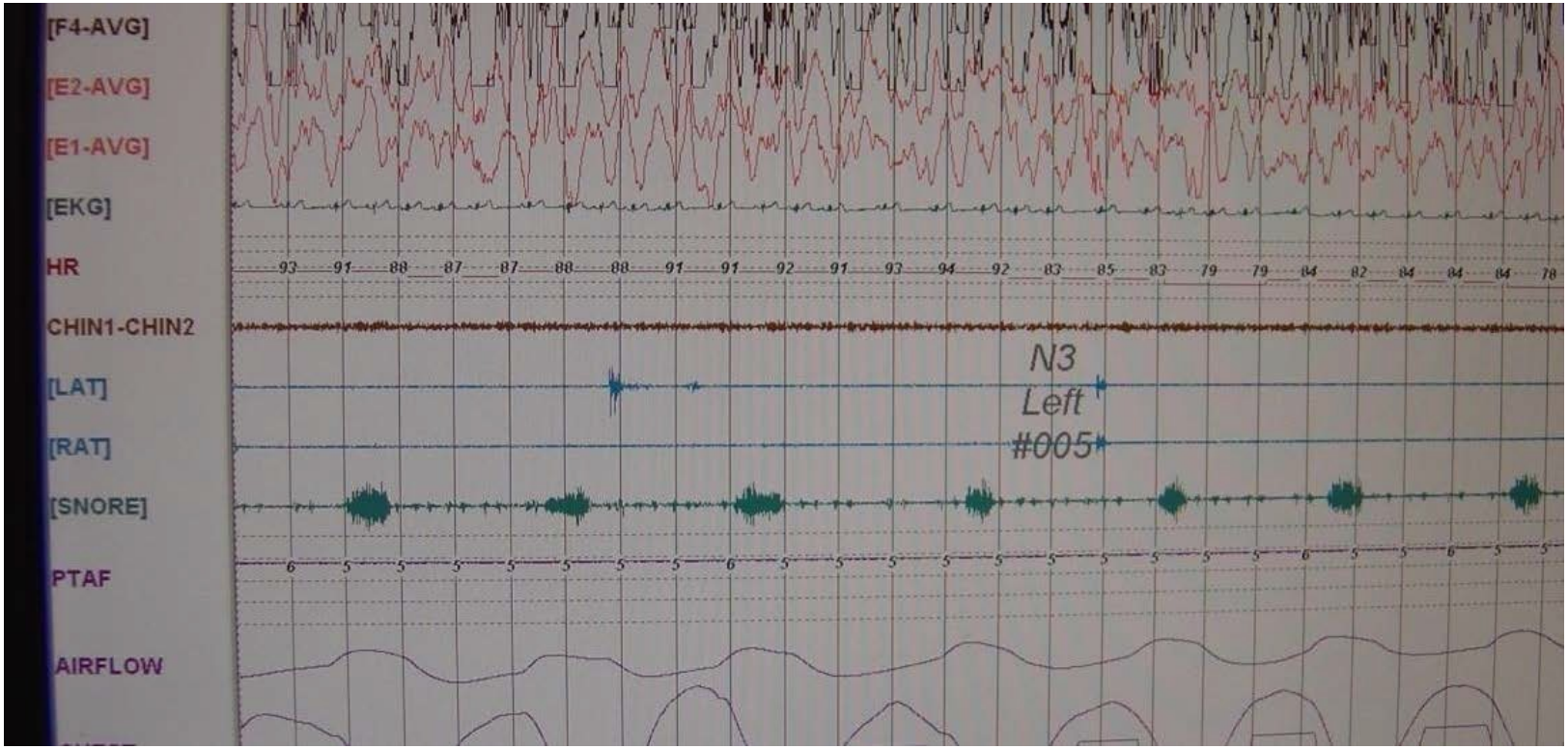
American Academy of Oto/Hd & Neck surgery

- Clinical Practice Guideline: Polysomnography for Sleep-Disordered Breathing Prior to Tonsillectomy in Children
- July, 2011
- Link: http://www.entnet.org/Community/upload/PSG-guideline.pdf

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?

Deep sleep helps kids grow



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

References

- 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
- 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.