Sleep Disorders in Children & Adolescents
A Brief Introduction

HI - I’m JT
Listen to my Story
- I am age 43 and have sleep apnea
- I have snored since high school and have been a mouth breather most of my life
- I was always tired in school and could not concentrate
- I had trouble holding onto a job
- Now I understand the effects of apnea
  “What would my life be like if someone recognized all of this when I was younger”

Clinical Practice Guideline: Diagnosis & Management of Childhood OSAS
- All Children Should be Screened for Snoring
- Differentiate between Snoring & OSA
- T & A is First Line Treatment
- Sleep History Screening should be part of routine health care visit

American Academy of Pediatrics, 2002

Clinton Wagner, MD
Published in 1884
“Habitual Mouth Breathing
Its Causes, Effects, and Treatment”

“Shut your mouth . . . And stretch the nostrils wide.”
Shakespeare

Published in 1889
“On Some causes of Backwardness And Stupidity in Children: And the Relief of These Symptoms in Some Instances by Naso-Pharyngeal Sacrification”

Author: Wm. Hill, BSc
Annual Meeting of the British Medical Assoc. BMJ Sept 28, 1889 p711-712

In 1892
- William Osler documented sleep and daytime performance of children with sleep-related upper airway obstruction
- “child is very stupid looking”
- “at night the child’s sleep is greatly disturbed, the respirations are loud and snorting, and there are prolonged pauses, followed by deep noisy inspirations”
- “influence on mental development is striking”
- “impossible to fix the attention for long at a time”
Prevalence of Sleep Disorders in Children and Adolescents

- 25% Have some type of sleep problem
- Can range from 25 to 50%
- Snoring: 3 – 12% range
  - 20% occasional – 10% habitual
- 1 – 3% have OSA
- 12 to 33% are “poor sleepers”

Importance Related to Pediatric Sleep Medicine

Research articles on Pediatric OSA has increased 1226% in the last 20 years

CLINICAL FINDINGS

- Primary: Adenotonsillar Hypertrophy
- Secondary:
  - Mouth Breather Allergies
  - Headaches
  - GERD
  - Nasal Airway Obstruction
  - Allergic Shiners
  - Tooth Wear

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent of patients%</th>
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</thead>
<tbody>
<tr>
<td>Sleep-related</td>
<td></td>
</tr>
<tr>
<td>Snoring</td>
<td>98</td>
</tr>
<tr>
<td>Breath holding</td>
<td>70</td>
</tr>
<tr>
<td>Fatigue during day</td>
<td>31</td>
</tr>
<tr>
<td>Night cough</td>
<td>25</td>
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<tr>
<td>Daytime</td>
<td></td>
</tr>
<tr>
<td>Mouth breathing</td>
<td>75</td>
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<td>Slow eating</td>
<td>60</td>
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<tr>
<td>Dry mouth</td>
<td>42</td>
</tr>
<tr>
<td>Trouble swallowing</td>
<td>37</td>
</tr>
</tbody>
</table>

*Based on parental responses to questionnaire for 100 patients scheduled for adenotonsillectomy for airway obstruction*. 

Evidence Based Association of Pediatric OSA

- Poor School Performance
- Enuresis
- Failure to Thrive
- Learning Disabilities
- Obesity
- ADD / Hyperactivity

Childhood Obesity

- Insufficient Sleep encourages weight gain
- Sleep Deprivation alters hormones involved associated with appetite control and metabolism
- Children who slept less than 9 hours a night were 3 times as likely to be obese as compared to longer sleepers
Obesity in Children

• Shorter Sleep Duration Increases the Risk for being overweight from age 9 to 12
• In 6th Graders – For every hour of sleep over 9 hours – 20% less likely to be overweight

Super Sized Kids

Newsweek
When I Grow Up, I’m Going to Weigh 300 Lbs. Help!
A Child By Definition

Psychotic Dwarf
With A
Favorable Prognosis

Etiology of SDB

- Adenotonsillar Hypertrophy
- Craniofacial / Dental arch abnormalities
- Obesity

Pediatric Sleep Apnea

Adenoidal Faces
**Adenoidal Faces**
- Long History of Mouth breathing
- Open Mouth Posture
- Nose that Appears Flattened
- Nostrils are Small & Poorly Developed
- Short Upper Lip
- Pouting Lower Lip
- Vacant Facial Expression

*Naso-Respiratory Function and Craniofacial Growth 1979 Center for Human Growth and Development  Univ of Michigan*

**Nasal Turbinates / Venous Stasis**

**The Allergic Shiner**

**Development Findings**
**Orthodontic Findings**
- Narrow Maxilla / Mandible
- Dental Crowding
- Tongue Thrust - Tongue Scalloping
- Malocclusion
- Deep Bite
- Cephalometric Findings
- Tooth Wear

**Sleep Studies in Children**
- 1 Apnea per Hour
- ↑ Sleep Latency
- ↓ N3 Sleep
- ↑ Movements (RLS / PLMDs)
  ADHD related to RLS

**Sleep Studies for Children and Adolescents**
- Diagnosis of Sleep Apnea: Recognition of 2 occluded respiratory events in small children define an obstructive apnea
- AHI of 1 or more is adequate to make a diagnosis:
  - AHI 1 – 4 Mild OSA
  - AHI 5 -10 Moderate OSA
  - AHI > 10 Severe OSA
Management of SRBD in Children

- Customize Treatment
- Always Consider Growth & Development
- Amount of Sleep in Hours

Palatal Expansion

Found to be very Helpful: Improves breathing, width of the nasal passages (nasal valve)

SLEEP 2004;27(4):761-6
SLEEP 1998;21(8):831-835

Outcome of RPE

Inspiratory Pressure Pulls Mandible & Tongue Back

Pectus Excavatum (hollowed chest)

Screening for Sleep Disorders BEARS

- B bedtime
- E excessive daytime sleepiness
- A awakenings
- R regularity and duration of sleep
- S snoring
**Pediatric Sleep Questionnaire**

**Symptoms in Children with SRBD**

**Night Time**
- Snoring
- Newborn breathing
- Mouth Breathing
- Nighttime Awakenings
- Behavioral issues (Irritable)

**Day-Time**
- Neurocognitive Impairment
- ADHD or ADD Symptoms
- Hyperactivity
- Tired / Poor School Performance

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**Learning Disabilities**

- Decreased GPA Related to:
  - RLS
  - Daytime Sleepiness
  - Snoring
  - Hard to wake in the morning
  - Fall asleep in class
    (first 3 periods the worst)

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**Learning and Memory**

**OSA Associated With Verbal Memory Deficits**

- OSA impacts verbal memory
- OSA does not impact visual memory
- Not impacted by reduced attention

*Am J Resp Crit Care Med*  
Pub ahead of print March 18, 2010

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**Sleep Apnea and Learning in Children**

- Children who snore twice as likely to have learning problems

*CHEST* July 2009
Clinical Manifestation of
Sleep-Disordered Breathing
Children & Adolescents

From Abstract at APSS 2007

<table>
<thead>
<tr>
<th>Associated Problem</th>
<th>Pre-School (n=41)</th>
<th>Pre-Adolescent (n=91)</th>
<th>Adolescent (n=51)</th>
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</thead>
<tbody>
<tr>
<td>Daytime Fatigue</td>
<td>30%</td>
<td>50%</td>
<td>71.1%</td>
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<tr>
<td>EDS</td>
<td>38.7%</td>
<td>59.2%</td>
<td>80.4%</td>
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<td>Sleep-onset Insomnia</td>
<td>40%</td>
<td>21.6%</td>
<td>48.1%</td>
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<tr>
<td>Nocturnal Sleep Disruption</td>
<td>85.3%</td>
<td>69.5%</td>
<td>70.0%</td>
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<tr>
<td>Sleep Terror</td>
<td>51.5%</td>
<td>28%</td>
<td>19.1%</td>
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<tr>
<td>Nightmare</td>
<td>12.5%</td>
<td>19.7%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Sleep Walking</td>
<td>9.4%</td>
<td>24%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Enuresis</td>
<td>40.7%</td>
<td>31.9%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Sleep Bruxism</td>
<td>50%</td>
<td>49.3%</td>
<td>23.9%</td>
</tr>
<tr>
<td>ADHD</td>
<td>13.8%</td>
<td>29.4%</td>
<td>40.9%</td>
</tr>
<tr>
<td>Morning Headache</td>
<td>9.7%</td>
<td>12%</td>
<td>19.1%</td>
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<tr>
<td>Delayed Sleep Phase Syndrome</td>
<td>0%</td>
<td>4.1%</td>
<td>10.6%</td>
</tr>
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</table>

Mean AHI: 16.4 ± 16.8 10.3 ± 12.3 16.2 ± 22.9
Mean RDI: 16.6 ± 15.7 11.1 ± 12.7 16.3 ± 21.8

Sleep Disorders and ADHD
Prevalence Increased 3 Fold between 1970 and 2000
1970 - 1.7%
2000 - 5-10%
Sleep 2004 27(2):188-189

1 in 10 of US kids have ADHD
• 2/3 are on medication
• Increase of 22% since 2003
• 5.4 million Kids have ADHD

From CDC publication Morbidity and Mortality - Weekly Report

Sleep and ADHD Meta-Analysis
• Children more impaired compared to controls
• Total sample: 722 children
  higher bedtime resistance
  more sleep onset difficulties
  SDB
  hard to wake up
daytime sleepiness
J Am Acad of Child & Adolescent Psychiatry 2009

Sleep-Disordered Breathing in Children Linked to Elevated BP
• BP elevated by 10 to 15 mm Hg during sleep and daytime as well
• Children with OSA greater than controls

Pediatrics on-line - June 27, 2011
Alarming Increase in Hypertension in US Children

• Study from 1997 to 2006
• Hospitalization for ↑
• Related to secondary causes – Obesity
• Progresses into adult hypertension – end result is end organ damage

Hypertension online June 18, 2012

The Future

• Treat Snoring - Prevent OSA?
• Urine Test for OSA in Kids: based on different protein ratios (color-based test)
• ID more kids at risk - prevent other health issues
• Need to recognize Craniofacial abnormalities that contribute to OSA

The Progression of Generations

• Silent Generation was before 1946
• Baby Boomers is 1946 to 1959
• Generation X is from 1960 and 1979
• Generation Y is from 1980 to now
  So what is generation Y?