Pediatric Considerations in the Sleep Lab

By Joel Porquez, BS, RST/RPSGT, CCSH
Conflict of Interest Disclosures

Speaker:

1. I do not have any potential conflicts of interest to disclose, OR

☐ 2. I wish to disclose the following potential conflicts of interest

<table>
<thead>
<tr>
<th>Type of Potential Conflict</th>
<th>Details of Potential Conflict</th>
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<tbody>
<tr>
<td>Grant/Research Support</td>
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<td>Consultant</td>
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<td>Financial support</td>
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<td>Other</td>
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☐ 3. The material presented in this lecture has no relationship with any of these potential conflicts, OR

☐ 4. This talk presents material that is related to one or more of these potential conflicts, and the following objective references are provided as support for this lecture:

1. 
2. 
Objectives

1. Identify circumstances and guidelines to consider while working with the pediatric age group.
2. Differentiate the pediatric technologist role vs working with adult patients.
3. Review common pediatric sleep disorders prompting a sleep study
The Pediatric Patient

• Birth to 18 years of age
Lack of Sleep

• Excessive sleepiness
• Poor attention
• Hyperactivity
• Impulsiveness
• Poor school performance
• School failure/drop out
• Social withdrawal
• Low self esteem
Prevalence

• Estimated 18% of children and adolescents are obese

2017 American Heart Association, INC

Risk factors for: - cardiovascular disease
- high cholesterol
- type 2 diabetes
Recommended Amount of Sleep:

Journal of Clinical Sleep Medicine, Vol. 12, No. 6, 2016

• Infants 4 – 12 months: 12 to 16 hours
• Children 1 – 2 years of age: 11 to 14 hours
• Children 3 – 5 years of age: 10 to 13 hours
• Children 6 – 12 years of age: 9 to 12 hours
• Teenagers 13 – 18 years of age: 8 to 10 hours

❖ On a regular basis to promote optimal health
Common Pediatric Sleep Disorders

- Sleep Disordered Breathing
- Parasomnias
- Circadian Rhythm Disturbances
- Narcolepsy
- Restless Legs Syndrome/PLMD
- Childhood Insomnias
Sleep disordered breathing, SDB

• Snoring, noisy breathing, “witnessed” apneas
• Restless sleep
• Mouth breathing
• Night sweats
• Excessive sleepiness
• Increased activity
Diagnosis

Gold Standard: Polysomnogram, PSG

• Not reliable **alone**:
  - clinical symptoms
  - questionnaires
  - audiotapes
  - videotapes
  - physical exam
  - oximetry
## OSA Differences

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prevalence (est.)</strong></td>
<td>2-3%</td>
<td>2-4%</td>
</tr>
<tr>
<td><strong>Peak ages</strong></td>
<td>2-6 years</td>
<td>30-60 years</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>M=F</td>
<td>M&gt;F</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Normal, decreased, or increased</td>
<td>Overweight</td>
</tr>
<tr>
<td><strong>Major cause</strong></td>
<td>Adenotonsillar hypertrophy</td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>Adenotonsillar hypertrophy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td></td>
</tr>
<tr>
<td><strong>Associated conditions</strong></td>
<td>Craniofacial anomalies Neurological disorders</td>
<td>Postmenopausal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From: Arens, In: Sleep and Breathing in Children</td>
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</tbody>
</table>
Are you sure???
Pediatric Patients vs Adults

• Obvious “size and age”
• Development (Tanner Stages)
• Different illnesses
• Scoring (respiratory rate)
• Treatment
Decreases With Age

- Total sleep time
- Sleep efficiency
- Percentage of SWS
- Percentage of REM
- REM latency

Meta-analysis of quantitative sleep parameters from childhood to old age healthy individuals  Sleep 2004 Nov 1;27(7):1255-73
Increases With Age

- Percentage of N1
- Sleep latency
- Percentage of N2
- WASO

*Meta-analysis of quantitative sleep parameters from childhood to old age healthy individuals*  *Sleep 2004 Nov 1;27(7):1255-73*
Other Considerations

- communication issues
- the scared child
- the screaming uncooperative child
- facial deformities
- hearing deficit
- the blind
- the over protective/1st time parents
- the “special needs” child
- language barriers
The Caregiver
Extra Equipment

- Accommodations for the caregiver/parent
- Cribs, beds with side rails
- Appropriate sizes: cannulas, belts, pulsox sizes, PAP interfaces
- Aware of skin sensitivity
- Alternatives to collodion
- Consider ways to protect your equipment
- CO2 monitoring
Electrode Placement

• EEG same as adults
• EOG E1-M2, E2-M2
  – E1 is 1 to .5 cm below the left outer canthus
  – E2 is 1 to .5 cm above the right outer canthus
• Chin EMG
  – Three electrodes: midline above inferior edge, r/l sides below mandible 1-2 cm to r/l of midline referenced to the electrode above the chin
• Leg EMG
  – Two electrodes, 2-3 cm apart, vertically over the anterior tibial muscle OR 1/3 of the length (whichever is shorter)
# Timing

<table>
<thead>
<tr>
<th></th>
<th>Quiet Sleepwalking</th>
<th>Confusional Arousals</th>
<th>Sleep Terrors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timing</strong></td>
<td>First 3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>First 3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>First 3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Agitation</strong></td>
<td>None/Mild</td>
<td>Mild/Moderate</td>
<td>Marked</td>
</tr>
<tr>
<td><strong>Autonomic arousal</strong></td>
<td>None/Mild</td>
<td>Moderate</td>
<td>Marked</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>1-10 min</td>
<td>5-40 min</td>
<td>1-5 min</td>
</tr>
<tr>
<td><strong>Peak Age</strong></td>
<td>Preschool/school</td>
<td>Toddler/preschool</td>
<td>Preteen/teen</td>
</tr>
<tr>
<td><strong>Family Hx</strong></td>
<td>Common</td>
<td>Common</td>
<td></td>
</tr>
<tr>
<td><strong>Amnesia</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Partial Arousals</th>
<th>Nocturnal Seizures</th>
<th>Nightmares</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timing in the night</strong></td>
<td>First 3(^{rd})</td>
<td>Anytime</td>
<td>Mid to Last 3(^{rd})</td>
</tr>
<tr>
<td><strong>Stage of sleep</strong></td>
<td>Deep NREM</td>
<td>NREM&gt;&gt;REM</td>
<td>REM</td>
</tr>
<tr>
<td><strong>Motor activity</strong></td>
<td>Variable</td>
<td>Stereotypical, repetitive</td>
<td>Minimal to none</td>
</tr>
<tr>
<td><strong>Arousal threshold</strong></td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Memory of event</strong></td>
<td>Amnesia</td>
<td>Amnesia</td>
<td>Vivid recall</td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>Common</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td><strong>Family History</strong></td>
<td>Common</td>
<td>Variable</td>
<td>Rare</td>
</tr>
<tr>
<td><strong>Daytime sleepiness</strong></td>
<td>None</td>
<td>Common</td>
<td>None</td>
</tr>
</tbody>
</table>
# PSG Normals

*Sheldon (ed) PIP Ped Sleep 2005*

| Metric                                      | Value  
|---------------------------------------------|--------
| EEG arousal index, n/hr                    | 7 +/- 2
| Sleep Efficiency, %                        | 84 +/- 13
| Stage 1, % TST                             | 5 +/- 3
| Stage 2, % TST                             | 51 +/- 9
| Slow-wave sleep, % TST                     | 26 +/- 8
| REM sleep, % TST                           | 19 +/- 6
| REM cycles, n                              | 4 +/- 1
Clinical Relevance

- Apnea Index (AI) > 1 is abnormal
- AHI (Apnea+Hypopnea Index) > 5 is abnormal

- At what point is the AI or AHI clinically significant?
  Almost always significant when AI >5, AHI >10

- Gestalt from reviewing history and the entire PSG
- End tidal CO₂ may reveal obstructive hypoventilation
- Clinical evaluation in Sleep Center extremely helpful
Interesting Findings

• Percentages of N2 and REM changed significantly with age
• Only sleep efficiency continued to decrease > 60 years of age

Meta-analysis of quantitative sleep parameters from childhood to old age healthy individuals  Sleep 2004 Nov 1;27(7):1255-73
Oldie But Goodie

Figure 3.1: Night-time sleep patterns for children, young adults, and elderly.
Management

- removal of tonsils and/or adenoids
- nasal steroids
- PAP therapy
- weight loss
- maxillofacial surgery
- tracheostomy
Treatment Options

Examples:

**Adults:**  
- PAP therapy  
  - Oral device  
  - Positional therapy  
  - Inspire, various surgical options

**Children:**  
- removal of adenoids, tonsils (both)  
  - wait it out, observe  
  - PAP therapy
Thank you

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