Diagnostic work up of Sleep Disorders for Children

Lourdes DelRosso, M.D. MS
Associate Professor of Pediatrics
University of Washington
Seattle Children’s Hospital
Goals

1. Discuss the evaluation of children with sleep complaints
2. Review the diagnostic tools and when to order sleep studies
3. Recognize the most common sleep disorders
What patients do we see in sleep clinic?

- Normal children
- Children from parents of all backgrounds
- Children with genetic syndromes
- Children with psychiatric conditions
- Children with craniofacial syndromes
- Children with PTSD
- Children post injuries
- Children with medical co-morbidities
Most common parental concerns about sleep:

- Child is not able to fall asleep independently
- Child has frequent nocturnal awakenings
- Early awakenings
- Abnormal awakenings (movements or parasomnias)
- Snoring or breathing problems
- Excessive daytime sleepiness or behavioral problems
- Not sleeping enough
How do we diagnose sleep disorders

- Clinical History
- Physical Exam
- Sleep Diaries
- Actigraphy
- Polysomnography
- MSLT
- Imaging/Blood tests
Practice parameters, anticipatory guidelines, position statements
The pediatric sleep history

6 y/o boy with past history of Down syndrome referred for suspected sleep disordered breathing

The child sleeps in his own room in his own bed. Bedtime routine...

Falls asleep at 9 PM once asleep there are 1 two awakenings ..... 

There is: snoring, enuresis, sleepwalking, sleeptalking, restless legs....

Pediatric sleep history

- How does child fall asleep?
- Are there awakenings through the night?
- How many hours does the child sleep?
- Snoring or breathing problems?
- Other behaviors during sleep?
- Are there daytime concerns?
  - Sleepiness
  - Hyperactivity
  - Cognitve
Physical exam

- Observation: behavior, habitus
- Vital signs
- HEENT: bone structure, face, macroglossia, palate
- Neck: thyroid
- Torso: chest, back (scoliosis)
- Neurologic exam: hypotonia
- Psychiatry: depression, anxiety
- Skin
**Tonsil Size**

*Figure 2—Tonsillar size.*

Grade 0: No tonsil tissue present. Grade 1: Tonsils hidden within the faucial tonsillar pillars. Grade 2: Tonsils extending to the pillars but not beyond them. Grade 3: Tonsils extending beyond the faucial tonsillar pillars but not to the midline. Grade 4: Tonsils extending to the midline and may be touching each other.

Mallampati Score

Figure 1—Mallampati score.

Class 1: Faucial/tonsillar pillars, uvula and soft palate are all visible. Class 2: Partial visibility of the faucial/tonsillar pillars, uvula and soft palate. Class 3: Base of the uvula, soft and hard palate visible. Class 4: Only hard palate is visible.

Imaging
Two-Year-Old with Post-Surgical Hypoglossal Nerve Injury and Obstructive Sleep Apnea

Lourdes M. DelRosso, M.D.; Romy Hoque, M.D.; Eduardo Gonzalez-Toledo, M.D., Ph.D.

1Division of Sleep Medicine, Department of Neurology, Louisiana State University School of Medicine, Shreveport, LA; 2Department of Radiology, Louisiana State University School of Medicine, Shreveport, LA
Malformaciones craniofaciales
Figure 1—Three-dimensional reconstructed computerized tomography of the head in a patient with achondroplasia

(A) Open anterior fontanelle with a transverse diameter of 80 mm and an anterior-posterior diameter of 127 mm. (B) Open posterior fontanelle with a transverse diameter of 46 mm and an anterior-posterior diameter of 19 mm. (C) Small short cranial base with mild narrowing of the foramen magnum: 16.8 mm by 18.8 mm.

A Three-Month-Old Achondroplastic Baby with both Obstructive Apneas and Central Apneas

Lourdes M. DelRosso, M.D.; Eduardo Gonzalez-Toledo, M.D., Ph.D.; Romy Hoque, M.D.
<table>
<thead>
<tr>
<th>Day</th>
<th>Noon</th>
<th>Afternoon</th>
<th>Evening</th>
<th>Midnight</th>
<th>Morning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**QUALITY OF EVIDENCE**
- High
- Moderate
- Low
- Very Low

**BENEFITS VERSUS HARMs**
- Benefits outweigh harms
- Benefits approximately equal harms
- Harms outweigh benefits

**PATIENT VALUES AND PREFERENCES**
- Vast majority of patients would use
- Majority of patients would use
- Majority of patients would not use
- Vast majority of patients would not use

**RECOMMENDATIONS FOR THE USE OF ACTIGRAPHY**

1. We suggest that clinicians use actigraphy to estimate sleep parameters in adult patients with insomnia disorder. (Conditional) [E=3]

2. We suggest that clinicians use actigraphy in the assessment of pediatric patients with insomnia disorder. (Conditional) [E=3]

3. We suggest that clinicians use actigraphy in the assessment of adult patients with circadian-rhythm sleep-wake disorder. (Conditional) [E=3]

4. We suggest that clinicians use actigraphy in the assessment of pediatric patients with circadian-rhythm sleep-wake disorder. (Conditional) [E=3]

5. We suggest that clinicians use actigraphy integrated with home sleep apnea test devices to estimate total sleep time during recording (in the absence of alternative objective measurements of total sleep time) in adult patients suspected of sleep-disordered breathing. (Conditional) [E=3]

6. We suggest that clinicians use actigraphy to monitor total sleep time prior to testing with the Multiple Sleep Latency Test in adult and pediatric patients with suspected central disorders of hypersomnolence. (Conditional) [E=3]

7. We suggest that clinicians use actigraphy to estimate total sleep time in adult patients with suspected insufficient sleep syndrome. (Conditional) [E=3]

8. We recommend that clinicians not use actigraphy in place of electromyography for the diagnosis of periodic limb movement disorder in adult and pediatric patients. (Strong) [E=3]
Polisomnography

RECOMMENDATIONS FOR DIAGNOSTIC INDICATIONS FOR POLYSOMNOGRAPHY IN SLEEP RELATED BREATHING

3.2.1 Polysomnography is indicated when the clinical assessment suggests the diagnosis of obstructive sleep apnea syndrome in children. STANDARD

3.2.2 Polysomnography is indicated when the clinical assessment suggests the diagnosis of congenital central alveolar hypoventilation syndrome or sleep related hypoventilation due to neuromuscular disorders or chest wall deformities. It is indicated in selected cases of primary sleep apnea of infancy. GUIDELINE

3.2.3 Nap (abbreviated) polysomnography is not recommended for the evaluation of obstructive sleep apnea syndrome in children. GUIDELINE

3.2.4 Polysomnography is indicated when there is clinical evidence of a sleep related breathing disorder in infants who have experienced an apparent life-threatening event (ALTE). GUIDELINE
**HYPERSOMNIA**

3.1.1 The MSLT, preceded by nocturnal PSG, is indicated in children as part of the evaluation for suspected narcolepsy.

3.1.2 The MSLT, preceded by nocturnal PSG, is indicated in children suspected of having hypersomnia from causes other than narcolepsy to assess excessive sleepiness and to aid in differentiation from narcolepsy.

**PARASOMNIA**

3.2.1 The polysomnogram using an expanded EEG montage is indicated in children to confirm the diagnosis of an atypical or potentially injurious parasomnia or differentiate a parasomnia from sleep-related epilepsy when the initial clinical evaluation and standard EEG are inconclusive.

3.2.2 Children with frequent NREM parasomnias, epilepsy, or nocturnal enuresis should be clinically screened for the presence of comorbid sleep disorders, and polysomnography should be performed if there is a suspicion for sleep-disordered breathing or periodic limb movement disorder.

**SLEEP RELATED MOVEMENT DISORDERS**

3.3.1 Polysomnography is indicated in children suspected of having RLS who require supportive data for diagnosing RLS.

3.3.2 PSG is indicated for children suspected of having PLMD for diagnosing PLMD.

3.3.3 Polysomnography is not routinely indicated for evaluation of children with sleep-related bruxism.
ICSD-3 and Scoring Manual
Sleep Disorders
ICSD-3 Classification

- Circadian
- Insomnia
- Parasomnia
- Breathing Disorders
- Movement disorders
- Hypersomnia
Circadian Disorders

• Adolescents (8%)
• Most common: delayed sleep phase
• History, sleep diaries and actigraphy are useful
• Also common in blind children, children with autism spectrum, and after hospitalizations.
• Melatonin, bright light and sleep hygiene
• Refer if other disorders suspected to contribute
# Parasomnia

## NREM
- Common in children (50%)
- Sleepwalking, sleeptalking, night terrors and confusional arousals
- Can be induced or precipitated by fever, sleep deprivation, and certain medications
- Safety measures and reassurance

## REM
- Nightmares (common in 3-6 years old)
- REM behavior disorder (RBD) extremely rare in children
- RBD = Dream enactment (running when chased, hiding, biting) and remembers dream when awaken
- Refer if suspected RBD
When to refer

- Secondary enuresis and suspected OSA
- Injurious parasomnia
- Suspected REM behavior disorder
- Suspected nocturnal seizures
When to suspect nocturnal seizures?

- Repetitive events through the night
- Stereotypic
- Abnormal postures (dystonia)
- Timing (parasomnia occurs within 2 hours of falling asleep)
- Duration s- eizures are usually brief (<2 minutes)
Obstructive sleep apnea

Figure from: Alkhalil Et AL. Molecular diagnosis in Iranian patients with spinal muscular Atrophy. Arch Iranian Med. 7(1): 47 – 52; 2004
Detection of pediatric obstructive sleep apnea syndrome: history y or anatomical findings
Kun-Tai Kang et. al Sleep Medicine
ICSD-3 AASM
Diagnostic Criteria

<table>
<thead>
<tr>
<th>1 of the following</th>
<th>And</th>
<th>1 of the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Snoring</td>
<td></td>
<td>Polysomnography AHI &gt; 1</td>
</tr>
<tr>
<td>2. Paradoxical chest/abdomen</td>
<td></td>
<td>Obstructive hypoventilation (ETCO2 &gt; 50 Torr por 25% de TST) with: snoring, nasal signal flattening or chest abdomen paradoxing.</td>
</tr>
<tr>
<td>3. Daytime symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Excessive sleepiness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Behavioral problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Academic problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scoring Rules Pediatric
OSA Severity  (obstructive AHI)

- Normal: AHI <1
- Borderline: AHI 1.1-2
- Mild: AHI 2.1-5
- Moderate: AHI 5.1-9.9
- Severe: AHI >10 **
Age specific differences in pediatric obstructive sleep apnea§
Debra M. Don *, Kenneth A. Geller, Jeffrey A. Koempel, Sally Davidson Ward
ACTA MEDICA SCANDINAVICA

ASTHENIA CRURUM PARAESTHETICA
("IRRITABLE LEGS")

A NEW SYNDROME CONSISTING OF WEAKNESS, SENSATION OF COLD AND NOCTURNAL PARESTHESIA IN THE LEGS, RESPONDING TO A CERTAIN EXTENT TO TREATMENT WITH PRISCOL AND DORYL. — A NOTE ON PARESTHESIA IN GENERAL

By

K. A. EKBOM
(Stockholm)
• Restless Leg Syndrome (RLS): urge to move the legs during wakefulness
• Periodic leg movements of sleep (PLMS): leg kicks during sleep
• Both link to iron deficiency
• IF suspected but not clear by history or does not know if disrupts sleep ---- PSG

*Higher prevalence in patients with ADHD*
Periodic leg movements
Sleep Related Rhythmic Movement Disorder

- Typically in infants and young children
- Body rocking, Head rolling
- Prevalence: At nine months body rocking 43%; head banging 22%; head rolling 24%. At 18 months 33%. Five years 5%
- Familial
- Onset prior to one year of age.
- Reassurance and prevention of injuries
Body Rocking
Insomnia

- Inadequate sleep hygiene
- Behavioral:
  - Limit setting
  - Sleep onset association disorder
- Chronic Insomnia
- Mood disorders/Depression/Anxiety
- Medications

*Higher prevalence in patients with Autism Spectrum Disorder*
*Refer when behavioral interventions are not successful after 3 months*
Behavioral Insomnia of Childhood

- No gender prevalence
- 6 months of age is a reasonable age to consider
- Child often goes to bed and falls asleep quickly for others (babysitter, grandparent) or in other situations (allowed to watch TV and sleep on couch in living room)
Hypersomnia

• Most common cause: Insufficient sleep!
• Adequate sleep hygiene and total sleep for age should be recommended
• Other causes should be explored
• DO NOT MISS:
  • NARCOLEPSY
  • RECURRENT HYPERSOMNIA (Kleine Levin Syndrome)
Narcolepsy

- Excessive sleepiness present almost daily for at least three months
- Cataplexy
- MSLT, sleep latency <8 min, < 2 SOREMP
- The hypersomnia is not better explained by another sleep disorder, mental disorder, medication use or substance use disorder
<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What has the parent done in the past?</td>
</tr>
<tr>
<td>How long has it been tried?</td>
</tr>
<tr>
<td>Did it work?</td>
</tr>
<tr>
<td>What factors contributed to failure?</td>
</tr>
<tr>
<td>Medications?</td>
</tr>
<tr>
<td>Weight?</td>
</tr>
<tr>
<td>Smoking?</td>
</tr>
<tr>
<td>What is the goal for the visit in the parents mind?</td>
</tr>
</tbody>
</table>
Sleep disorders are common in children and vary from insomnia, parasomnia, sleep disordered breathing, movement disorders and circadian disorders.

Parental concerns vary from normal to various sleep, medical, psychiatric, disorders.

There are populations at higher risks of sleep disorders.

Personalized history and physical.

Appropriate diagnostic test.
Questions?