Complaints Every Provider Hears:

“My child won’t sleep”
“My child is tired”

What goes through your mind when you hear this??

Do you really want to sleep like a baby?

Do you remember being tucked in?
WHAT WE SEE IN CLINIC

• Normal Sleep?
• Insomnia
• Obstructive Sleep Apnea
• Parasomnias
• Restless Leg Syndrome
• Delayed Sleep Phase Syndrome

Sleep impacts behavior

Sleep disorders mimic attention and learning disorders

The need for sleep is biological
The way you sleep is learned

What wakes you up may not be what keeps you awake

Two-Process Model
1. Homeostatic Drive
   Increases with the duration of waking
   Governed by the need for sleep
2. Circadian Rhythms
   Confines sleep and waking to different phases of the daily cycle
   Entrained to the light-dark cycle
   Clock-dependent alerting
Sleep Timing

- Sleep timing is influenced by homeostatic and circadian factors
- The less we sleep the more sleep we need and vice versa
- Twice a day our alertness level peaks
- Twice a day our sleepiness peaks

Sleep Stages

- EEG Recordings
- Typical Nighttime Sleep Pattern in Young Adult

Clues to the function of mammalian sleep. Jerome M. Siegel Nature 437, 2005

Courtesy of Dale Edgar PhD
Actigraphs are small, wrist-worn devices that measure movement.

**Normal Actigraph**

- Fri 02/14/09
- Sat 02/15/09
- Sun 02/16/09
- Mon 02/17/09

**Irregular Sleep Wake Cycle**

- Variable sleep time (not necessarily the bed time)
- Variable wake up time (not necessarily the out of bed time)
- Variable nap time

**Abnormal Actigraph**

- Thu 02/13/09
- Fri 02/14/09
- Sat 02/15/09
- Sun 02/16/09
- Mon 02/17/09
- Tue 02/18/09
- Wed 02/19/09

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What is the motivation to go to bed?

What is the motivation to get out of bed?

**SELF Correction**

- Social
- Exercise
- Light
- Food

“Pediatrics is Latin for off-label”
Wallace Mendelson

**The real issue is not the pill, it is the insomnia**

The thought of sleeping wakes them up
Trends in medication prescribing for pediatric sleep difficulties in US outpatient settings Sleep 07

- Cross-sectional study on pts ≤17 yrs from ‘93-’04 NAMCS.
- 18.6 million visits occurred for sleep related difficulty in children most 6-12 yr.
- 81% of visits Rx’ed a med (only 48% of the adult patients with insomnia Rx’ed!)
- CONCLUSION: “… physicians frequently prescribed medications for sleep difficulties in children in US outpatient settings. Of particular concern is prescribing of many unapproved medications for this population”

Do not to equate sedation with normal sleep!

Potential Pharmacokinetic Basis for Zolpidem Dosing in Children With Sleep Difficulties ‘07

- Open-label, dose-escalation study in children with insomnia. 21 children, seven per age group (2-6, >6 to 12, >12 to 18 years), received a single dose of zolpidem at one of the three dose levels (0.125, 0.25, or 0.50 mg/kg (20 mg maximum dose))
- Overall, zolpidem was well tolerated and a pediatric dose of 0.25 mg/kg is recommended for future efficacy studies

Paradoxical Reaction To A Hypnotic Medication
Pediatric SDB Features

- Unrefreshing sleep
- Behavioral awake problems
- Difficulty gaining weight
- Bed wetting
- Night sweats
- Snoring/Mouth breathing

Crouzon Syndrome

Characterized by abnormalities of the skull, upper and midfacial region. Craniosynostosis causes a flattened forehead. The forehead and midface bones are sunken, giving the eyes a bulging appearance. Narrow air passages may cause breathing difficulty.

Sleep Disorders in Children

Correct Physiological Rest Position

- Anterior portion of tongue on palate
- Lips closed and relaxed
- Teeth apart
- Nasal breathing

Naso-Respiratory Function and Cranialfacial Growth
James McNamara 1979 as presented by James B. DuHammel DDS
Attention-Deficit/Hyperactivity Disorder

“The essential feature of ADD/HD is a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development.”

“There are no specific physical features...although minor physical anomalies...may occur at a higher rate...” DSM IV

Snoring Predicts Hyperactivity Four Years Later Chervin 2005

- Parents of 229 children aged 2 to 13 yrs, recruited at 2 general clinics, completed initial and 4-yr f/u surveys.
- Surveys included a Pediatric Sleep Questionnaire about snoring, sleepiness, and overall risk of SDB, and the hyperactivity index within the Conners’ Parent Rating Scale.
- 13% were rated as hyperactive (hyperactivity index > 60) at f/u. Hyperactivity at f/u was predicted by baseline habitual snoring (odds ratio = 4.4) or loud snoring (4.5) and, sleepiness (3.0), or SDB (4.0).
- This 4-year prospective study shows that snoring and other symptoms of SDB are strong risk factors for future emergence or exacerbation of hyperactive behavior. These findings support the hypothesis that untreated childhood sleep-disordered breathing contributes to development of hyperactivity

Cognition, sleep and respiration in at-risk children treated for obstructive sleep apnoea.

Eur Respir J. 2005 Montgomery-Downs, Crabtree, Gozal

- 19 children low income family attending pre-school underwent PSG and cognitive assessment before and following surgical treatment for OSA and 19 matched controls were also assessed
- Following T&A, OSA subjects' delta sleep increased, REM decreased, and respiratory and arousal indices improved.
- Prior to T&A, cognitive scores were significantly lower in OSA subjects
- Following T&A, patients had normalized sleep and respiratory patterns and improved cognitive scores.
- These findings, in this vulnerable population, which is unlikely to seek evaluation and treatment for obstructive sleep apnea, underscore the potential value of outreach screening program for SDB, particularly among low-income groups of pre-school age

- This retrospective review nine children with sleep apnea and seizure disorders.
- Seizure frequency was reduced in five patients (56%) in the first 12 months after sleep apnea treatment without changes in their antiepileptic medications.
- Sleep apnea can be one of the seizure precipitants in children with epilepsy.

Sleep disturbances in adolescents and young adults with autism and Asperger syndrome. *Autism. 2005*

Investigated sleep in older individuals (aged 15-25 years) with autism and Asperger syndrome, using sleep questionnaires, sleep diaries and actigraphy. Although the sleep questionnaires completed by parents and caretakers revealed only a moderate degree of sleep problems, greater sleep disturbance was recorded with actigraphy. Using the latter method, low sleep efficiency (below 85 percent) or long sleep latency (more than 30 minutes) were found in 80 percent of the individuals. There was no early morning awakening, contrary to some earlier reports. This study suggests that even though subjective complaints of sleep disturbances are less common in adolescents and young adults with autism, this may be due to an adaptation process rather than an actual reduction in sleep disturbances.


- Melatonin, produced from serotonin, is of special interest in autistic disorder given reported alterations in central and peripheral serotonin neurobiology.
- Nocturnal urinary excretion of 6-sulphatoxymelatonin was measured in children and adolescents with autistic disorder (n = 49) and normal control individuals (n = 88).
- Nocturnal 6-sulphatoxymelatonin excretion rate was significantly and substantially lower in patients with autism than in normal controls and was negatively correlated with severity of autistic impairments in verbal communication and play.
- Further research needed to understand the mechanisms underlying the lower production, to assess the impact of altered melatonin on the pathophysiology and behavioral expression of autistic disorder, and to determine the utility of melatonin administration in individuals with autism.

Rapid eye movement sleep percentage in children with autism compared with children with developmental delay and typical development. 2010

- PSG in 3 groups: autism, developmental delay matched for nonverbal IQ, and TD
- Children with autism had less TST, more SSW, and smaller REM % (14.5% vs 22.6%)
- Relative deficiency of REM may indicate an abnormality in neural organization and suggest neurotransmitter abnormalities.
Early functional brain development in autism and the promise of sleep fMRI 2010

- fMRI during natural sleep as a mechanism to study function in the developing brain
- Show that defects in the superior temporal gyrus (STG) in response to language are early emerging in autism and can be found in as young as 14 months in age
- Consistent with suggestion that autism involves early brain overgrowth.

Stanford Sleep and Autism Research

- Currently recruiting children with autism ages 6-18 for sleep evaluations
- Will provide free sleep testing in the home
- Contact is John Flournoy, 650-723-2795

Your life is reflected in your sleep

Your sleep is a reflection of your life

Conclusions

- Children with a wide variety medical problems have common sleep disturbances
- Treatment for childhood sleep disorders is available