Disclosures

- I have no actual or potential conflict of interest in relation to this program / presentation
  - Grant/Research Support: none
  - Speaker's Bureau: none
  - Consultant: none
  - Major Shareholder: none
- I will be discussing “off-label” uses of medications

Learning Objectives

- Review the normal sleep cycle and relate this to common sleep problems in children
- Discuss interventions for sleep problems to include common behavioral methods and traditional pharmacology
- Discuss sleep problems in children with ADHD
Sleep Is Developmental
- Sleep is a skill
- Too much help = reliance on adult to sleep
- Reliance on the adult can lead to sleep problems

Pediatric Sleep Problems can lead to..
- Problems for child self soothing when upset
- Daytime behavior problems
- Low frustration tolerance / irritability
- Inattention
- Parental depression
- Marital discord

Sleep Cycles in Children: “First Third”
- Fall asleep: NON REM sleep
- Light Sleep → Deep Sleep
- Deep Sleep Returns
- First third of the night: After 3 months of age
- 3-4 Hours duration
- 1-2 hours into sleep “brief arousal”
During Brief Arousals…

- **Mild Behaviors**
  - Rub face
  - Turn over
  - Open eyes
  - Sit up

- **Parasomnias**
  - Sleep walking
  - Sleep terrors
  - Confused thrashing

Sleep Cycles in Children: “2nd Third”

- REM
- Light Sleep and longer periods of REM
- Brief Arousal: “Checking Response”

Second 3rd of the night: Most common to have sleeplessness here

- 3-4 Hours duration

Children with sleep associations may have trouble falling back to sleep now if their “falling asleep conditions” are not in place

Sleep Cycles in Children: “3rd Third”

- Another trip into deep sleep
- Mood depends on stage of sleep from which you arouse

Third 3rd of the night: Least sleeplessness noted here

- 3-4 Hours duration

A child might awaken from Stage IV sleep in a cranky mood for 10-15 minutes or may ascend to stage II or REM right before awakening and this would lead to a happier awakening
Take “an average” History
- Start with dinner and go through breakfast
- Ask about routine
- Ask about sleep location(s)
- What happens in the middle of the night?
- Nap time?
- Parental relationship

Identifying sleep problems
- Clinical Interviews
  - BEARS
    - B = Bedtime Issues
    - E = Excessive Daytime Sleepiness
    - A = Awakenings
    - R = Regularity and Duration of Sleep
    - S = Snoring

Other History
- Sleep ROS
  - Ask about Parasomnias
- Past medical problems?
- Medications?
- Social history
  - New sibling?
  - Recent stresses?
- What have they tried and hasn’t worked?
  - Has worked?
  - For how long?
Outcomes of Infant Sleep Problems

- Sampling of children 3-4 years with a history of sleep problems over a 3 year period
- Night waking continued to be a problem
- Children with sleep problems also had more behavior problems and higher maternal depression scores

Pediatrics 3/2003 Lam et al

Sleep Hygiene

- Routine
  - Duration
  - Sleepy but awake
- Bedtime
  - Timing
- Plan for problems ahead of time
  - Proactive/ not reactive
  - Chart progress (sleep deprived memory never good)

So with all that what can go wrong?
Insomnia

- Bedtime resistance (25-50% of preschool-age children)
- Sleep Associations
- ADHD
- Depression/ anxiety
- Substance abuse
- Delayed sleep phase (Circadian Rhythm Disorders)

Insomnia: Behavioral type

- Limit-Setting Type
  
  Parental difficulties establishing behavioral limits and enforcing bedtimes

  Associated with stalling and refusing to go to bed

- Sleep-Onset Association Type

  Any set of conditions or objects (i.e. pacifier) that must be present in order for the child to fall asleep

  Maladaptive sleep-onset associations such as:
  - Rocking
  - Feeding
  - Watching TV
  - Parental presence

Naptime problems

- Too much sleep at night
- Too many naps for child’s age
- Sleep associations

<table>
<thead>
<tr>
<th>Age</th>
<th>No of Naps</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks to 4 months</td>
<td>May be 4 naps per day</td>
<td>Evolving</td>
</tr>
<tr>
<td>6 months</td>
<td>2-3 naps per day</td>
<td>More predictable</td>
</tr>
<tr>
<td>9-12</td>
<td>2 naps per day</td>
<td>Predictable</td>
</tr>
<tr>
<td>18 months to 4 years</td>
<td>1 nap per day</td>
<td>Afternoon, predictable</td>
</tr>
</tbody>
</table>
Larking

- Largely genetic
- Other Causes:
  - Circadian Rhythm Disorder: Early sleep phase
  - Time in bed too long
  - Early morning nap / Excessive napping
  - Irregular sleep / wake cycle
  - Sleep disruptions (noise, activity, light, TV, early feeding)
- Treatment
  - “Sleep Begets Sleep” so earlier bedtime can help

Adapted from Ferber, 2006

Frequent night awakenings

- Sleep associations
- Limit setting problems
- Anxiety/Depression
- Obstructive apnea, PLMD (other medical problems such as asthma or reflux)
- Parasomnias (sleep terrors, sleep walking etc)
- Nocturnal Enuresis
- Time in bed too long or excessive napping
- Irregular sleep wake cycles
- Multiple sleep environments

Adapted from Ferber, 2006

Insomnia: Treatment

- Sleep associations
  - Routine - brief and reproducible by anyone
  - Timing - based on age
  - Location – Non sleep activities should not be done in bed
  - Encourage one sleep environment
  - “Tuck and go” and be consistent
  - For infants: Drowsy but awake
Insomnia: Treatment

- **Sleep associations**
  - Educate the child’s uncanny ability to learn how to fall asleep on his/her own
  - In the morning: Praise success
  - Close follow up- phone or in person

- **Limit setting problems**
  - “Robot approach”
    - Set your routine, brief, reproducible by anyone
    - Tuck in and go
    - If a child gets out of bed/room return them to bed without eye contact, talking or turning on lights
    - Repeat until child falls asleep on his own in his bed
    - Praise the next day

Our job as parents is to create an environment that is conducive to good sleep habits and then wait for the child to learn how to self soothe to sleep on their own without sabotaging the act of learning.
Insomnia: Treatment

- Anxiety/Depression
  - Older children
  - CBT Cognitive Behavioral Therapy

Non REM Arousal Parasomnias

- Night terrors
- Somnambulism
- Confusional arousals
- Bruxism
- Periodic limb movement disorder (related to restless leg)
- Most occur in stage 3 or 4 sleep
- Exacerbated by fatigue, exercise or stress

Tx is conservative with reassurance, environmental / behavioral strategies first

- Mostly for frequent night terrors and somnambulism
- Planned brief arousals for 21 consecutive nights before the first event is likely to occur (‘nudge and go’)
- Pharmacology reserved for failed behavioral interventions, frequent episodes and where safety is a concern
- Clonazepam 0.25mg to 0.5mg at bedtime for 4-6 weeks can be effective
If you decide to use medication

- Lowest effective dose
- Intermittent dosing (2-3 nights/wk)
- Short term (2-3 wk at a time)
- Discontinue after slow taper if the patient has been taking it regularly
- Choose agents with short and/or intermediate half-life to minimize daytime sedation.

http://emedicine.medscape.com/article/291573-overview#aw2aab6c14

Medication Categories

- Benzodiazepines
- Non-benzodiazepine sedative hypnotics
- Melatonin (and Melatonin Agonists)
- Anti-Histamines
- Anti-Depressants
- Alpha Agonists
Benzodiazepines

- Bind to the benzodiazepine receptor site
- Modulate GABA<sub>A</sub> receptors and chloride ion channels
- Hypnotic, myorelaxant, anxiolytic and anticonvulsant effects
- Short, Medium, Long Acting

Sleep architecture changes include:
- Suppression of slow wave sleep (stage 3)
- Increase of sleep spindles and stage 2 sleep
- Mild suppression of REM sleep
- Reduction in frequency of nocturnal arousals

Benzodiazepines - Why not?

- No pediatric clinical trials
- Side effects:
  - Tolerance
  - Sedation
  - Anterograde amnesia
  - Cognitive and psychomotor impairments
  - Rebound insomnia
  - Abuse potential
Nonbenzodiazepine Benzodiazepine Receptor Agonists

- **Examples**
  - Ambien (MA)
  - Lunesta (LA)
  - Sonata (SA)
- Bind preferentially to omega-1 benzodiazepine receptor of the GABA\textsubscript{A} receptor complex
- No anticonvulsant or myorelaxant effects
- Preservation of stage 3 sleep

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Melatonin

- Indoleamine with sleep-promoting and chronobiotic-properties (influence sleep timing)
- Administer 30 minutes before bed time
- 1 hour half life
- There are extended release preparations for children with night awakenings

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Melatonin

- Begin at 3 mg and increase in 1.5-3mg increments every 4-5 days as needed
- Max dose =15mg
- Specific efficacy with delayed sleep phase, neuro-developmental disabilities and blindness
### Anti-Histamines

- Diphenhydramine, Hydroxyzine, Doxylamine
- Increased REM latency with no change in overall amount of REM sleep
- SEs: anticholinergic, next-day sedation


### Alpha-Agonists

- Clonidine & Guanfacine
- Stimulate pre-synaptic receptors in the locus coeruleus thereby decreasing noradrenergic stimulus
- No controlled studies
- Some evidence with ADHD
  - Mean dosage was 0.15mg for Clonidine (start at 0.025-0.05mg)
  - 0.09-0.12 mg/kg/day for Guanfacine (1,2,3 or 4mg)

### Alpha-Agonist Side Effects

- Blood Pressure and Pulse
  - Resolves by week 8
  - 3-4 week adjustment phase in reduction of sleep latency
ADHD

- Affect between 4% and 8% of school-age children worldwide.
- Characterized by inattention, hyperactivity and impulsivity that can impair academic, social and occupational functioning
- Parent reported sleep problems occurs in 25-50% of children with ADHD

ADHD: Subjective Sleep Problems

- Delayed sleep onset or bedtime resistance
- Frequent nocturnal awakenings or restlessness
- Tiredness on waking
- Daytime sleepiness

ADHD: Objective Sleep Problems

- Increased sleep latency
- Decreased rapid eye movement stage
- Decreased overall sleep time
- Increased nocturnal activity
- Treatment induced Insomnia
  - Increased sleep latency
  - Rebound hyperactivity response

Confirmed by polysomnography & actigraphy
ADHD: Treatment

- Medication re-evaluation
- Adding shorter acting formulation
- Switching to non stimulant
- Sleep Hygiene
- Melatonin (long or short acting)
- CBT for anxiety
- Treating comorbidities
  - Nocturnal enuresis (bed wetting alarm)

Summary

Sleep problems are common in children and cause behavior problems

Sleep is developmental and understanding this can help parents learn how to better manage their child’s sleep

Effectively managing sleep problems can significantly improve the quality of life for children and their families

Thank you

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