Why Won't You Go To Sleep? Pediatric Insomnia and Its Impact on Families

Satellite Conference and Live Webcast
Thursday, May 24, 2012
12:00 – 2:00 p.m. Central Time

Produced by the Alabama Department of Public Health
Video Communications and Distance Learning Division

Faculty

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Learning Objectives

- Discuss the differential for pediatric insomnia
- Describe the epidemiology and significance of pediatric insomnia
- List behavioral interventions of pediatric insomnia
- Explain the impact of pediatric insomnia on families and caregivers

Sleep

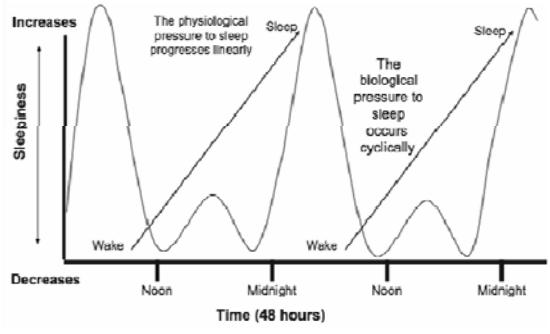
- Primary activity of the brain during the day in early development
- Basic function of sleep
  - Still unknown
  - Required for life, learning, growth
- Rest is not a substitute for sleep

A Family's Perspective on Sleep

A Discussion with Ellie Frederick, Parent of a Child with Insomnia

Sleep Pressure

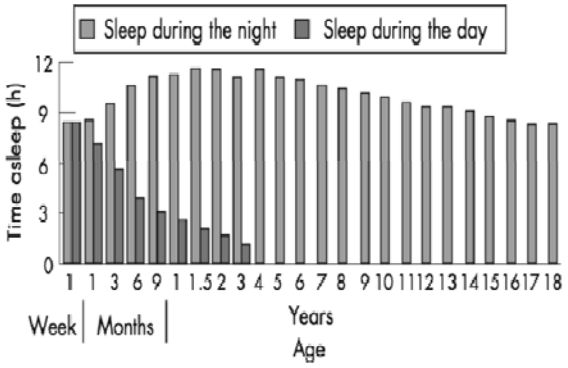
Homeostatic drive vs. circadian rhythm



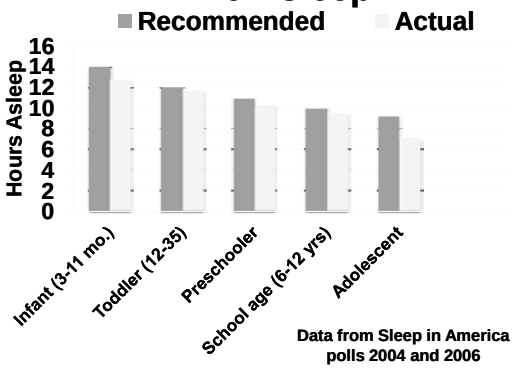
Overview of Pediatric Sleep

- Changes as we age
- Napping

Overview of Pediatric Sleep



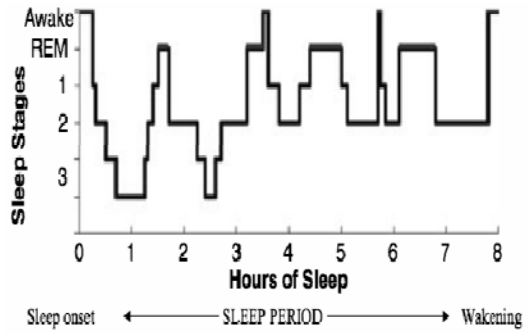
Time Asleep



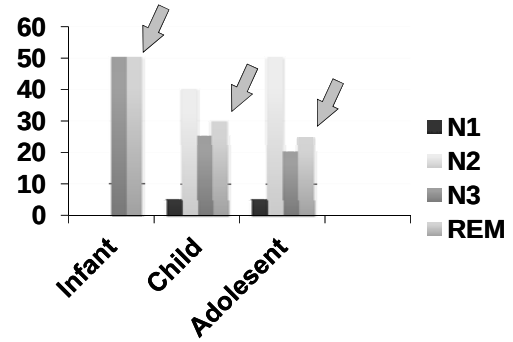
Sleep Architecture

- Active process
- Multiple stages of sleep
- Varies throughout the night

Sleep Architecture



Sleep Changes Versus Time



Infant Sleep: 0-2 Months

- Sleep time: 10-19 hours (average 13)
  - Naps: Alternating every 1-3 hours
  - Sleep-wake regulated by satiety
- Sleep Development: Active versus quiet sleep

Infant Sleep: 0-2 Months

- Sleep problems
  - Most are discrepancy between parental expectations and developmentally appropriate sleep

Infant Sleep: 2-12 Months

- Sleep time: 9-10 hours/night
  - Naps: 3-4 hours

Infant Sleep: 2-12 Months

- Sleep development: sleep as a social behavior
  - Sleep regulation – self soothing
  - Sleep consolidation
  - Sleep onset association
  - Nighttime arousals
  - Transitional objects

Infant Sleep: 2-12 Months

- Sleep problems
  - Most are discrepancy between parental expectations and developmentally appropriate sleep
  - Behavioral insomnia of childhood-sleep onset association type

Toddler Sleep: 12-36 Months

- Sleep time
  - 9½-10½ hours/night
  - Naps 2-3 hours
    - ~100% of 1 yo and 50% of 3 yo

Toddler Sleep: 12-36 Months

- Sleep and development
  - Increase in ambulation
  - Understand cause and effect
  - Increased imagination

Toddler Sleep: 12-36 Months

- Sleep issues
  - Transition to bed from crib
  - Transitional objects
  - Bedtime routine
- Sleep problems
  - Bedtime resistance in 25%
  - Night wakenings (30-50%)

Preschoolers: 3-5 Years

- Sleep time 9-10 hours/night
  - Naps decrease from 1 to 0
- Sleep and development
  - Capacity to delay gratification
  - More limit testing
  - Increased imagination

Preschoolers: 3-5 Years

- Sleep issues
  - Co-sleeping
- Sleep problems
  - Trouble falling asleep (15-30%)
  - Night wakenings (15-30%)
  - OSA
  - Parasomnias

School-aged: 6-12 Years

- Sleep time: 9-10 hours/night
- Sleep and development
  - Social anxiety
  - Schedules may limit sleep time
  - Media use

School-aged: 6-12 Years

- Sleep issues
  - Irregular sleep schedules
  - Parental presence at bedtime (30%)

School-aged: 6-12 Years

- **Sleep problems**
  - **Somnambulism**
  - **Bruxism**
  - **OSA**
  - **Inadequate sleep hygiene**
  - **RLS**

Adolescents: 13-18 Years

- **Sleep time: 7-9 hours/night**
- **Sleep and development**
  - **Phase delay**
  - **Slow sleep drive accumulation**

Adolescents: 13-18 Years

- **Sleep issues**
  - **Irregular sleep schedules**
  - **Early school start time**

Adolescents: 13-18 Years

- **Sleep problems**
  - **Inadequate sleep hygiene**
  - **Insomnia – psychophysiologic**
  - **Delayed sleep phase**
  - **OSA**
  - **Narcolepsy**

Prevalence of Sleep Problems

Age	Prevalence
Infant (0-2 months)	Not well known
Infant (3-12 months)	25-50%
Toddlers	25-30%
Preschoolers	30%
School-aged	37%
Adolescents	20%

Diagnosis of Insomnia

- **Complaint of difficulty initiating sleep, maintaining sleep, or waking up too early, or sleep that is chronically non-restorative or poor in quality**
- **Occurs despite adequate opportunity and circumstances for sleep**

Diagnosis of Insomnia

- At least one of the following forms of daytime impairment is reported:
  - Fatigue or malaise
  - Attention, concentration, or memory impairment
  - Social or vocational dysfunction or poor school performance
  - Mood disturbance or irritability

Forms of Daytime Impairment

- Daytime sleepiness
- Motivation, energy, or initiative reduction
- Proneness for errors or accidents at work or while driving
- Tension, headaches, or GI symptoms in response to sleep loss
- Concerns or worries about sleep

Pediatric Insomnia

- Subjective difficulty initiating and/or maintaining sleep, early morning awakening, and "non-restorative" sleep
- History is from caregiver
- Wide diversity in chief complaint
- Should be viewed as a symptom rather than a diagnosis

Pediatric Insomnia

- Most parents complain of sleep problems at some point in child's life
- "Night wakenings" most common complaint in infancy and early childhood
  - Most children can sleep through night by 6 months of age
  - 25-50% of children waken nightly requiring parental intervention

Pediatric Insomnia

- Bedtime refusal occurs in 10-30%
- Anxiety and trouble falling asleep occurs in 15-20% of adolescents

Pediatric Insomnia

- Between 3-7% of pediatric outpatient visits were reportedly due to insomnia

Pediatric Insomnias

- Behavioral insomnia
  - Sleep Association Type
- Behavioral insomnia
  - Limit Setting Type
- Psycho-physiological insomnia

Behavioral Insomnia of Childhood

- Sleep Onset Association Type
  - From the diagnostic criteria:
    - Based on the report of parents or other adult caregivers
    - Falling asleep is an extended process that requires special conditions

Behavioral Insomnia of Childhood

- Sleep-onset associations are highly problematic or demanding
- In the absence of the associated conditions, sleep onset is significantly delayed or sleep is otherwise disrupted

Behavioral Insomnia of Childhood

- Night time awakenings require caregiver intervention for the child to return to sleep
  - Not better explained by another sleep disorder, medical condition, neurological, metal disorder, or medication use

Nightwakenings

- 25-50% of 9-12 month olds awaken during the night and require parental intervention
- Recurrent, persistent events usually due to inappropriate sleep associations
- Infants usually briefly arouse between 2-6 times per night

Nightwakenings

- May be due to extrinsic or intrinsic factors
  - Self-soothing skill
  - Neurodevelopmental factors
  - Illness

Nightwakenings

- Parental reactions often central to outcome
  - Children have brief arousals at night
  - Parental response to crying in night results in reinforcement or extinction of the event

Sleep Associations

- Sleep onset occurs in a particular setting
- The conditions required for sleep should be present throughout the night to facilitate soothing

BIC-SOA Type

- Child requires sleep regulation at sleep onset and to fall back asleep with nighttime awakenings without parental participation

BIC-SOA Type

- Children with BIC-SOA are not able to self soothe
  - Cry out in middle of night or visit parental bedroom
- Response helps to reinforce or reduce the behavior

Factors Associated with Awakenings

- Awakenings increase due to extrinsic and intrinsic factors
- Extrinsic:
  - Parental presence at sleep onset, co-sleeping, feeding child to sleep
  - Medical illness (GERD, URI)
  - Schedule changes (vacation)

Factors Associated with Awakenings

  - Parental anxiety, maternal depression
- Intrinsic
  - Insecure maternal-child attachment, anxiety

Self-soothing Skills

- Develop around 12 weeks of age
- Prior to this child should not be expected to sleep through the night on their own

Happiest Baby on the Block

- Central tenet:
  - Babies need a "4th trimester"
- Developed the 5 S's
  - Swaddling
  - Side (or stomach)
  - Shhh – Soothing sound
  - Swinging
  - Sucking
- The 6th S is sleep

If You Will Only Go To Sleep

The crimson rose plucked yesterday, the fire and cinnamon of the carnation, The bread I baked with anise seed and honey, and the goldfish flaming in its bowl, All these are yours baby born of woman, if you'll only go to sleep. A rose, I say And a carnation! Fruit, I say! And honey! And a sequined goldfish, and still more I'll give you if you'll only sleep till morning!

~ Gabriel Mistral

Behavioral Insomnia of Childhood

- Limited Setting Type
  - Characterized by noncompliant behaviors at bedtime
  - Seen most commonly in preschoolers

Behavioral Insomnia of Childhood

- Commonly caused by caregivers inability or unwillingness to set strict rules and enforce a bedtime
  - Worsened with oppositional behavior

Behavioral Insomnia of Childhood

- From the diagnostic criteria:
  - Based on the report of parents or other adult caregivers
  - Individual has difficulty initiating or maintaining sleep

Behavioral Insomnia of Childhood

- Individual stalls or refuses to go to bed at an appropriate time or refuses to return to bed following the nighttime awakening
- Caregiver demonstrated insufficient or inappropriate limit setting to establish appropriate sleeping behavior in the child

Behavioral Insomnia of Childhood

- Not better explained by another sleep disorder, medical condition, neurological, metal disorder or medication use

BIC-LST

- Etiologies of bedtime resistance:
  - Irrational fears due to imagination
  - Increase in separation anxiety
  - Medication use
    - Caffeine, prednisone
  - Medical illness
    - Asthma, RLS

BIC-LST

- Intrinsic circadian preference
- Personalities
  - Defiant child, permissive parenting style

Epidemiology

- Disorder of mainly young children (0-5 years)
- Lack of good definitions for research

Epidemiology

- Prevalence studies
  - 20-30% of US children have significant bedtime refusal or awakenings
  - Up to 50% of infants continue to have awakenings beyond 6 months
  - Bedtime resistance in 15-20% of toddlers

Clinical Assessment

- Diagnosis of BIC based on parental report
- Comprehensive evaluation including
  - Current sleep pattern
  - Sleep duration
  - Sleep/wake schedule
  - Sleeping arrangements

Clinical Assessment

  - Bedtime routine
  - Parental behavior and responses
- Medical evaluation for sources of pain or reflux

Treatment

- Based on the AASM Practice Parameters 2006
- Behavioral interventions are effective and are the recommend treatment of BIC
  - Based on 52 studies (9 RCT)
  - 94% demonstrate behavioral intervention resulted in clinically significant improvement

Behavioral Interventions

- Unmodified extinction
- Graduated extinction
- Positive routines/faded bedtime with response cost
- Scheduled awakenings
- Parent education/prevention

Unmodified Extinction

- First studied in 1959 by Williams
- Child is placed to bed at a set bedtime
- Child is ignored until morning
  - Parents monitor child for safety or illness

Unmodified Extinction

- Goals
  - Eliminate parental response as a reinforcer
  - Teach self-soothing skills

Graduated Extinction

- Devised by Rolinder and Van Houten in 1984
- Parents ignore bedtime crying and tantrums for pre-determined time periods before briefly checking on the child
  - Progressive or fixed checking schedule is used

Graduated Extinction

- Goal
  - Develop self-soothing skills and fall asleep independently without inadequate sleep associations

Richard Ferber, MD

- Published in 1985
- Targets infants at 4 months and up

Ferber

- Ferber method
  - Fixed bedtime routine
  - Laying child down awake but drowsy
  - Graduated extinction
- Criticized for "crying it out" and emotional scarring

Attachment Parenting and "No-cry Sleep Solution"

- Two key references
  - Baby Sleep Book (William Sears)
  - Secrets of the Baby Whisperer (Tracy Hogg, RN)
- Not referenced in the current AASM guidelines

Extinction with Parental Presence

- Similar to graduated extinction
  - Child placed in bed drowsy and allowed to cry
  - Parents remain in the room, but comfort after progressively longer durations

Extinction with Parental Presence

- Procedure more popular in England, but rising in popularity in U.S.
- Four studies of 290 children found it to be effective

Positive Bedtime Routine

- Developing a set bedtime routine that is enjoyable, quiet activities to establish a "bedtime behavior chain" to sleep onset
- First described by Milan in 1981

Positive Bedtime Routine

- Two studies since:
  - Conclude this is rapid and effective
  - May reduce the post-extinction burst

Faded Bedtime with Response Cost

- Temporarily delaying bedtime to coincide with child's natural sleep onset
  - Then fading earlier as child get "better" at falling asleep

Faded Bedtime with Response Cost

- Response cost
  - Taking the child out of bed for prescribed, brief periods if child does not fall asleep
- Behavioral underpinning is sleep restriction and stimulus control
  - Similar to adult insomnia treatment

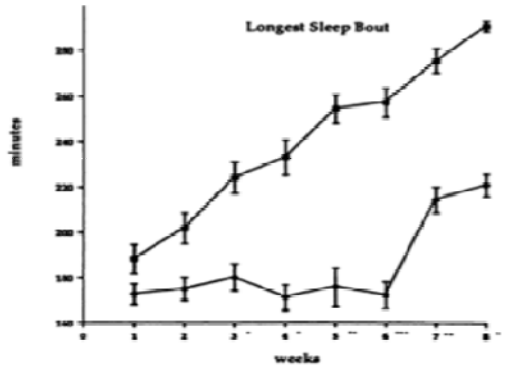
Scheduled Awakening

- Described by McGarr and Hovell in 1980
- Parents pre-emptively wake child prior to a typical nocturnal awakening and providing the usual response as if child had woken spontaneously

Scheduled Awakening

- Requires documentation of typical awakening time
- May not be acceptable to parents

Parent Education and Prevention



Parent Education and Prevention

- Based on 5 large studies
- Parents receive education about sleep education and prevention strategies during the first 6 months of life

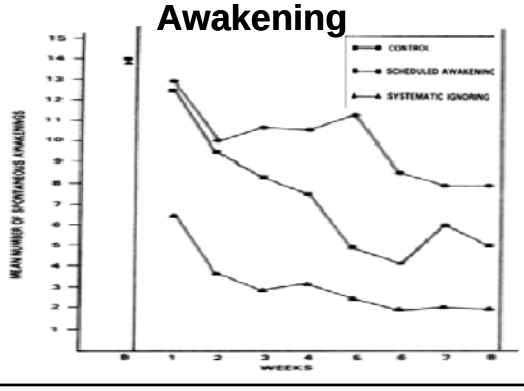
Effectiveness of Behavioral Interventions

- 94% of studies report clinically significant reductions in bedtime resistance and night awakenings
- 11 studies (RCT) demonstrates strong support for
  - Extinction
  - Parental education/prevention

Effectiveness of Behavioral Interventions

- Support shown for:
  - Graduated extinction
  - Scheduled awakenings
  - Bedtime fading

Extinction vs. Scheduled Awakening



Extinction vs. Scheduled Awakening

- 33 infants randomly assigned to group
  - Extinction, scheduled awakening, or control

Sleep Associations Substitutions

- Transitional objects can be used
- Must be an object that will remain with the child during the duration of the night

Psychophysiologic Insomnia

- Often referred to as "insomnia"
  - May be at sleep initiation or sleep maintenance
- Occurs in older children, adolescents, adults

Psychophysiologic Insomnia

- Characterized by:
  - Learned sleep preventing associations
  - Heightened physiological arousal
- Complaint of daytime sleepiness

Diagnosis of Psychophysiologic Insomnia

- Insomnia present for at least 1 month
- Meets criteria for insomnia
- Patient has evidence of conditioned sleep difficulty or heightened arousal in bed as indicated by one or more of the following:

Diagnosis of Psychophysiologic Insomnia

- Excessive focus on and heightened anxiety about sleep
- Difficulty falling asleep in bed at the desired bedtime or during planned naps, but no difficulty falling asleep during other monotonous activities when not intending to sleep

Diagnosis of Psychophysiologic Insomnia

- Ability to sleep better away from home than at home
- Mental arousal in bed characterized by either intrusive thoughts or a perceived inability to volitionally cease sleep-preventing mental activity

Diagnosis of Psychophysiologic Insomnia

- Heightened somatic tension in bed reflected by perceived inability to relax the body sufficiently to allow the onset of sleep

• Not better explained by another sleep disorder, medical or neurological disorder, mental disorder, medication, or substance abuse

3 "P's" of Pediatric Insomnia

• Predisposing
  - Genetic vulnerability
  - Underlying medical illness
  - Personality traits
• Precipitating
  - Stress

3 "P's" of Pediatric Insomnia

• Perpetuating
  - Poor sleep habits
  - Caffeine use
  - Maladaptive cognitions about sleep

Poor Sleep Habits

• Excessive time in bed
• Blue light exposure
• Daytime napping
• Irregular sleep-wake exposure
• Caffeine use

The 24/7 Lifestyle

- 100 adolescents (12-18 years old) in Philadelphia studied 2007-2008
  - Median household income $53,000
    - 66% had TV in bedroom
    - 90% had cell phone
    - 79% had MP3 player
  - Engage in 4 electronic activities after 9:00 pm

The 24/7 Lifestyle

- 85% report drinking caffeine
  - Median intake 144 mg
    - 27% less than 100 mg/day
- Sleep
  - 79% had <8 hours sleep
  - 33% fell asleep during school

Maladaptive Sleep Cognitions

- Beliefs and attitudes about sleep and the consequences of missed sleep that are incorrect and limit relaxation prior to sleep
  - "I will never be able to fall asleep tonight."
  - "If I don't fall asleep, I will sleep through my alarm, miss my test, and fail the 11th grade."

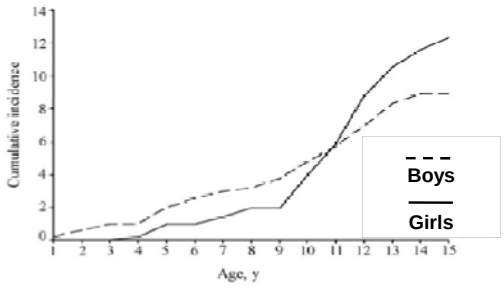
Epidemiology of Psychophysiologic Insomnia

- Studied 1,014 adolescents (13-16 years)
  - 11% met DSM-IV criteria for insomnia over lifetime
    - 12% reported difficulty initiating sleep
    - 5% reported difficulty maintaining sleep

Epidemiology of Psychophysiologic Insomnia

- 8% reported non-restorative sleep
  - Prevalence was 9%
  - Increased insomnia with lower SES

Epidemiology of Psychophysiologic Insomnia



Differential Diagnosis

- Transient insomnia
- Delayed sleep phase
- Inadequate sleep hygiene
- RLS/PLMS
- OSA

Differential Diagnosis

- Psychiatric disorder
  - Anxiety
  - Depression
- Asthma, allergies
- Headaches

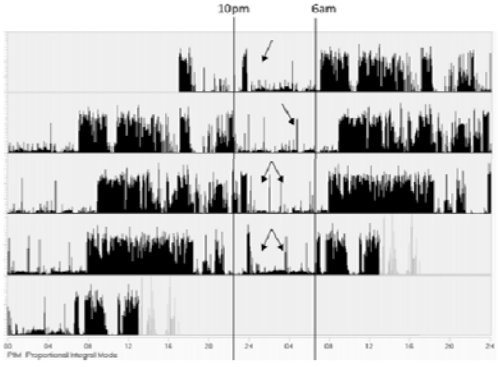
Diagnostic Aids

- Sleep diaries
  - Demonstrate prolonged sleep onset and nighttime awakenings
- Actigraphy
  - Document prolonged periods of wakefulness
  - May see sleep state misperception

Diagnostic Aids

- Polysomnography
  - Not indicated

Diagnostic Aids



Treatment

- Behavioral interventions
  - Sleep hygiene
  - Stimulus control
  - Sleep restriction
  - Cognitive restructuring
  - Relaxation
- Medications

Sleep Hygiene

- Sleep in a cool, dark, quiet environment
- Consistent sleep schedule
- Avoid naps
- Avoid caffeine
- Remove electronics from the room
- Relaxing bedtime routine
- Consistent morning wakening

Stimulus Control

- Stopping activities in bed that are not conducive to sleep
  - Television, computer, homework, worrying
  - Cues for wakefulness not sleep
- Use bed only for sleeping

Stimulus Control

- Go to bed when drowsy
  - If not asleep within 15-20 minutes, get out of bed
  - Do a quiet, non-stimulating activity

Sleep Restriction

- Limit the time in bed to 6-7 hours
  - Allows consolidation of sleep, disrupt previous sleep associations
  - Set initial restriction to the amount of sleep

Sleep Restriction

- Keep accurate record of time in bed and time asleep
- Once sleep efficiency greater than 85%, increase time in bed

Cognitive Restructuring

- Cognitive-behavioral technique
- Teaching to counter inappropriate thoughts
- Three-step process
  - Identify the inappropriate sleep cognition

Cognitive Restructuring

- Challenging validity of sleep cognition
- Replacing thought with a more productive one

Relaxation

- Learned strategies to help cope with anxiety, stress, or intrusive thoughts
  - Progressive muscle relaxation
  - Deep breathing exercises
  - Visual imagery
  - Biofeedback
  - Meditation

Inpatient Insomnia

- Multi-center study
  - Found 6% of all hospitalized children (3% of all children excluding psychiatric disease) were given medication for insomnia in hospital

Inpatient Insomnia

Medication	Percentage given (ALL)	Percentage given (No psych)
α-agonist	10.4%	4.5%
Antidepressant	5.9%	3.0%
Antihistamine	36.6%	39.1%
Antipsychotic	16.4%	3.4%
Benzodiazepines	19.4%	38.0%
Chloral hydrate	4.0%	7.1%
Nonbenzodiazepines	2.2%	2.3%
SSRI	5.1%	2.6%

Outpatient Use of Hypnotics

- Survey mailed to 3,424 members of AAP in 6 U.S. cities
  - 3-7% of visits were due to insomnia
  - Percentage of physicians who reported using these medications for insomnia in past 6 months

Outpatient Use of Hypnotics

Medication	0-2 y	3-5 y	6-12 y	≥13 y	Any age
α-agonist	2	11	28	19	31%
Antidepressant	-	1	7	15	16%
Antihistamine	16	17	19	15	29%
Antipsychotic	0.45	1	5	5	8%
Benzodiazepines	1	2	7	9	12%
Chloral hydrate	7	6	6	2	12%
Nonbenzodiazepines	-	-	1	8	8%

Medications

- There are currently no medications approved by the Food and Drug Administration for the treatment of insomnia in children or adolescents
- British National Formulary
  - "The prescribing of hypnotics to children…is not justified."

Off-label Information Ahead

Medications Used for Insomnia

- Melatonin
- Clonidine
- Antihistamines
- Benzos
- Non-benzos

Melatonin

- Hormone secreted by pineal glandin response to darkness
- Entrains the circadian rhythm
- Mild hypnotic
- Level peaks 1 hour after administration

Melatonin

- Effects in normally developing children
  - Improve sleep latency and quality of life
  - No impact on total sleep time

Melatonin

- Potential side effects
  - Suppression of hypothalamic-goandal axis, increased reactivity of immune system

Melatonin

- In children with epilepsy, autism, and learning disability
- Meta-analysis showed improved sleep latency and total sleep time

Melatonin

- Placebo controlled trial of 5mg in children with neurodevelopmental delay
  - Improved sleep onset by 30 minutes
  - Improved total sleep time
  - Decrease in awakenings

Clonidine

- α2-agonist: decreases adrenergic tone
  - Onset in 1 hour, peak in 2-4 hours
  - Shorten sleep latency in ADHD
  - Decrease in REM and SWS
  - Tolerance may develop

Clonidine

- Side effects
  - Hypotension, bradycarda, irritability, dysphoria, anticholinergic effect, rebound hypertension
  - Avoid in patients with Raynaud's or diabetes
  - Narrow therapeutic window
    - Cardiotoxicity

Antihistamines

- Most commonly prescribed meds for insomnia
- Acts on central histamine receptors
- Rapid absorption

Antihistamines

- Potential side effects
  - Anticholinergic effect
  - Daytime drowsiness
  - Paradoxical excitation
  - Tolerance occurs

Antihistamine Efficacy

- 1976 study
  - Demonstrated a small reduction in sleep latency, decrease in awakenings, total sleep time with a 1 mg/kg dose

Antihistamine Efficacy

- Trial of Infant Response to Diphenhydramine (TIRED) Study (2006)
  - 44 children from 6 to 15 months
  - 1 mg/kg prior to bedtime
  - No difference between diphenhydramine and placebo in reducing night awakenings

Benzodiazapine Receptor Agonists

- Act at γ-aminobutyric acid receptor
- Acts to shorten sleep latency
- Increases total sleep time
- Improve non-REM sleep maintenance

Benzodiazapine Receptor Agonists

- Risk of habituation, compromised daytime function, and addiction
- Very limited use in children and adolescents

Nonbenzodiazepine Receptor Agonists

- Preferentially bind to GABAA receptor complex with α1-subunits
- Sleep impact
  - Decrease sleep latency
  - May increase SWS

Nonbenzodiazepine Receptor Agonists

Medication	Half-life	Side Effects
Zaleplon	1 hour	Anterograde amnesia, confusion, hallucination
Zolpidem	2-3 hours	Parasomnias, hallucination
Ezopiclone	6 hours	Unpleasant taste, headache

Impact on Family

- Maternal depression has been linked to poor infant sleep
  - As many as two-thirds of mothers with depression report an infant sleep problem at 6-12 months
  - Independent risk factor for maternal depression
    - Odds ratio of 2.13 (CI 1.27-3.56)

Impact on Family

- Marital satisfaction improves as infant sleep improves
- Childhood insomnia is linked to decreased readiness for school
- Childhood insomnia is linked to increased familial stress

Impact on Family

- Behavioral intervention to improve child sleep associated with improved parental satisfaction
  - Parents report improved interaction with their children, more time to spend with spouse/significant other, less bedtime struggles with child

A Family's Perspective on Sleep

A Discussion with Ellie Frederick, Parent of a Child with Insomnia

Books of Insomnia

- For Families and Caregivers
  - Owens, J and Mindell J. (2005) Take Charge of Your Child's Sleep. New York: Marlowe
- For Healthcare Professionals
  - Mindell J and Owens J. (2010) A Clinical Guide to Pediatric Sleep: Diagnosis and Management of Sleep Problems. Philadelphia, PA