Common Sleep Problems Through the Years

- Infant not sleeping
- Toddler won’t go to bed
- 3rd grader snores like a freight train
- 10 year old has worms crawling up legs
- Teenager can’t wake for school
- College student spinning wheels

Jane - Presentation

- 10 month old girl
- Mom has always held and nursed her to sleep at the beginning of the night, then places her in the crib around 7:30pm
- Wakes 2-4 times per night, usually starting around 10pm
- Mom nurses her back to sleep for the first couple of awakenings, and then spends the last half of the night in parent’s bed

Jane - Evaluation

- Bedtime routine
- Sleep schedule
- Physiologic sleep disorders
- Developmental history
- Family history and culture
- Medical factors

Bedtime Routine

- Present?
- Conditions for sleep
- Simple, easy, consistent
- Infants
- Age-appropriate bedtime
- Sleep environment

Bedtime Routine

Mindell JA et al, 2015
**Bedtime Routine**

- Duration of night-wakings (minutes)
  - Infants/ Toddlers
  - Preschoolers

---

**Sleep Schedule**

- Entire 24-hour period
- Start at dinner
- Activities leading up to routine
- Routine
- Weekdays vs weekend
- In bed vs asleep time
- Nightwakings
- Waketime
- Naps

---

**Sleep Schedule Milestones**

- Newborns: shorter periods of sleep throughout day and night; 12-18 hours
- 1-4 months: survival mode
- 4-6 months: sleep consolidates; 10-12 hours at night and 2-3 naps during the day
- 1 year: 10-12 hours at night and 1-2 naps
- 1-3 years: 1 afternoon nap, switching from crib to bed around 3
- 3-5 years: 9-10 hours total, drop nap

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**Sleep Schedule**

- Total sleep duration
  - Graph showing sleep duration over age
Night Feeds
- By 6 months of age infants no longer physiologically require nighttime feed
- Dream feed

Physiologic Sleep Disorders
- Obstructive sleep apnea
  - Snoring, witnessed apneas, gasping arousals
- RLS/PLMD
  - Leg discomfort at bedtime
  - Frequent leg kicking, twitching, jerking
- Narcolepsy
  - Sleep paralysis, hallucinations, cataplexy

Family History
- Medical problems
- Sleep disorders
- Developmental disorders
- Parental anxiety or mood disorder

Medical Factors
- Teething
- Otitis media
- Reflux
- Eczema
- Epilepsy
- Neurologic disorders

Jane – FIX IT !!!
DX: Sleep-onset associations
TX: Behavioral interventions
- Standard extinction
- Graduated extinction with parental presence
- Graduate extinction without parental presence

Standard Extinction
- Consistent routine
- In crib awake, leave
- Ignore protests
- Ignore awakenings
- Works in 3-4 days
- Extinction burst
Graduated Extinction without Parental Presence

- Consistent routine
- In crib awake, leave
- Check at set intervals
- Increase interval time
- Brief, boring
- Works in 1-2 weeks

Graduated Extinction with Parental Presence

- Consistent routine
- In crib awake
- Parent stays until child is asleep
- Provide verbal reassurance
- After 3-5 nights, move further from crib each night
- Works in 1-2 weeks

Contraindications to Sleep Training

- <6 months age
- Medical conditions that may be worsened by prolonged crying, such as severe reflux, reactive airway disease, epilepsy
- Children with history of severe anxiety or trauma

Sleep Training & Abandonment

"Will sleep training cause harm to a child’s emotional development and mental health?"

Sleep Training & Abandonment

**NO, IT WON’T**

Five-Year Follow-up of Harms and Benefits of Behavioral Infant Sleep Intervention: Randomized Trial

**WHAT'S KNOWN ON THIS SUBJECT:** Behavioral techniques are efficacious in reducing infant sleep problems and associated maternal depression in the short to medium-term. In a 38-month follow-up study, despite their effectiveness, behavioral outcomes were not maintained. Parents and health professionals can feel comfortable about using behavioral techniques to reduce the association between infant sleep problems and maternal depression.

**WHAT THIS STUDY ADDS:** Behavioral sleep techniques did not reduce pediatric sleep problems, but they did reduce maternal sleep problems. The benefits of these interventions may persist in the long term, as suggested by the follow-up data, and further research is needed to determine the long-term effects on sleep outcomes.
Sleep Training & Abandonment

- Sleep training resulted in:
  - Falling asleep faster
  - Waking up less
  - Lower cortisol levels
  - Decreased maternal stress
  - No changes in attachment/emotional problems at 1 year follow-up

Co-Sleeping

- Unsafe in children <1 year
- Room-sharing without bed-sharing
- Proactive versus reactive
- Cultural and SES factors

Safe Sleep Practices

- SIDS #1 cause of death
  age 1 month to 1 year
- Peak incidence 1 month
to 4 months
- ABCs of risk reduction

Safe Sleep Practices & Reflux

- Normal infants protect their airway after an episode of reflux
- Prone position does reduce reflux, but it also increases risk of SIDS
- Side positioning doesn’t reduce reflux and does increase risk for SIDS
- Elevating head of the crib doesn’t reduce reflux and may increase risk for SIDS
- Non-supine position for GERD only if risk of death is greater than risk of SIDS

Pediatrics 2011;128:e1341–e1367

Safe Sleep Practices & Reflux

- Nursing was moved earlier in bedtime routine and
done in the living room
- Put down awake in crib
- Dream feed
- Check-back method
- Own crib and safe sleep education

Jane – FIX IT !!!

- Nursing was moved earlier in bedtime routine and done in the living room
- Put down awake in crib
- Dream feed
- Check-back method
- Own crib and safe sleep education
**Chris – Presentation**

- 3 year old boy
- Refuses to go to bed for the last year, after being moved from crib to bed
- Routine starts at 7 PM, lasts 2-3 hours
- Asks for another book, potty, water, etc
- Will only go to sleep if parent stays in room
- Parent tries to sneak out but he awakens and throws a tantrum

**Chris - Evaluation**

- Bedtime routine
- Sleep schedule
- Physiologic sleep disorders
- Developmental history
- Family history and culture
- Medical factors

**Bedtime Resistance & Limit setting**

- Bedtime stalling
- Circadian factors - The Night Owl
- Homeostasis - Nap transitions
- Associations - Ending the night with parental presence

**Chris – Treatment Menu**

- Bedtime chart
- Bedtime fading
- Removing parental presence
- Bedtime pass

**Bedtime Chart**

- Create a picture chart/book of the bedtime routine
- The routine should be short, moving towards the bedroom, and end in the child’s room
- Have the child take pictures of each step, print them, and put them on poster board
- Stick to the chart every single night
- Check each step off, and use a timer to keep on track
- When resistance is encountered, blame the chart and move on!

Source: Autism Treatment Network
Bedtime Fading

- What time is the child actually falling asleep?
- Delay bedtime routine until about 30 mins prior
- Once falling asleep consistently for about a week within
  30 mins, advance bedtime 15 mins every other night until
  goal is reach
- Keep the same waketime, even on the weekend

“Take a Break”

- Increase duration of parental absence
- How long does it take child to fall asleep with parent
  present?
- Have the parent stay for 1/2 that usual time, then start
  taking short breaks with excuse
- Upon returning, provide praise or token reward
- Increase break interval on successive nights

Bedtime Pass

- Start with one or several bedtime pass
  allowances per night
  The child turns in the pass if they
  leave the room at night
- Left over passes can be exchanged for
  small prizes in the morning
- Decrease the number of passes per
  night over time

Positive Reinforcement ≠ Bribe

- Parents don’t like the idea of a bribe
- A bribe is given ahead of time (eg $ to juror)
- A reward is given after the fact to reinforce
  wanted behavior (eg paycheck)
- Rewards should be simple and focus on
  interaction (family game, movie night) instead of
  food or expensive toys

Cribs to Beds

- Cribs are your friend, try to use
  them until age 3
- Set up new bed in the child’s room
  next to crib
  If they get out of bed, then they will
  be placed in crib the rest of the
  night
  Leave crib in room for about 2
  weeks as reminder
  Good morning light can be helpful

Cribs to Beds

- Some children learn to climb out of
  their cribs
- Is the mattress at lowest setting?
- Are there objects they can climb
  on (large stuffed animals)?
- May need to transition for safety
Nap Transitions

- Most children drop nap around age 4 to 5 years
- Continuing a nap affects sleep pressure, and therefore bedtime
- Some children will be cranky in the afternoon without their nap, but fall asleep without difficulty at night
- Others will benefit during the day from the nap, but have a later bedtime as a result

When should we get a sleep study?

- Symptoms suggestive of physiologic sleep disorder (eg OSA, PLMD)
- Behavioral insomnia unresponsive to therapy

When should we use meds?

- Vast majority of children do not require
- Not first line or FDA approved
- Consider in children with comorbid neurodevelopmental disorders and severe sleeplessness
- Use in combination with behavioral interventions
- Use in a time-limited fashion

Resources for Providers - Behavioral Interventions

Chris - Treatment

- Bedtime chart constructed and instituted
- New bedtime 9:30pm
- Parent initially staying in room and performing “Take a Break” drill
- After 2 weeks bedtime was faded to 8pm and falling asleep independently

Alvin – Presentation

- 5 year old healthy male
- Snorrs, snorting arousals
- Hyperactive, grouchy
- 3+ tonsils
Pediatric OSA

- Prevalence 1-5% children
- May cause problems with learning, growth, and cardiovascular morbidity
- Risk factors: AT hypertrophy, obesity, syndromes
- TX: 1st line T&A

OSA – Beyond T&A

- CPAP
- Weight loss
- Rapid maxillary expander
- Anti-inflammatory medications
- Myofascial reeducation
- Positional therapy

Preoperative Sleep Study for T&A

AAP

Key Action Statement SR: Polysomnography
If a child or adolescent snores on a regular basis and has any of the complications or findings shown in Table 2, clinicians should either (i) obtain a polysomnography (Sleepiness Quality I, Key Action statement: Recommendations) or (ii) refer the patient to a sleep specialist or otolaryngologist for a more extensive evaluation (Sleepiness Quality II, Key Action statement: Recommendations). Marcus C et al, 2012

Preoperative Sleep Study for T&A

AAO-HNS

Table 1, Summary of Action Statements for PSG

<table>
<thead>
<tr>
<th>Statement</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Indications for PSG</td>
<td>Before performing tonsillectomy, the clinician should offer children with SDB for PSG if they exhibit any of the following: obesity, Down syndrome, craniofacial abnormalities, neurobehavioral disorders, sleep onsets, or neurodevelopmental delay. The clinician should advocate for PSG prior to tonsillectomy for SDB in children with any of the cardinalities listed in statement 1 for whom the need for surgery is uncertain or when there is discordance between history or physical examination and the reported severity of SDB.</td>
</tr>
</tbody>
</table>

Primary Snoring vs OSA

- Is this a clinically important distinction?
  - Difference in associated morbidity?
  - Differential response to therapy?

Primary Snoring vs OSA

5- to 7-year-old children from the community (n=1,010)
Primary Snoring vs OSA

5-to-7 year old children from the community (n=1,022)

<table>
<thead>
<tr>
<th></th>
<th>No snoring or OSA</th>
<th>Primary snoring</th>
<th>Mild OSA (AHI 1-5)</th>
<th>Moderate/Severe OSA (AHI&gt;5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4/C3 Electromyogram</td>
<td>52.0±4.1 (97)</td>
<td>57.2±4.1 (94)*</td>
<td>55.6±4.1 (97)</td>
<td>55.8±4.1 (98)*</td>
</tr>
<tr>
<td>delta</td>
<td>58.9±4.0 (95)</td>
<td>61.3±4.0 (94)*</td>
<td>58.2±4.0 (96)</td>
<td>61.8±4.0 (95)</td>
</tr>
<tr>
<td>Total</td>
<td>54.3±2.1 (94)</td>
<td>57.2±2.1 (94)*</td>
<td>57.5±2.1 (98)</td>
<td>57.2±2.1 (96)*</td>
</tr>
<tr>
<td>C4/C3 Electromyogram</td>
<td>0.0±1.0 (97)</td>
<td>0.0±1.0 (95)*</td>
<td>0.0±1.0 (97)</td>
<td>0.0±1.0 (98)*</td>
</tr>
<tr>
<td>delta</td>
<td>0.0±1.0 (95)</td>
<td>0.0±1.0 (94)*</td>
<td>0.0±1.0 (96)</td>
<td>0.0±1.0 (95)</td>
</tr>
<tr>
<td>Total</td>
<td>0.0±1.0 (94)</td>
<td>0.0±1.0 (94)*</td>
<td>0.0±1.0 (98)</td>
<td>0.0±1.0 (96)*</td>
</tr>
<tr>
<td>SWA</td>
<td>0.0±1.0 (97)</td>
<td>0.0±1.0 (95)*</td>
<td>0.0±1.0 (97)</td>
<td>0.0±1.0 (98)*</td>
</tr>
<tr>
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<td>0.0±1.0 (96)*</td>
</tr>
</tbody>
</table>

Data are presented as means. C4/C3: Child Behavior Checklist - Result (C4/C3); Attention-deficit/hyperactivity disorder: COPS-R: Connors’ Parent Rating Scales - Result (COPS-R); Diagnosis and Statistical Manual of Mental Disorders. Report (values are adjusted using Bonferroni’s correction). * Group 2 is significantly more impaired than Group 1 at p<0.05. † Group 2 is significantly more impaired than Group 3 at p<0.05.†† Group 4 is significantly more impaired than Group 3 at p<0.05.

Smith et al, 2016

PSG Metrics & Clinical Symptoms

Rosen C et al, 2015

Primary Snoring

- RCT of T&A for mild sleep-disordered breathing (Clinical SDB with OAHI<2)

Goldstein N et al, 2004

Work of Breathing

Esophageal pressures, polysomnography, and neurobehavioral outcomes of adenotonsillectomy in children

Goldstein N et al, 2004

Alternative Measures

- Esophageal manometry
- Pulse transit time
- Urine/blood/breath biomarkers
- Home sleep studies
- Sonomat

Norman et al, 2014
Mild OSA Candidates

- Role of intranasal steroids and leukotriene inhibitor for children with non-severe OSA
- PSG may allow one to identify children who are candidates for medical rather than surgical therapy

Flonase for Mild OSA

- Gozal & Gozal, 2008

Singulair For Mild OSA

- Goldbart A et al, 2012

Reasonable Approach

- Ingram & Friedman, 2015
- Rubinstein & Baldassari, 2015

Postoperative Sleep Study

- Persistent symptoms
  - High risk of incomplete resolution
    - Severe preoperative disease
    - Obesity
    - Craniofacial anomalies
    - Down syndrome
Special Populations

- Down syndrome
  - 50-80% prevalence OSA
  - PSG by 4 years old
- Prader-Willi syndrome
  - 80% prevalence OSA
  - PSG prior to GH initiation
- Achondroplasia
  - PSG at time of diagnosis
  - At risk for OSA, hypoventilation (restrictive lung physiology), and CSA (compression of medulla from foramen magnum stenosis)
  - CSA may contribute to the 2-5% rate of unexpected infant deaths

Preparing a Family

- Tour of the lab, video
- Training kit
  - Pulse ox → paper tape
  - Leads → stickers
  - RIP belts → gauze
  - Thermister/flow sensor → nasal cannula
- Formal desensitization
  - With consistent practice, virtually all children have been successfully prepared to complete sleep studies

Setup and Measures

- EEG
- EOG
- Chin EMG
- RIP belts
- Pulse oximeter
- ETCO2
- Nasal pressure transducer and thermister
- Limb EMG
- ECG

Scoring and Interpretation

Ingram DG et al, under review

Alvin – Treatment

- Sent to ENT for T&A
- Daytime and nighttime symptoms resolved
- No post-op sleep study

Bob – Presentation

- 10 year old male otherwise healthy
- Difficulty falling asleep because of leg symptoms:
  - “Want to move”
  - “Got to kick”
  - “Ants and bugs crawling on legs”
Restless legs syndrome

**RLS Criteria**
- Urge to move the legs
- Worse during rest
- Improved with movement
- Occur more often at night

**RLS Mimics**
- Positional discomfort
- Numbness
- Leg cramps
- Growing pains

---

Restless legs syndrome

- Prevalence 2-3% of children
- Etiology
  - ?Genes
  - ?Iron depletion
  - ?Dopamine synthesis
- Co-occurrence with ADHD ~25%
**RLS/PLMD and Iron**

- **Dose**
  - >6yo: Ferrous sulfate 45-65mg elemental Fe BID
  - <6yo: 3 to 6mg/kg/day elemental Fe divided BID

- Do take with vitamin C (juice)
- Do NOT take with dairy

**Bob - Treatment**

- **1st line:** Optimize body iron stores with supplemental iron - goal ferritin 50 to 100; lifestyle (adequate sleep, physical activity)
- **2nd line:** gabapentin
- **3rd line:** clonidine, clonazepam, mirapex/requip
- Increase physical activity
- Assess for contributors: insufficient sleep, caffeine, antihistamines, antidepressants

**Other RLS Treatments?**

- **Vitamin D**
  - Deficiency associated with RLS (Oran et al 2014; Balaban 2012)
  - Supplementation improves RLS symptoms (Wali et al 2015)
  - Low vit D → dopaminergic dysfunction → RLS
  - All adult data; ?children

- **Vibratory devices**
  - Under development
  - Data immature

**Phil - Presentation**

- 16 year old healthy male
- In bed at 10pm every night but over the last 2 years can’t fall asleep until 3am
- Mom tries to wake him for school but can’t get him up
- Finally wakes up around noon
- Missed so much school he is now home schooled

**Delayed Sleep Phase Syndrome**

- Circadian rhythm disorder
- Occurs in 16% of adolescents
- Inability to fall asleep at ‘normal’ time, but once asleep able to sleep without problems
- Associated with mood problems, suicidal ideation, poor school performance, isolation, job loss, substance abuse
- DSPS or insomnia?

**Phil - Treatment**

- **Chronotherapy**
  - Forwards
  - Backwards
  - Weekends

- **Bright light therapy**
- Melatonin
Wendy

- 20 year old healthy female
- Lights out 10:30pm, but wouldn’t fall asleep until 1am
- Spinning wheels in bed
- On the weekend stays up later but still takes her 2 hrs to fall asleep

Insomnia

- Sleep restriction and stimulus control
- When actually falling asleep?
- Needed waketime?
- 4 rules

Thank You!