Sleep Issues and Developmental Disabilities

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Speaker Disclosure

Speaking honorarium: Abbvie and Otsuka/Lundbeck Alliance.

Shareholder: Neurozone MSH.
Objectives

• Normal Sleep and Assessment Tools
• Autism Spectrum Disorders
• Down’s Syndrome
• Intellectual Disability
Normal Sleep Architecture and Assessment Tools
Sleep Architecture

• Two types of sleep: non-rapid eye-movement (NREM) sleep and rapid eye-movement (REM) sleep.

• NREM sleep is divided into stages 1, 2, and 3 (SWS), representing a continuum of relative depth.

• REM sleep is dream sleep.

• Each has unique characteristics including variations in brain wave patterns, eye movements, and muscle tone.
REM vs NREM Sleep

• NREM and REM sleep alternate cyclically during sleep periods.

• The function of alternations between these two types of sleep is not yet understood, but irregular cycling and/or absent sleep stages are associated with sleep disorders.

• Example: an abrupt shift from deep sleep to light sleep and wakefulness may cause night terrors.
NREM to REM Cycling

- Normal sleep begins with a short period of NREM stage 1 progressing through stage 2, followed by stages 3 and finally to REM.

- REM will cycle back to NREM sleep throughout the night.

- NREM sleep constitutes about 75 to 80 percent of total time spent in sleep, and REM sleep constitutes the remaining 20 to 25 percent.

- The average length of the first NREM-REM sleep cycle is 90 minutes. The second, and later, cycles are longer lasting (up to 120 minutes).
NREM to REM Cycling

• SWS is seen in the first third of the night.

• As the sleep episode progresses, stage 2 begins to account for the majority of NREM sleep, and SWS may sometimes altogether disappear.

• REM sleep increases as the night progresses and is longest in the last third of the sleep episode.
Sleep Assessment Tools

- Sleep Diary
- Sleep History
- Physical Examination
- Actigraphy
- Polysomnography
# Sleep Diary

**Instructions:**

1. Write the date, day of the week, and time of day: Work, School, Day Off, or Vacation.
2. Put the letter "C" in the box when you have coffee, cola, or tea. Put "M" when you take any medication. Put "A" when you drink alcohol. Put "E" when you exercise.
3. Put a line (|) to show when you go to bed. Shade in the box that shows when you think you fell asleep.
4. Shade in all the boxes that show when you are asleep at night or when you take a nap during the day.
5. Leave boxes unshaded to show when you wake up at night and when you are awake during the day.

**Sample Entry Below:** On Monday when I worked, I jogged on my lunch break at 1 PM, had a glass of wine with dinner at 6 PM, fell asleep watching TV from 7 to 9 PM, went to bed at 10:30 PM, fell asleep around Midnight, woke up and couldn’t go back to sleep at about 4 AM, went back to sleep from 5 to 7 AM, and had coffee and medicine at 7:00 in the morning.

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<thead>
<tr>
<th>Today’s Date</th>
<th>Day of the Week</th>
<th>Time</th>
<th>Type of Day</th>
<th>Work</th>
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<tr>
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<th>Today’s date</th>
<th>4/5/11</th>
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<tbody>
<tr>
<td>1. What time did you get into bed?</td>
<td>10:15 p.m</td>
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<td>2. What time did you try to go to sleep?</td>
<td>11:30 p.m</td>
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<td>3. How long did it take you to fall asleep?</td>
<td>55 min</td>
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<td>4. How many times did you wake up, not counting your final awakening?</td>
<td>3 times</td>
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<td>5. In total, how long did these awakenings last?</td>
<td>1 hour 10 min</td>
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<td>6. What time was your final awakening?</td>
<td>6:35 a.m</td>
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<td>7. What time did you get out of bed for the day?</td>
<td>7:20 a.m</td>
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<td>8. How would you rate the quality of your sleep?</td>
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<td>9. Comments (if applicable)</td>
<td>I have a cold</td>
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Sleep History

- “Do you have any concerns regarding your child’s sleep?”
- “Does your child take more than 30 minutes to fall asleep at bedtime?”
- “Once asleep, does he stay asleep?”
- “Does your child seem excessively sleepy during daytime?”
- “Have you heard your child snore or stop breathing during the night?”
Actigraphy

Worn on non-dominant hand

Cheaper and less cumbersome than PSG

 Likely higher compliance
Normal
Polysomnography
Polysomnography Measurements

- **Electroencephalogram (EEG)** – distinguishes between wakefulness and various sleep stages.

- **Electrooculogram (EOG)** – monitors eye movements.

- **Electromyogram (EMG)** – measures muscle tone on chin and limbs.

- ECG, airflow, video-recording, sound, effort of respiration, oxygen saturation, body positioning.
Polysomnography

- Gold standard assessment tool for sleep disorders
- Not well tolerated by all
- Home testing an option
Implication of Sleep Disturbances

• Sleep disturbances are a common problem in childhood – 25% in preschool and school-aged children

• Problems not only with children, but affects families. Increased parental stress, depression, poor marital relationships, and even child abuse
Epidemiology in DD Population

• Sleep problems occur in up to 89% of ASD children, 86% of ID children, and 65% of children with Down Syndrome.

• Sleep disturbances likely associated with behavioural and psychological problems in developmental disability population.
Summary

• Sleep divided into NREM and REM sleep.
• Evaluated by subjective and objective means.
• Sleep complaints common in young children.
• Even more common in developmental disabilities.
Autism Spectrum Disorders
ASD and Sleep Disturbances

- Insufficient sleep = worsening of core ASD symptoms
- Increased stereotypic behaviours, social, communication and cognitive difficulties
- Increased self-injury, non-compliance, irritability, tantrums and aggression
- Relationship of cognitive impairment and severity of sleep problems is mixed
ASD and Sleep Disturbances

- Appear to persist through lifetime.
- Most studies focused on high functioning ASD (greater communication and cooperation with PSG and actigraphy).
ASD and Sleep Problems

• Mixed phenotype = NO ONE TYPICAL SLEEP PROBLEM

• Sleep problems often go untreated.
Pathophysiology

- Disturbed reception to circadian rhythm entrainment - light, meal timing, social contacts.
- Disrupted melatonin secretion.
- Clock gene abnormalities.
- Comorbidities leading to sleep disruption: GI symptoms; epilepsy; anxiety, ADHD.
- Medications: SSRIs, antipsychotics.
Polysomnographic Findings

- Decreased REM sleep and TST
- Increased leg movements, SWS, and REM sleep latency
- Higher loss of REM atonia
ASD - Insomnia

- Prolonged sleep onset latency
- Increased wake after sleep onset
- Early morning awakenings
- May translate to increased bedtime resistance and excessive daytime sleepiness
Non-Pharmacological Treatments

Behavioural Therapy

• Parents overwhelmingly prefer non-medication treatments
Non-Pharmacological Treatments

• Sleep hygiene
• Setting appropriate bedtime and set routine
• Minimizing TV/LCD/LED exposure
• Reducing emotional and behavioural stimulation at night
Non-Pharmacological Treatments

• Elimination of association between sleep and prerequisite conditions (e.g. bottle of milk, co-sleeping, being on the couch).

• Structured behavioural program improved: pre-sleep disturbances, falling sleep alone, night waking and co-sleeping.
Non-Pharmacological Treatments

Bright light therapy

- AM exposure = advance sleep onset time
- PM exposure = delay sleep onset time
Melatonin

- Endogenous hormone secreted by the pineal gland
- Nocturnal secretion beginning at nightfall, peaking at 0300AM
- Secretion is suppressed by light (suprachiasmatic nuclei of hypothalamus)
- Major role: regulation of sleep (timing of sleepiness and circadian rhythm control)
Melatonin

• Sleep problems occur when melatonin secretion is disturbed.

• O’Hare et al; Kulman et al: low serum melatonin in autistic children

• Abnormally elevated night time melatonin levels in ASD - Malfunctioning melatonin function?
Melatonin 0.3 – 3mg

- Timing subject to debate
- Shortens sleep onset latency
- Increases total sleep time
- Does not affect midsleep awakenings
- ?Safe
- Unregulated food product
Clonidine 0.05 – 1mg

- Shortens sleep onset latency
- Decreases midsleep awakenings
- Caution re: rebound hypertension; in cardiac and depressed populations
Other Medications

Only in specific situations

- Sedating antipsychotics (olanzapine, quetiapine, risperidone) at bedtime in those with other indications
- Trazodone (beeware of priapism)
- ?zolpidem/zopiclone
Other Medications

Not recommended

- Benzodiazepines - higher chance of paradoxical effect, cognitive impairment, limited by tolerance
- Chloral hydrate
- Diphenhydramine (Benadryl), hydroxyzine
ASD - Parasomnias

Abnormal behaviours in sleep

- Night Terrors
- Confusional Arousals
ASD - Parasomnias

- 54% in children with ASD

Treatment

- Time
- Last resort: clonazepam at bedtime
- (Caution re: paradoxical agitation)
ASD – Circadian Rhythm Disorders

- Delayed Sleep Phase - associated with severe ASD.
- Irregular Sleep Wake Cycle - polyphasic sleep; early decrease in physiologic total sleep time.
- Advanced Sleep Phase - rare
ASD – Circadian Rhythm Disorders

Treatments

• Melatonin 0.3 – 3mg

• Bright light therapy

• Behavioural approaches – avoiding blue light; sound proofing
Future Research Areas

- Low functioning ASD
- Longitudinal studies - Sleep improves with chronological vs. developmental age
Trisomy 21: Down’s Syndrome
Myriad of Sleep Disturbances

- Bedtime resistance
- Increased parasomnias
- Excessive daytime sleepiness
- Increased sleep anxiety (improving with age)
- Midsleep awakenings (improving with age)
- Long sleep onset latency (improving with age)
OSA in Down Syndrome

• 50% have obstructive sleep apnea.

• Related to facial morphology and hypotonia.
OSA

Non-Obstructed Airway

Obstructed Airway
Facial Morphology

- Midface hypoplasia
- Retrognathia
Oropharyngeal Morphology

The Mallampati Score

CLASS I
Complete visualization of the soft palate

CLASS II
Complete visualization of the uvula

CLASS III
Visualization of only the base of the uvula

CLASS IV
Soft palate is not visible at all
Obstructive Sleep Apnea

- Cardiac Problems
  - Abnormal heart rhythms, heart attack and heart failure
- Stroke
  - High Blood Pressure
- Memory Problems and Inability to think correctly
- Impotence & Lack of Sex Drive
- Increased Insulin resistance
  - (Even in non-diabetic patients)
- Increased traffic and workplace accidents
Treatment

• Tonsillectomy and adenoidectomy
Treatments

CPAP Therapy
A potential life saving and changing option for the treatment of sleep apnea.
Before
Appearance of throat prior to UPPP surgery. Note the anatomy which is common to sleep apnea patients to include the large tonsils, long uvula and narrow arch behind the tonsils.

After
Appearance after UPPP surgery. The tissue in the front part of the throat is trimmed and the uvula is folded and sutured.
Summary

- DS highly associated with sleep apnea
- Testing is suggested for all patients if they snore
- Treatments in young people include surgery, CPAP in older population
Intellectual Disability
• 39% of adults with severe intellectual disabilities have insomnia

• Melatonin shown to decrease SOL and WASO

• Very few of these receive CBT-i and those that do have mixed results (studies are confounded by use of melatonin)
ID

- 34.6% of ID adults were obese (BMI > 30) vs. 20.6% from general population.

- 28.9% of ID adults were overweight (BMI 25 – 29.9) vs. 34.1% from general population.

- May exhibit disturbed circadian rhythms (esp. moderate to severe ID individuals)

- Obese patients more likely to have sleep disordered breathing and/or sleep-related hypoventilation
Summary

- ID associated with insomnia
- Melatonin best studied treatment
- Higher rates of obesity = need for greater apnea screening
References


References


