Improving sleep for families

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Learning Objectives
At the end of this session you will be able to:

- Understand the physiological and psychological processes of sleep
- Implement sleep assessment strategies
- Advise parents on techniques that can be easily implemented to improve sleep
  - infants, toddlers, adolescents
  - pregnancy, postpartum

Introduction

- Sleep serves restorative and reparative roles
- Loss of sleep affects physiological and psychological health
- Sleep disturbance has consequences for social and family health

Why care about sleep?

Sleep is extremely important for a child’s growth and development including:

- Behavioural regulation
  - Irritability/argumentativeness
  - Hyperactivity
- Emotions/mood
  - Low mood
  - Anxiety
  - Depression

Why care about sleep?

Sleep is extremely important for a child’s growth and development including:

- Cognitive functioning/school performance
  - Poor recall
  - Impaired problem-solving
  - Absenteeism
  - Low grades

Why care about sleep?

Sleep is extremely important for a child’s growth and development including:

- Growth and healing of tissue
- Immune function
  - Increased common illness
- Endocrine function/glucose regulation
  - Weight gain, obesity
  - Impaired glucose tolerance, type 2 diabetes
- Cardiovascular health
  - Increased blood pressure
Why care about sleep?

Sleep is extremely important for a child’s growth and development including:

- Risk-taking behaviour
- Smoking
- Substance use
- Accidental injury
- Drowsy driving

Normal Sleep Physiology

- There are two types of sleep
  - REM (Rapid Eye Movement)
  - Non-REM (Slow Wave Sleep)
- REM sleep stimulates the development of the brain by exciting neurons, synapses, and visual pathways
  - Newborns spend 50% of sleep in REM
  - 5 years old+ spend 25% of sleep in REM
- In NREM sleep, the body rests and restores itself

NREM Sleep

- 4 stages of NREM sleep are parallel to the ‘depth of sleep’
- Arousal threshold is lowest in stage 1, highest in stage 4

REM Sleep

- In REM sleep, there is paralysis or nearly absent muscle tone (except the control of one’s breathing)
- There is increased levels of brain activity
- Dreaming occurs during the REM portion of sleep

Stages of Sleep

One cycle through the stages lasts 60 minutes for a newborn and increases to 90 minutes for 5 year old+:

- Stage 1 - 10 minutes
- Stage 2 - 25 minutes
- Stage 3 and Stage 4: half of night = deep sleep
- REM: predominates in second half of night = dreaming
Brief arousals or awakenings commonly occur when we transition from deeper to lighter stages of sleep—we are often not aware of these awakenings, but infants and children may “signal” to their caregivers if awoken, we usually must go through the lighter stages of sleep before entering the deeper, restful stages.

Two-process model of Sleep Regulation (Borbely, 1982)

- Sleep is regulated by two simultaneous processes:

  **Process S**
  - Sleep propensity increases as waking accumulates and dissipates during sleep
  - The longer you are awake, the more sleepy you become – “sleep drive”

  **Process C**
  - Sleep propensity oscillates with a Circadian variation
  - approximately 24-hours in humans

Process C: Circadian Rhythm

- A self-sustained biological rhythm that is normally synchronized to a 24-hour period
- Evidenced by regular physical and mental changes occurring in a day
- Regulated by the body’s biological “clock”
- Affected by social and environmental cues

Biological Clock: SCN & Melatonin

- Suprachiasmatic nucleus (SCN) in the hypothalamus receives light input from the retinal hypothalamic tract
- Melatonin, a hormone that induces sleepiness, is produced in the pineal gland under the influence of the SCN
- Melatonin production is inhibited by light and permitted by darkness

Light during night suppresses Melatonin

- Exposure to bright light

- Plasma melatonin (pg/mL)

- Time of Day (hr)
Circadian Rhythm: Social & Environmental Cues

- Circadian rhythm affected by:
  - Regular nap and nighttime sleep times
  - Regular feeding times
  - Exposure to light and darkness
  - Temperature
  - Noise
  - Bedtime routines
  - Physical activity

How common are sleep problems for children?

- 20-30% of children from infancy to adolescence have sleep problems that are considered significant by the family

Sleep Loss in Children

Insufficient sleep (sleep deprivation) or Fragmented Sleep (sleep disruption) = Sleep Loss

Impact of Sleep Loss in Children

- Changes in mood and affect
- Presence of behavioural problems
  - internalizing (depression, anxiety)
  - externalizing (aggressiveness, hyperactivity, poor impulse control)
- Neurocognitive deficits
  - attention, memory, and executive functions
- Performance deficits
  - academic/social impairment
- Family disruption

Behavioral Insomnia of Childhood

- Conditions that are habitually presented at bed time and become required for infant/child to fall asleep
- Rocking/nursing to sleep
- Require parental intervention
  - 25-50% of 6-12 month olds
- Inadequate enforcement or complete absence of bed time limits
- Bedtime resistance – 10-30% of toddlers
- ‘Curtain calls’ – drinks, kisses, stories
Behavioural Insomnia of Childhood

- Night-time awakenings
- Delayed sleep onset, fearful behaviours
- Difficulties at nap time
- Daytime behavioural problems
- Family Discord

Sleep: the Basics

- Bedtime routine
  - Brief, enjoyable, relaxing
  - In the setting where sleep will occur
- Consistent bed and wake times (for naps too)
- Child is put to bed/ goes to bed awake/drowsy
- Avoid caffeine
- Bedroom = cool, dark, quiet
- Daytime exercise & sunlight

Safe Sleep for Infants

FACTORS PROTECTIVE AGAINST SIDS
- Breastfeeding
- Supine to sleep
- Sleeping on a firm surface
- Keep objects and loose bedding out of crib
- A separate but proximate sleeping environment
- Avoid maternal smoking during pregnancy
- Avoid overheating

See: RNAO BPG on Safe Infant Sleep

Sleep: the Basics

Consider:
- Cultural differences
- Family differences
- Room sharing
- Bed sharing
- Canadian Pediatric Society recommendations (see www.cps.ca and www.caringforkids.cps.ca)

Sleep Across the 1st Year of Life

<table>
<thead>
<tr>
<th>Amount of Sleep Needed</th>
<th>Characteristics of Sleep</th>
<th>Developmental Tasks and Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborns (0-2 months)</td>
<td>10.5-16 hrs</td>
<td>Irregular sleep patterns until about 3-4 weeks; multiple sleep periods in day and night; sleep is active (crying, sucking, body movement); avoid caffeine</td>
</tr>
<tr>
<td>Infants (3-6 months)</td>
<td>Night: 11-12 hrs nap; 3-4 hrs awake</td>
<td>Encouraging nighttime sleep; sleep pattern emerges; avoid for 1.5-2 yrs; keep infant busy</td>
</tr>
<tr>
<td>Infants (6-9 months)</td>
<td>Night: 10-12 hrs nap; 2-3 hrs awake</td>
<td>Avoid for 1.5-2 yrs; keep infant busy</td>
</tr>
<tr>
<td>Infants (9-12 months)</td>
<td>Night: 10-12 hrs nap; 2:3 hrs awake; 2-3 naps</td>
<td>Avoid for 2-3 yrs; keep infant busy</td>
</tr>
<tr>
<td>Toddlers (12 months)</td>
<td>Night: 10-12 hrs nap; 2:3 hrs awake; 2-3 naps</td>
<td>Avoid for 2-3 yrs; keep infant busy</td>
</tr>
</tbody>
</table>

Normal Developmental Changes in Sleep Architecture

- NEWBORNS (0-2 months)
  - 3 sleep states: active, quiet, indeterminate
  - Total sleep is 10-19 hours/day
  - Sleep periods separated by 1-2 hours awake
  - No day/night pattern in the first few weeks
Normal Developmental Changes in Sleep Architecture

- **INFANTS** (2-12 months)
  - Amount of active (aka REM sleep) decreases
  - Sleep cycles q50 minutes
  - Total sleep is 12-13 hours/day
  - Naps: 2-3 hours, decrease from 4 to 1
  - By 6 months no longer physiologically need a nocturnal feed

Common Sleep Problems in Infancy

- difficulty settling to sleep
- night awakenings

How Common Are Sleep Problems in Infants and Toddlers (aka night awakenings)?

- 25-50% of 6-12 month olds
- 30% of 12 month olds
- 15-20% of toddlers (1-3 year olds)

“Is your baby sleeping through the night?”

- Sleep regulation
  - Infants start to learn how to fall asleep on their own at bedtime
  - They also learn to fall asleep on their own during the night if they wake = “self-soothers”
- Sleep association
  - Infant typically falls asleep under certain conditions (e.g. while feeding, being rocked)
  - May be avoided by using “Sleep-Feed-Activity-Repeat”

Quick Tips for Newborns

- Observe the baby’s sleep patterns and identify signs of sleepiness
- When possible, put baby in the crib when drowsy, but awake
- A quiet and dark room at a comfortable temperature is best for sleep
- Differentiate between day and night
- Begin a bedtime routine

Quick Tips for Infants (3-12 months)

- Put baby in the crib when drowsy, but awake
- Establish a brief (15-30 minutes), enjoyable bedtime routine, in the place where sleep will occur
- Establish consistency in sleep and wake times for nighttime sleep and daytime naps
Normal Developmental Changes in Sleep Architecture

- **Toddlers** (1-3 years)
  - REM sleep amounts continue to decline
  - Total sleep is 11-13 hours
  - Naps: 2-3 hours, decrease from 2 to 1, around 18 months
  - Developmental issues arise in toddlers in relation to sleep = separation anxiety/cognitive development which leads to nighttime fears; mastery of independent skills which leads to power struggles

Sleep in Preschoolers

- The total amount of sleep a preschooler has each day is approximately 11-12 hours
- Naps are usually being eliminated by this age
- By 3 years of age, 92% of children still nap
- By 4 years of age, 57% of children still nap
- And by 5 years of age, 27% of children still nap

Sleep In Toddlers & Preschoolers

- Frequent night wakings may continue to be a problem
- Feeding at night
- Parental involvement in falling asleep
- Developmental issues arise in toddlers in relation to sleep
- Nighttime fears
- Need for independence may lead to power struggles & need for limit setting

Sleep Assessment

- **Sleep Habits**
  - Chief Complaint
  - Sleep Schedule
  - Bedtime Routine
  - Nocturnal awakenings
  - Nocturnal behaviors
  - Symptoms of sleep disordered breathing
- **Daytime Function**
  - Morning symptoms
  - Daytime sleepiness
  - Naps, ? refreshing
  - RLS Screen
  - Narcolepsy Screen
  - Mood Instability
- **Other**
  - Past Medical History
  - Family History
  - Developmental History
  - Transitions/Changes/ Social History
  - Medications
  - Review of Systems

Sleep Diary

- **BEARS** Sleep Screening Algorithm for the most common sleep issues:
  - Bedtime Problems - difficulty going to bed, falling asleep;
  - Excessive Daytime Sleepiness - includes associated behaviors;
  - Awakenings during the night;
  - Regularity of sleep/wake cycles (bedtime, wake time) and average sleep duration;
  - Snoring

Evaluation of Sleep

Sleep in Early Infancy: focus on prevention

**Bedtime problems:**
- Never too early to begin a short bedtime routine.
  - 15 to 30 minute series of predictable events.
  - Bath, massage, rocking in a chair and reading a book, cuddling, singing a song, or whatever else parent might enjoy.

Sleep in Early Infancy: focus on prevention

**Excessive daytime sleepiness:**
- Crying and fussing can be signs of fatigue.
  - Early signs = zoning out, fussing, yawning, pulling ears, rubbing eyes, pushing you away
  - Late signs = crying (if not hunger, diaper, etc)

Sleep in Early Infancy: focus on prevention

**Awakenings during the night:**
- How does baby fall asleep?
  - Held, rocked, swing, stroller, bouncy chair, on mum’s chest, etc?
- Falling asleep at the breast? Snacking?
  - An association between feeding and sleep may develop
  - Need to implement “Sleep-Feed-Activity-Repeat”

Sleep in Early Infancy: focus on prevention

**Awakenings during the night:**
- Waking the baby to feed?
  - May not be needed if feeding well and gaining weight appropriately
  - Introduce a “dream feed”
  - Stretch times between feeds
- How responding to brief wakes?

Sleep in Early Infancy: focus on prevention

**Regularity & duration of sleep:**
- When is bedtime?
- How long does daytime sleep last?
- What environmental cues are present?
  - Light, noise, social interaction
May need to address parental beliefs re: infant sleep

- "I am a mean parent/bad person if I let him cry/have her sleep alone/etc"
- "It will harm my child if I make my child sleep in her own crib/let him cry/etc"
- "I've already tried that and it doesn't help"

TIPS Intervention: Advice and Strategies

- Available by request via www.stremlerresearch.com

Available by request via www.stremlerresearch.com

Management

**Sleep Schedule**
- Set Bedtime and Wake time
- Scheduled Naps

**Bedtime Routine**
- Same every night
- Technology avoidance

**Parental Education**
- Reassurance
- Night wakings are normal

Eliminating sleep associations

- Identification of associations and withdrawal of those associations
  - Reduction of night feeding, if appropriate
  - Reduction of volume/time
  - Dream feed
  - Parental involvement in infant falling asleep
  - Reduction of contact, time
- Extinction (cry it out)
- Graduated extinction (checking in)
- Extinction with parental presence (chair method)

Management of “Bedtime Resistance”

- Set an appropriate and consistent bedtime, with a routine and rules
- Consistently return child to bed gently, but firmly if up after bedtime; intermittent reinforcement may be necessary
  - Bedtime pass
- Use positive reinforcement for appropriate bedtime behaviour (e.g. sticker chart, pillow prizes)
- Bedtime fading
  - May need to advance bedtime until child is sleepy
  - Must wake up at regular time in morning

Management of “Early Risers”

- Environmental reasons
  - Room-darkening shades
  - White noise
  - Wet diaper
  - Reduce night feedings
  - Double diapering
- Move bedtime earlier
- “Good Morning” light
How does night feeding contribute to night waking?

- Sleep association develops, so that when infant awakens, needs to be fed to reinitiate sleep.
- Hunger cues occur at regular intervals and contribute to waking at night.
- Need to shift milk intake into daytime over a period of time.
- Process needs to occur gradually for infant and parent comfort!

How to reduce night feeding:

- Over a night or two, track the length and timing of feeds.
- Any feeding less than 2 minutes in length is not contributing much to total intake and can be eliminated right away.
- For other feeds, decrease length of feed by 2 minutes (or by 30 mL if bottle fed), every other night.
- Offer more/larger volume feeds during day to counter the shift from night.

- When a feedings are gradually eliminated, hunger cues are also removed, so this results in fewer awakenings.
- For last feed before nighttime sleep will need to avoid being fed to sleep.
- For awakenings that continue, will need to settle the baby using other methods.
- Other methods can now be used to address the wakings that remain, e.g. graduated extinction.

- 94% of the studies report that behavioral interventions were efficacious
- Over 80% (en=2000) of the children had clinical improvement, sustained at 3-6mo
- Other solutions or preventive strategies are needed for early infancy (<6 months of age)

Make a Plan

- Is now a good time?
- Identify the final goal
- What is the first sleep association/limit that can change?

Adolescence: A Time of Transition
Sleep Needs Vary Over the Life Cycle

<table>
<thead>
<tr>
<th>Group</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborns/Infants</td>
<td>10.5-18</td>
</tr>
<tr>
<td>Toddlers/Children</td>
<td>10-13</td>
</tr>
<tr>
<td>Adolescents</td>
<td><strong>9.25 hours</strong></td>
</tr>
<tr>
<td>Adults/Older Persons</td>
<td>7-8 hours</td>
</tr>
</tbody>
</table>

Sleep restriction in adolescents: a vicious circle

- Late bedtime
- Difficulty initiating sleep
- Daytime sleepiness
- Afternoon napping

Adolescent Sleep: the perfect storm

- Psychological factors +
  - increased independence, anxiety, stress
- Environmental factors +
  - access to e-devices, caffeine, screen time
- Social factors +
  - increased importance of peers, more extracurricular activities, decreased parental involvement
- Social jet lag
  - irregular sleep-wake times across weekdays and weekends
  - Sleep restriction in spite of an unreduced need for sleep

How much sleep do high school students achieve?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sleep during the week</th>
<th>Sleep on weekends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Grades 9-12</td>
<td>7.2</td>
<td>8.7</td>
</tr>
<tr>
<td>Grade 9</td>
<td>7.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Grade 12</td>
<td>6.9</td>
<td>8.4</td>
</tr>
</tbody>
</table>

2006 National Sleep in America Poll

How much sleep do high school students achieve?

- 62% of adolescents in grades 9-12 were achieving less than 8 hours on weeknights
- 25% achieving 8-9 hours on weeknights
- Only 13% reaching an optimal 9 hours on weeknights

2006 Sleep in America Poll

Teens Experience a Biological Shift to a Later Sleep-Wake Cycle

- The biological clock of children shifts during adolescence
- Gives adolescents the "ability" to stay up later
- Sleep needs don't decrease, though, leading to a natural tendency to wake later
- Places teens' sleep in conflict with school/work schedules
Impact of Technology

- Increased use of computers, gaming, mobile devices, etc in adolescence
- 72% of children 6-17 have 1+ electronic device in the bedroom while asleep
- Teens who leave devices on at night get 30 minutes less sleep/night (2014 Sleep in America poll)

Impact of Technology

- Numerous studies link use of technology with delayed bedtimes and shortened sleep durations
- What is the mechanism?
  - Using technology instead of sleeping
  - Exposure to light sends signal to the brain to wake up
  - Mental/Physical tasks related to use are alerting

Impact of Caffeine

- 75% of adolescents report drinking at least one caffeinated beverage/day
- 31% consume 2+/day
- Those that consume report less sleep time

Good sleep strategies

- Cool, dark, quiet bedroom
- Limit caffeine
- Limit screen time/device use
  - before bed and when in bed
- Exercise
  - not too close to bedtime

Good sleep strategies

- Relaxing activities before bed
  - Reading
  - Bath/shower
  - Download your brain:
    - To do list/write in journal
- Relaxation techniques to induce sleep
  - deep breathing, progressive muscle relaxation
- 29% of Grade 9-12 students reported losing sleep because of worries, ‘all the time’ or ‘often’ (2011-2012 TDSB Student Survey)
Good sleep strategies
- Parental involvement in
- making sleep a priority
- setting bedtime
- device use
- caffeine consumption
- awareness of drowsy driving
- role modeling

Strategies for an earlier bedtime
- Gradually move bedtime back
- 5 minutes at a time on each weeknight
- No more than 1 hour difference in bed and wake times on weekdays vs weekend
- Wake time is the most important to keep consistent
- Avoid naps
- If taken, should be limited to 30 minutes and should not occur within 4 hours of bedtime
- Eat breakfast
- Early morning light exposure

Excessive daytime sleepiness:
The Epworth Sleepiness Scale

Choose a number for each situation:

0 = would never doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

Add the numbers: normal score is <10

Online resources
- Canadian Sleep Society (patient handouts)
  http://css-scs.ca/
- National Sleep Foundation (+++ materials –US-based)
  www.sleepfoundation.org

References

References
Questions? Thank you!

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