

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

zzzz...

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

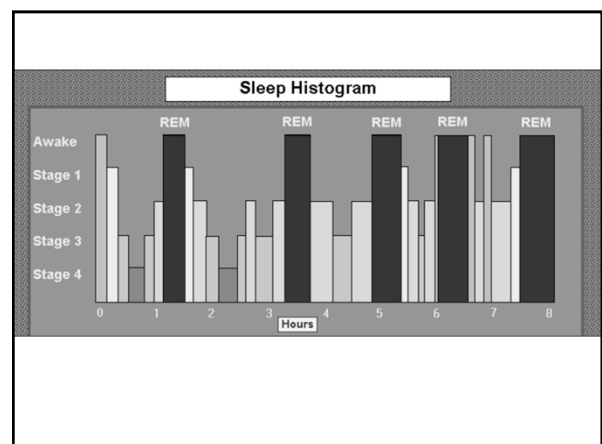
REM Sleep

- 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 } → predominate in first half of night = deep sleep
- Stage 4 } →
- REM } → predominates in second half of night = dreaming



STAGE 5
Your brain is active and you dream. Your eyes move under your eyelids in RAPID EYE MOVEMENT (R.E.M).

STAGES 1 & 2
You first fall asleep, but are not yet in a deep sleep.

STAGES 3 & 4
You are in a deep, restful sleep. Your breathing and heart rate slow down, and your body is still.

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)

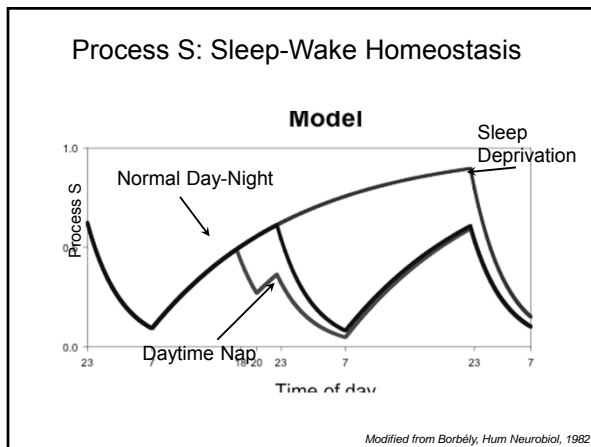
- Sleep is regulated by two simultaneous processes:

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

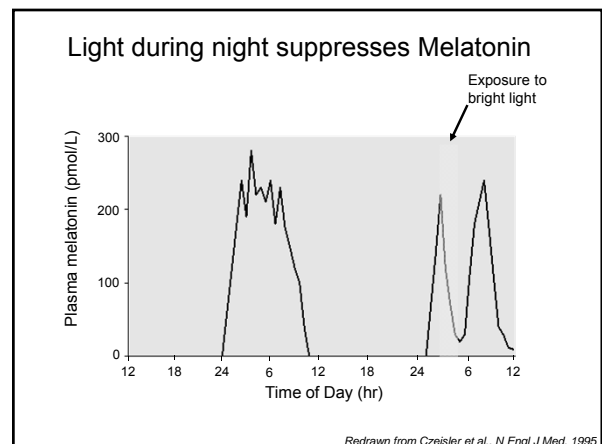


Process C: Circadian Rhythm

- 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



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

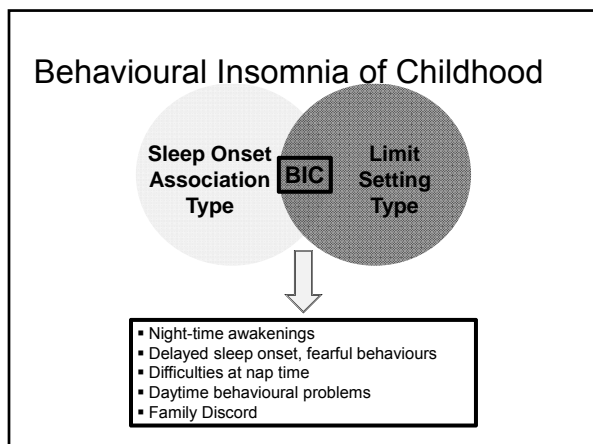
Sleep Onset Association Type

BIC

Limit Setting Type


- 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




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



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)



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 Across the 1st Year of Life

	Amount of Sleep Needed	Characteristics of Sleep	Developmental Tasks and Issues
Newborns (0-2 months)	10.5-18 hrs	Irregular sleep patterns until about 6-8 weeks; multiple sleep periods in day and night; sleep is active (smiling, sucking, body movements)	Sleep on back to prevent SIDS; facilitate nighttime sleep; create a positive and safe sleeping environment; identify signs of sleepiness
Infants (3-4 months)	Night: 11-12 hrs Naps: 3-4 hrs in 3 naps	Increasing nighttime sleep; sleep pattern emerges; awake for 1.5-2.5 hrs bwn naps	Create a regular bedtime schedule and routine; learning to self-soothe; greater alertness and interest in the world
Infants (4-6 months)	Night: 11-12 hrs Naps: 2-3 hrs in 2-3 naps	Awake for 2-2.5 hrs bwn naps; by 6 months most infants can eliminate night feeding	Teething, learning to crawl can interfere with sleep; 25-50% of 6 month olds have frequent night wakings
Infants (6-9 months)	Night: 11-12 hrs Naps: 2-3 hrs in 2 naps	Most 9 month olds "sleep through the night"; awake for 2-3 hrs bwn naps	Learning to pull to stand/cruise can interfere with sleep; REM sleep comprises about 30% of sleep time
Infants (9-12 months)	Night: 11 hrs Naps: 2-2.5 hrs in 2 naps	Awake for 2.5-3.5 hrs bwn naps; transition from 1 to 2 naps occurs around 18 months	Learning to walk can interfere with sleep

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



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.
- See: Mindell JA; Telofski LS; Wiegand B; Kurtz ES. A nightly bedtime routine: impact on sleep in young children and maternal mood. *SLEEP* 2009;32(5):599-606.

Sleep in Early Infancy: focus on prevention

● Bedtime problems:

- **Have baby fall asleep in the same location, on the same sleep surface, all the time.**
- **Ideally put baby down drowsy, but awake.**

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

BMJ

BMJ 2013;346:f1164 doi: 10.1136/bmj.f1164 (Published 20 March 2013)

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RESEARCH

Effect of behavioural-educational intervention on sleep for primiparous women and their infants in early postpartum: multisite randomised controlled trial

OPEN ACCESS

Robyn Stremler assistant professor and adjunct scientist^{1,2}, Ellen Hodnett professor¹, Laura Kenton trial coordinator³, Kathryn Lee professor⁴, Shelly Weiss staff neurologist and assistant professor⁵, Julie Weston senior trial coordinator⁶, Andrew Willan senior scientist and professor^{1,2}

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)

CONSISTENCY
IS 

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.

How to reduce night feeding:

- 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.

PEDIATRIC SLEEP

Behavioral Treatment of Bedtime Problems and Night Wakings in Infants and Young Children

An American Academy of Sleep Medicine Review

Jodi A. Mindell, PhD¹; Brett Kuhn, PhD²; Daniel S. Lewin, PhD³; Lisa J. Meltzer, PhD⁴; Avi Sadeh, DSc⁵

¹Department of Psychology, Saint Joseph's University, Philadelphia, PA; ²University of Nebraska Medical Center, Omaha, NE; ³Children's National Medical Center, George Washington University School of Medicine, Washington, DC; ⁴Children's Hospital of Pennsylvania, Philadelphia, PA; ⁵Department of Psychology, Tel Aviv University, Tel Aviv, Israel

- 94% of the studies report that behavioral interventions were efficacious
- Over 80% (n=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?

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Adolescence: A Time of Transition



Sleep Needs Vary Over the Life Cycle

Newborns/Infants	10.5-18 hours
Toddlers/Children	10-13 hours
Adolescents	9.25 hours
Adults/Older Persons	7-8 hours

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

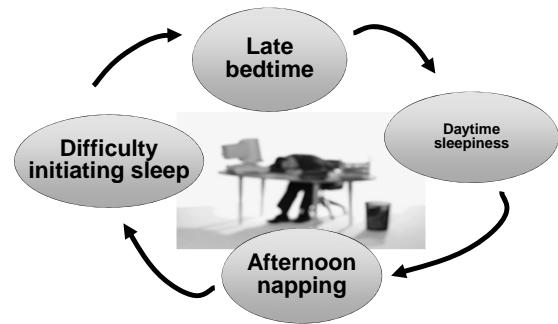
- The biological clock of children shifts during adolescence
- Gives adolescents the “ability” to stay up later
- Sleep needs don’t decrease, though, leading to a natural tendency to wake later
- Places teens’ sleep in conflict with school/work schedules



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 un-reduced need for sleep*

Sleep restriction in adolescents: a vicious circle



How much sleep do high school students achieve?

	Sleep during the week	Sleep on weekends
Average Grades 9-12	7.2	8.7
Grade 9	7.6	8.8
Grade 12	6.9	8.4

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



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)

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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

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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

Situation:

1. Sitting and reading ____
2. Watching television ____
3. Sitting inactive in a public place ____
4. As a passenger in a car for an hour without a break ____
5. Lying down in the afternoon when circumstances permit ____
6. Sitting and talking to someone ____
7. Sitting quietly after lunch without alcohol ____
8. In a car, while stopped for a few minutes in traffic ____

Online resources

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

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Questions? Thank you!



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