

# Sleep: What can go wrong and where to turn

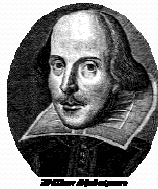
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Child Neurology and Sleep Medicine  
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At CHKD  
Assistant Professor, Pediatrics, Eastern Virginia Medical School

Or....

- “My toddler ends up in our bed, my snoring 3<sup>rd</sup> grader cannot seem to pay attention, and my teenager is up all night texting and updating facebook!”

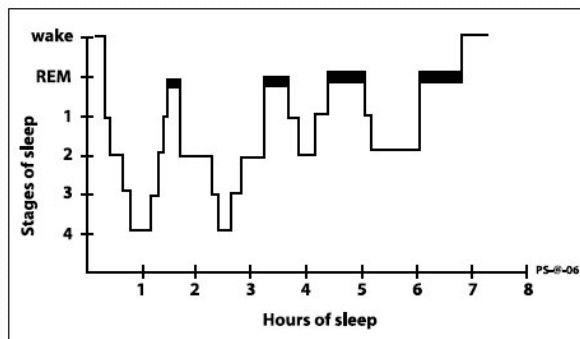
## Outline

- Sleep- what it is.
- What “normal” sleep looks like across childhood.
- Consequences of poor sleep in children.
- Common sleep issues in children.
- Approach to diagnosis and treatment.



*The death of each day's life, sore labour's  
bath,  
Balm of hurt minds, great nature's second  
course,  
Chief nourisher in life's feast.*  
[Macbeth \(2.2.46-51\)](#)

## Sleep is not a “passive” state



## 2 Components of normal sleep

- Non-REM:
  - Non-Dream Sleep
  - “Front-loaded”
  - Restorative Function
  - Metabolic
  - Growth Hormone
  - Heart rate/O<sub>2</sub> use
  - Brain/Body Rest
- REM(Rapid Eye Movement):
  - Dream sleep
  - “Back-loaded”
  - Information Processing
  - Memory
  - ?Creativity
  - Organize/filter/store
  - Heart Rate/O<sub>2</sub> use
  - Metabolic activity

## What determines sleep for us?

- Homeostatic Drive( sleep dependent).
- Circadian Rhythm(non- sleep dependent).

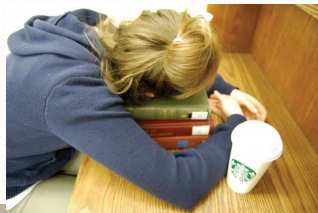
## In our kids

- An estimated 25–50% of children and adolescents with attention-deficit hyperactivity disorder (ADHD) experience problems with sleep. The most common sleep problems reported in children with ADHD include delayed sleep onset, osa, sleep or bedtime resistance, prolonged tiredness upon waking and daytime sleepiness.

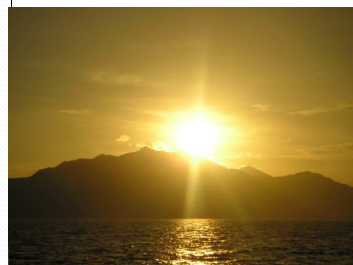
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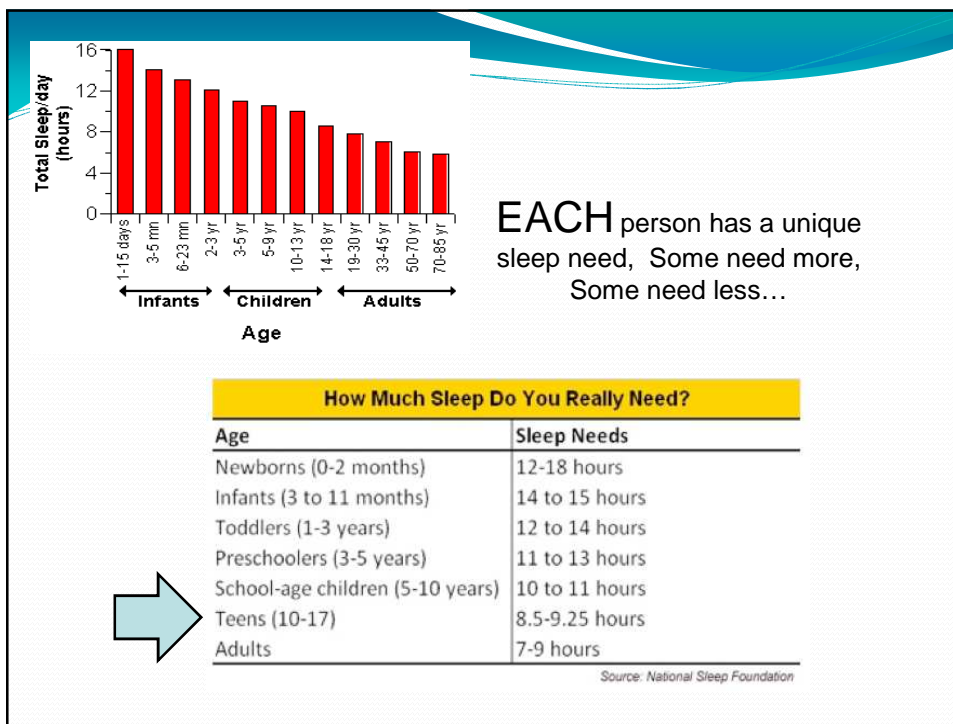
## What this looks like...

- Homeostatic



- Circadian

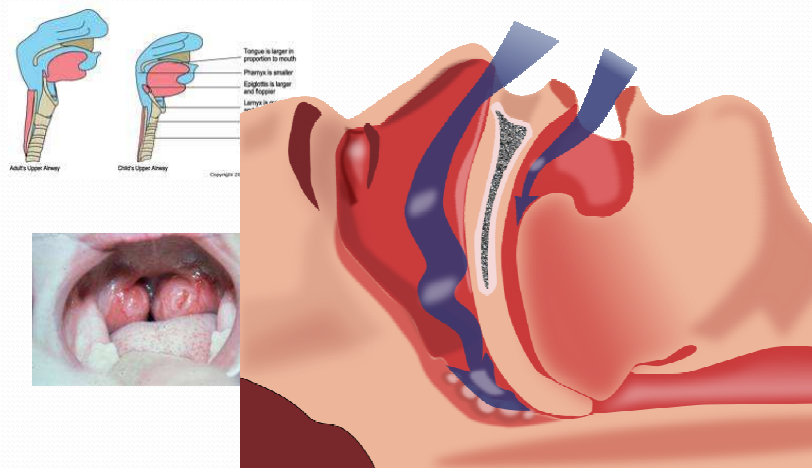




**EACH** person has a unique sleep need, Some need more, Some need less...

## Snoring-normal or not?

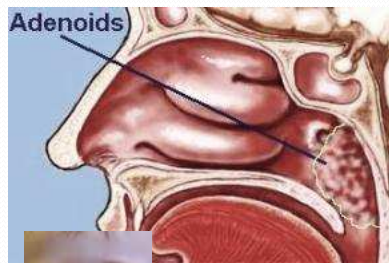
**NOT,  
Snoring=  
obstruction**



## Symptoms and Signs

- History
  - Frequent snoring(>3 nights/week)
  - Labored breathing during sleep
  - Gasps/snorting noises/observed apnea
  - Bedwetting
  - Sleeping in a seated position or with neck hyperextended
  - Cyanosis
  - Headaches upon wakening
  - Daytime sleepiness
  - **ADHD/Learning problems**

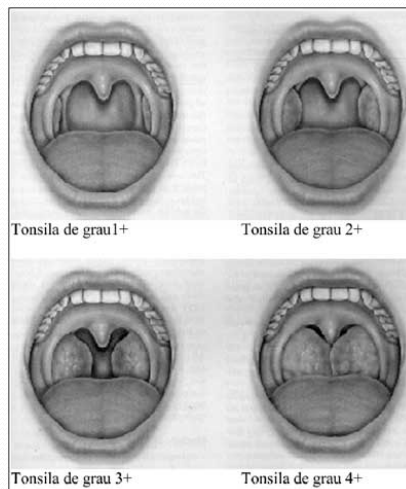
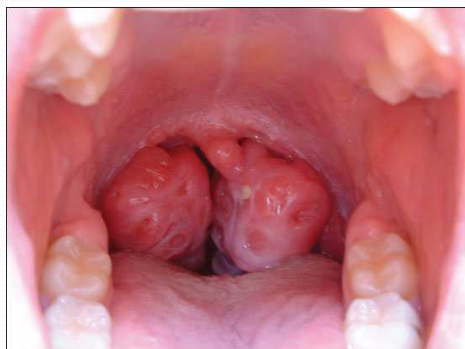
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**adenoid facies** *n.* **The appearance in children with adenoid hypertrophy, associated with a pinched nose and an open mouth.**

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# Tonsillar Hypertrophy



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# Micro/Retrognathia



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## So, my kid snores some..

- IF symptoms of OSA exist, the way we sort out a diagnosis is-
- See sleep doctor for thorough evaluation of symptoms including mood, attention, allergies, weight, growth.
- Exam- airway is only part of issue.
- Sleep Study– overnight study that measures oxygen, breathing, CO2, movements, brain activity and sleep stages, heart rate, and arousals from sleep.

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## If your child snores, pauses during sleep—and it is OSA

- Preferred tx is still surgery,
- CPAP, in concert with attempts at weight loss?
- Obesity- weight loss good!, but- not easy to achieve.
- - and given lack of data on needed weight loss to effect change in OSAS, unreliable and long-term nature of any weight loss plan--
- Intranasal steroids--ok, in mild(if surgery is not an option). But, no long-term data on therapeutic effect, and overall less effective.
- If YOUR CHILD SNORES, PAUSES—get it checked out..

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## Consequences of OSA

- Fragmented sleep
- Poor weight gain/excessive weight gain
- Immune system dysfunction
- Growth hormone effects, poor growth.
- **Behavior, mood, attention—**
- **Sleep and correlation with ADHD.**

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## What does poor sleep do?

- At the cellular level, sleep deprivation impairs synaptic plasticity<sup>13)</sup> increases hippocampal oxidative stress<sup>14)</sup> and facilitates neuronal loss,<sup>15)</sup> all of which can detrimentally affect neurocognitive function.
- One meta-analysis of the relationship between sleep deprivation and cognition in school-aged children found a significant increase in behavioral problems in children with shorter sleep duration. Additionally, sleep deprivation resulted in a significant increment emotional reactivity in children, which led to delinquency, long-term emotional and behavioral difficulties.

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## The science of OSA

- OSA has been demonstrated to be highly associated with symptoms of inattention and hyperactivity in previous studies, and evidence of amelioration of behavioral, psychological problems **after treatment interventions** like adenotonsillectomy have been frequently reported.
- Recent functional magnetic resonance imaging studies have revealed aberrant cerebral perfusion, reduced gray matter, and altered patterns of intrinsic regional brain activity in patients with OSA.

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## The link to ADHD

- Golan N, Shahar E, Ravid S, Pillar G. Sleep disorders and daytime sleepiness in children with attention-deficit/hyperactivity disorder. *Sleep*. 2004;27:261-6.
- Melendres CS, Lutz JM, Rubin ED, Marcus CL. Daytime sleepiness and hyperactivity in children with suspected sleep-disordered breathing. *Pediatrics*. 2004;114:768-75.
- Chervin RD, Ruzicka DL, Archbold KH, Dillon JE. Snoring predicts hyperactivity four years later. *Sleep*. 2005;28:885-90.
- Chervin RD, Dillon JE, Bassetti C, Ganoczy DA, Pituch KJ. Symptoms of sleep disorders, inattention, and hyperactivity in children. *Sleep*. 1997;20:1185-92.

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## How they compare..

- **The primary symptoms of ADHD are:**

- Hyperactivity
- Inattention
- Impulsivity
- Distractibility
- Difficulty waiting or taking turns

- **Poor sleep in kids:**

- Hyperactivity
- Inattention
- Impulsivity
- Oppositional behavior
- Moodiness and irritability
- Difficulty waking up in the morning

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## Big stuff in high schoolers

- Independence
- Ego-centric
- Multi-tasker: school, sport, job
- Driving
- Technology

## Sleep Issues

- Delayed sleep onset
- The multi-tasker's sleep problems
- Hormones, sleep, behavior
- Weekdays and weekends
- Insomnia
- Hypersomnia

## Up all night

- Inadequate sleep secondary to poor sleep hygiene.
- Teens “clock” normally shifts (melatonin).
- Normal for them- sleep onset 10:30-11 pm.
- Social and technology pressures/distractions.
- Job, Sports, TV, cell phone, Ipad, etc...
- Caffeine use, nicotine.
- School times– often 7:15!
- Teen brain needs 9 -9.5 hours of sleep!

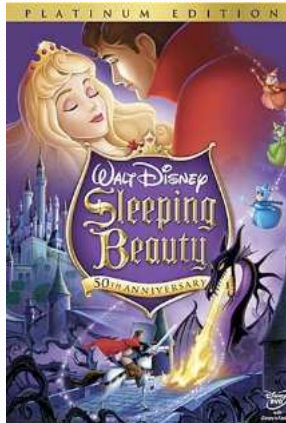
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## Teen Tips if it is a mess

- Go to bed when sleepy. But have a set time to get ready and try. Start with 8 hours max.
- Avoid nicotine, minimize caffeine.
- NO caffeine or exercise 2 hours before bed.
- 30 minutes of quiet time- technology “break”.
- READ- boring book
- Avoid worry in bed, ? Plan to before.
- Low lights
- NO clocks to be seen
- Ambient noise(fan, NOT any tech device)
- Wake time—keep this time set!(7 days a week, until sleep is organized and solid at night)

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I know, fantasy...



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## Delayed Sleep Phase Syndrome

- Extreme of poor hygiene
- Some genetic predisposition (like insomniacs).
- Teens who cannot get to sleep until 2-3 am on any night.
- Wake time- noon?
- Must differentiate (big GRAY zone) from school avoidance.
- Can reset this with a plan that uses both time, and circadian stresses to push, pull sleep to a normal routine.

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# True Hypersomnia

- IF-
  - Despite reasonable sleep time,
    - Fall asleep on short car ride
    - Fall asleep in class regularly
    - Fall asleep watching a movie
    - Need a nap in the afternoon, evening..

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**THE EPWORTH SLEEPINESS SCALE**  
(To assess risk of Obstructive Sleep Apnea)

Use the following scale to choose the most appropriate number for each situation:-

0 = would never doze  
1 = Slight chance of dozing  
2 = Moderate chance of dozing  
3 = High chance of dozing

Situation	Chance of dozing
Sitting and reading .....	<input type="text"/>
Watching TV .....	<input type="text"/>
Sitting, inactive in a public place (e.g. a theatre or a meeting) .....	<input type="text"/>
As a passenger in a car for an hour without a break .....	<input type="text"/>
Lying down to rest in the afternoon when circumstances permit .....	<input type="text"/>
Sitting and talking to someone .....	<input type="text"/>
Sitting quietly after a lunch without alcohol .....	<input type="text"/>
In a car, while stopped for a few minutes in the traffic .....	<input type="text"/>
<b>Total</b> .....	<input type="text"/>

Score:

0-10 Normal range

10-12 Borderline

12-24 Abnormal

If your child scores in teens, they should  
See our sleep team

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## Narcolepsy

- Disorder of sleep presenting with remarkable hypersomnia plus-
- Vivid dreams
- Hypnagogic Hallucinations(see, hear stuff before I fall asleep)
- Dreaming at sleep onset, or during short nap
- Sleep Paralysis upon waking
- Cataplexy
- Disturbed, fragmented nocturnal sleep

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## Narcolepsy

- Diagnosis- Polysomnogram followed by MSLT.
- MSLT-series of nap opportunities used to assess ability to fall asleep, enter REM sleep.
- Treatment-
- Education (patient, family, school)
- Sleep hygiene
- Naps
- Medications—that address poor sleep, and/ or help patients maintain wakefulness

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## Driving

- 51 percent of all adolescents who drive reported that they had driven drowsy at least once in the past year. Among those adolescents, 5 percent had nodded off or fallen asleep while driving in the past year, and 27 percent of those respondents had an accident or near accident due to drowsiness while driving.
- National Sleep Foundation's 2006 Sleep in America poll

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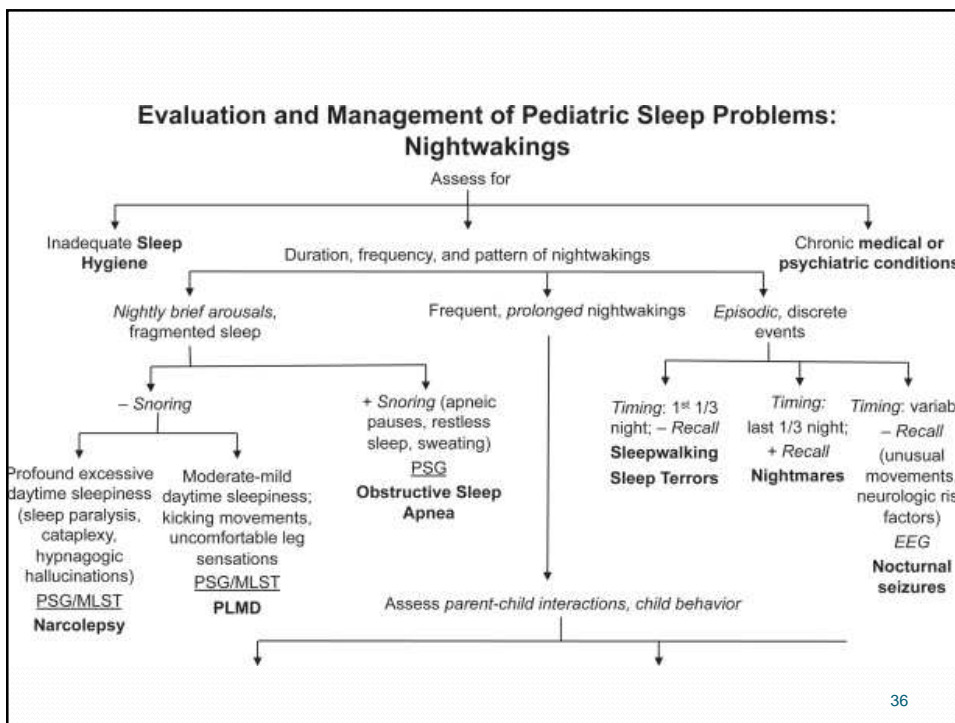
## Driving and school

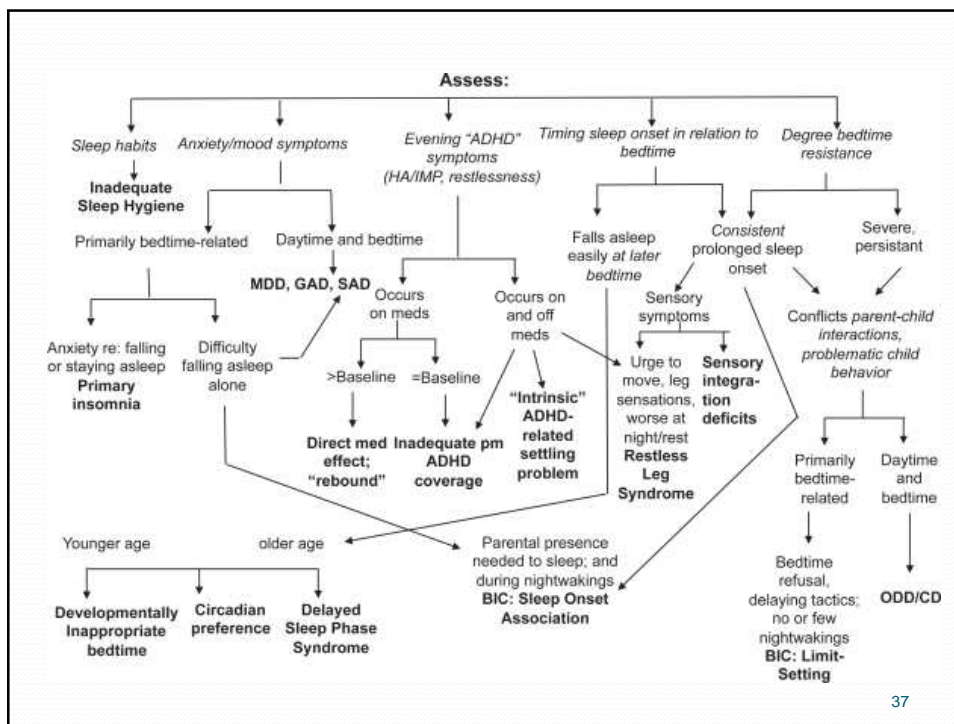
- **Dissimilar Teen Crash Rates in Two Neighboring Southeastern Virginia Cities with Different High School Start Times**
- Robert Daniel Vorona, M.D.
- Journal of Clinical Sleep Medicine, Vol. 7, No. 2, 2011

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- Early high school start times may contribute to insufficient sleep leading to increased teen crash rate. Virginia Beach (VB) and Chesapeake are adjacent, demographically similar cities. VB high schools start 75-80 minutes earlier than Chesapeake's. We hypothesized that VB teens would manifest a higher crash rate than Chesapeake teens.
- In 2008, there were 12,916 and 8,459 Virginia Beach and Chesapeake 16- to 18-year-old drivers, respectively. For VB and Chesapeake, teen drivers' crash rates in 2008 were 65.8/1000 and 46.6/1000 ( $p < 0.001$ ), respectively, and in 2007 were 71.2/1000 and 55.6/1000. Teen drivers' crash peaks in the morning occurred one hour earlier in VB than Chesapeake, consistent with school commute time. Congestion data for VB and Chesapeake did not explain the different crash rates.

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## Sleep IS that important

- Sleep is a dynamic process that evolves over time in all humans.
- Sleep is natural, but not everyone does it well on their own.
- No parent or child plans on having horrible sleep.
- Sleep problems occur at all ages- and can have devastating consequences.
- Commonly this affects attention, learning and mood.
- Most sleep problems can be fixed with proper attention and time.

## Sleep Medicine

- Dr. Michael Strunc MD
- Child Neurology and Sleep Medicine
- Director, Sleep Medicine at CHKD
- Staff of doctors, nurses, and sleep technicians who all work together to address the sleep issues of kids.
- We are eager to see you!!