Sleep 101:
The ABCs of Getting Your ZZZs

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What you will learn:

- Why do we sleep?
- How much sleep do we need?
- What are the effects of sleep deprivation?
- What are the different stages of sleep?
- What are the types of sleep problems?
- What is sleep apnea and how is it treated?
- How can we sleep better?

Why do we sleep?

- Each of us will spend about 1/3 of our lifetime sleeping!

- Sleep helps us with:
  - Memory consolidation
  - Immune system
  - Recharge energy for the day
  - Growth and development

How much sleep do we need?

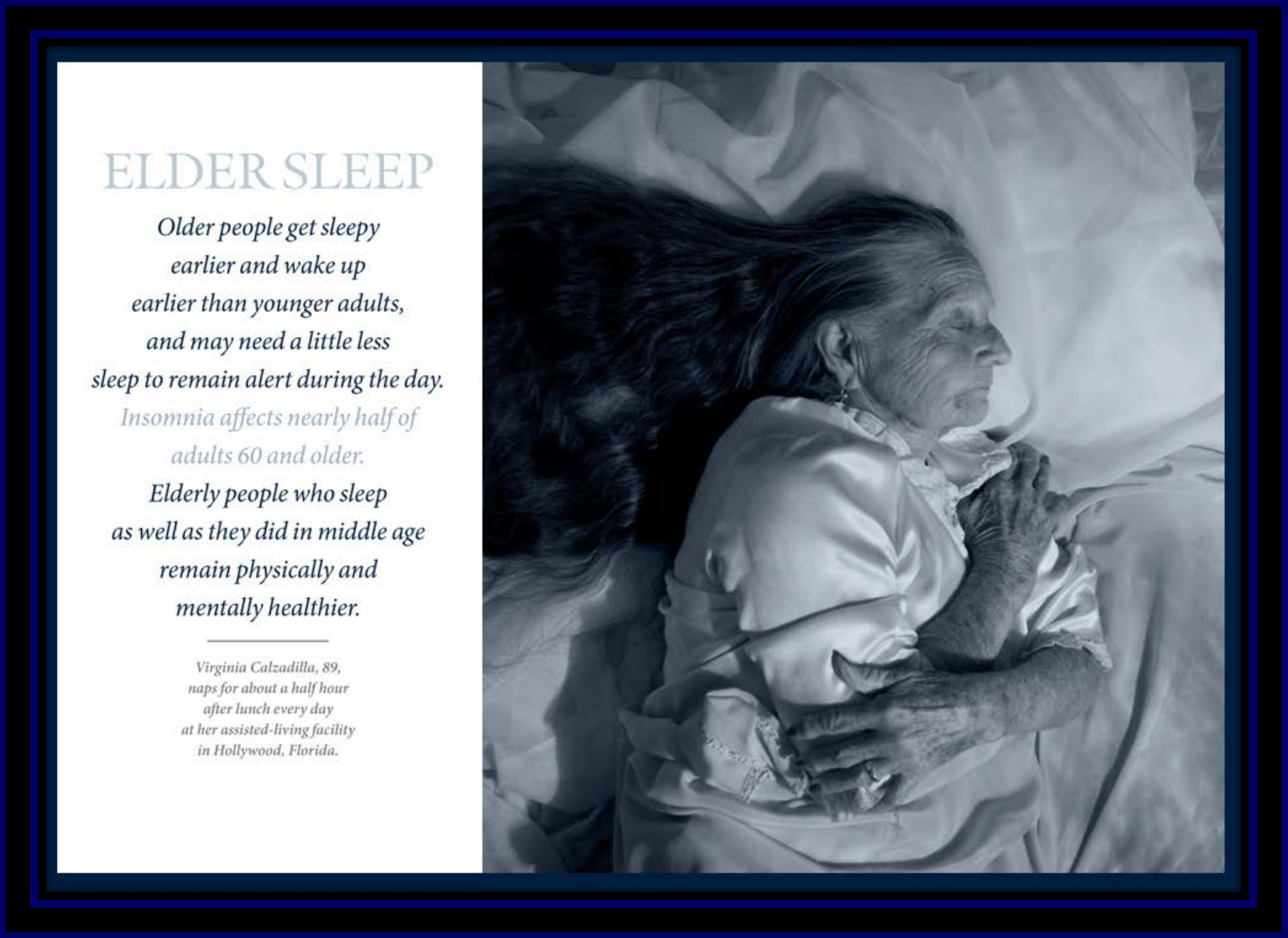
Infants : 14-15 hours

National Sleep Foundation
Secrets of Sleep; National Geographic Magazine . 2010

Adolescents: 8.5-9.25 hours

National Sleep Foundation
Secrets of Sleep; National Geographic Magazine . 2010

Adult/Elder Sleep: 7-9 hours



National Sleep Foundation
Secrets of Sleep; National Geographic Magazine . 2010

How much sleep do we get?

National Sleep Foundation Poll in 2005

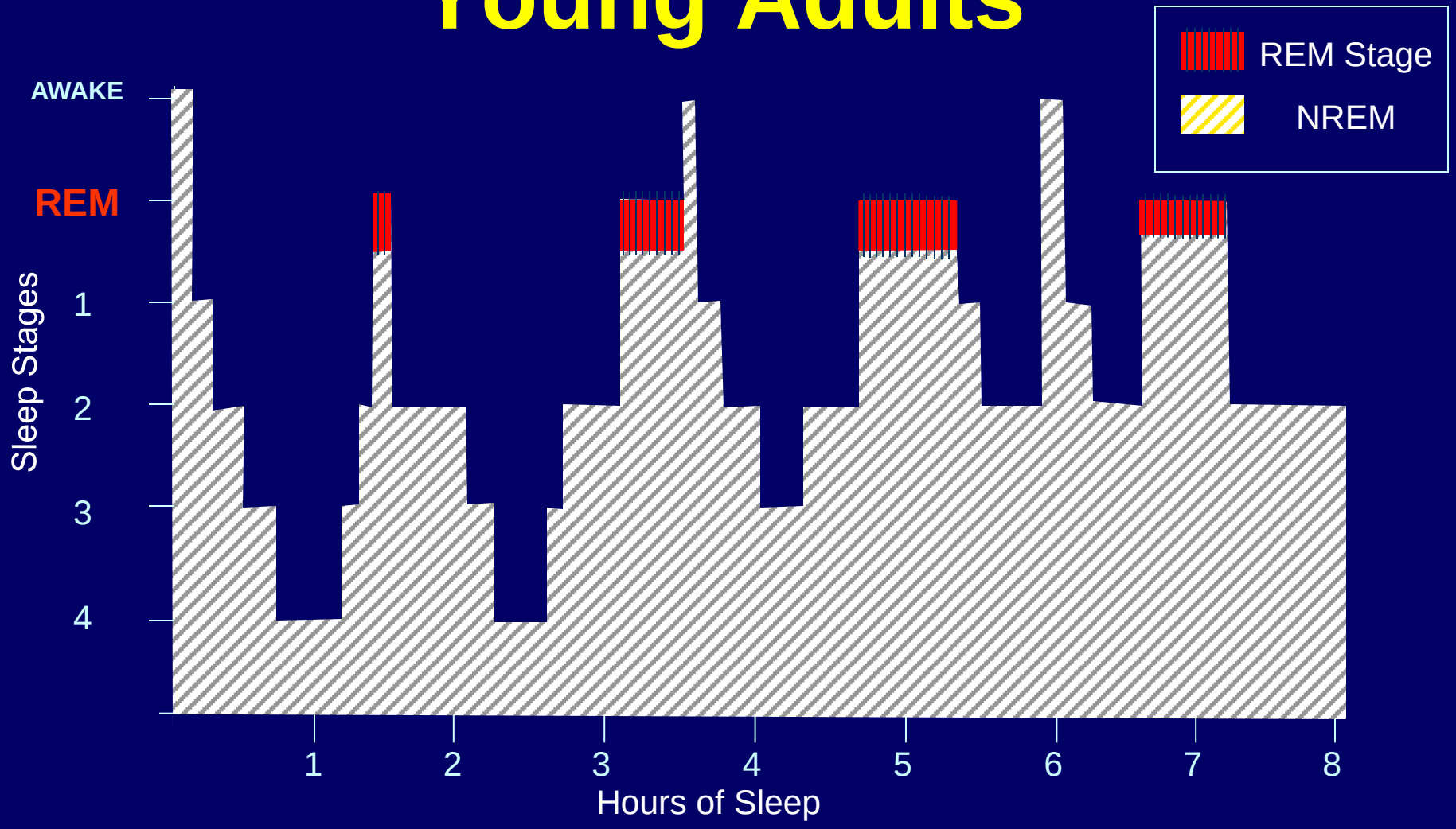
71% of adult Americans < 8 hours per night

40% of adult Americans < 7 hours per night

What are the different stages of sleep?

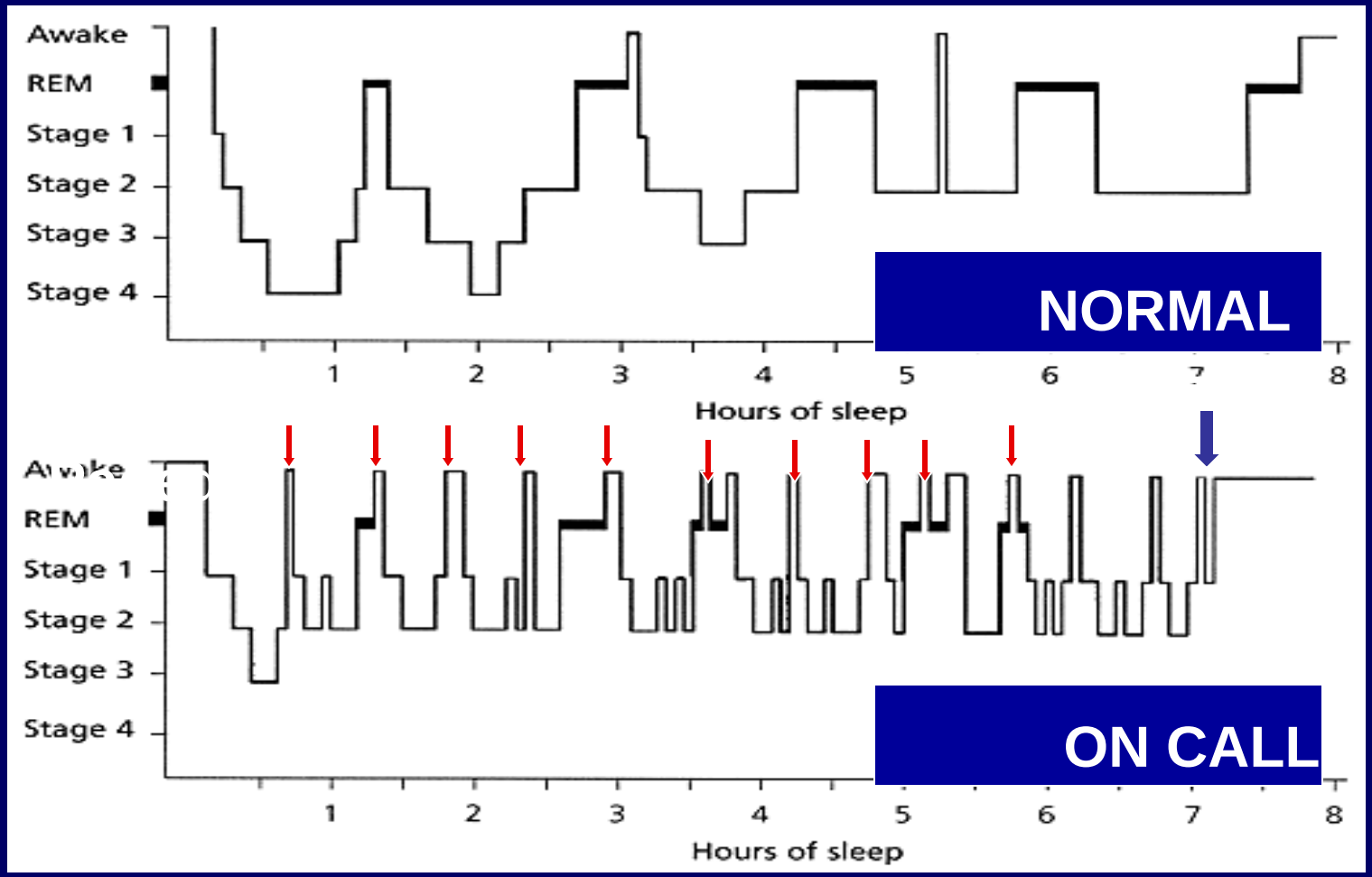
- Non REM Sleep -75% of the night
  - Stage 1
  - Stage 2
  - Stage 3
  - Stage 4
- REM Sleep -25% of the night
  - Dreaming

Normal Sleep Patterns in Young Adults



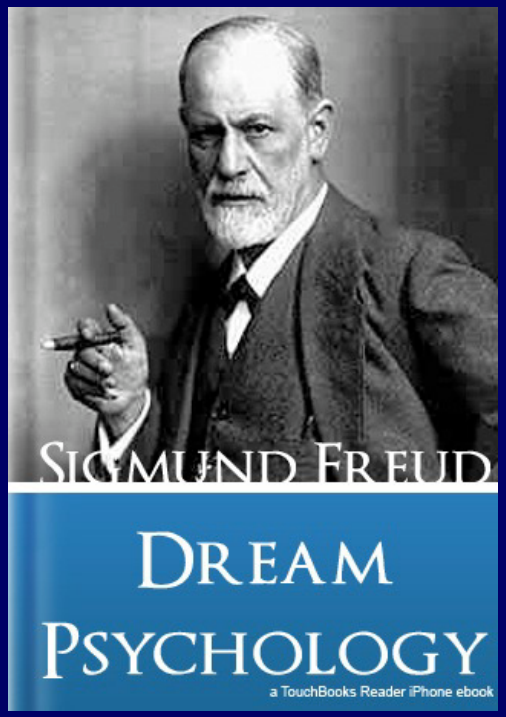
Adapted from Berger RJ. The sleep and dream cycle. In: Kales A, ed. *Sleep Physiology & Pathology: A Symposium*. Philadelphia: J.B. Lippincott; 1969.

Sleep Fragmentation Affects Sleep Quality

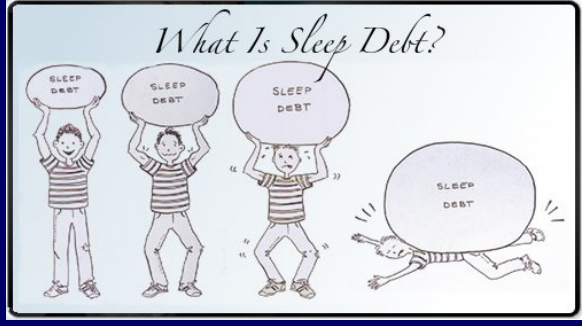


Why do we dream?

- Everyone dreams several times a night
- Dreaming occurs during REM sleep
- Theories of dreaming
  - Freud's theory
  - Problem-solving
  - A prevalent view today is that dreams don't serve any purpose at all, but are side effects of REM



Sleep Facts



- Most adults need at least 8 hours of sleep a night to function well
- Adults *can not* generally adapt to getting less sleep over time
  - A sleep debt builds up
  - Recovery from on-call sleep loss usually takes 2 nights of extended sleep to restore baseline alertness

What are the effects of sleep deprivation?

- Behavioral/Mood
  - Fatigue
  - Possible decreased work productivity
  - Deficits in memory
  - Mood effects
  - Car Accidents or Occupational Accidents
- Physiologic
  - Possible insulin resistance
  - High blood pressure
  - Blunted immune response
  - Increased risk for heart disease and death

Banks S; Dinges DF. *J Clin Sleep Med*. 2007;3:519-528.

Three Mile Island

Chernobyl

Bhopal Chemical Disaster

Exxon Valdez Oil Spill

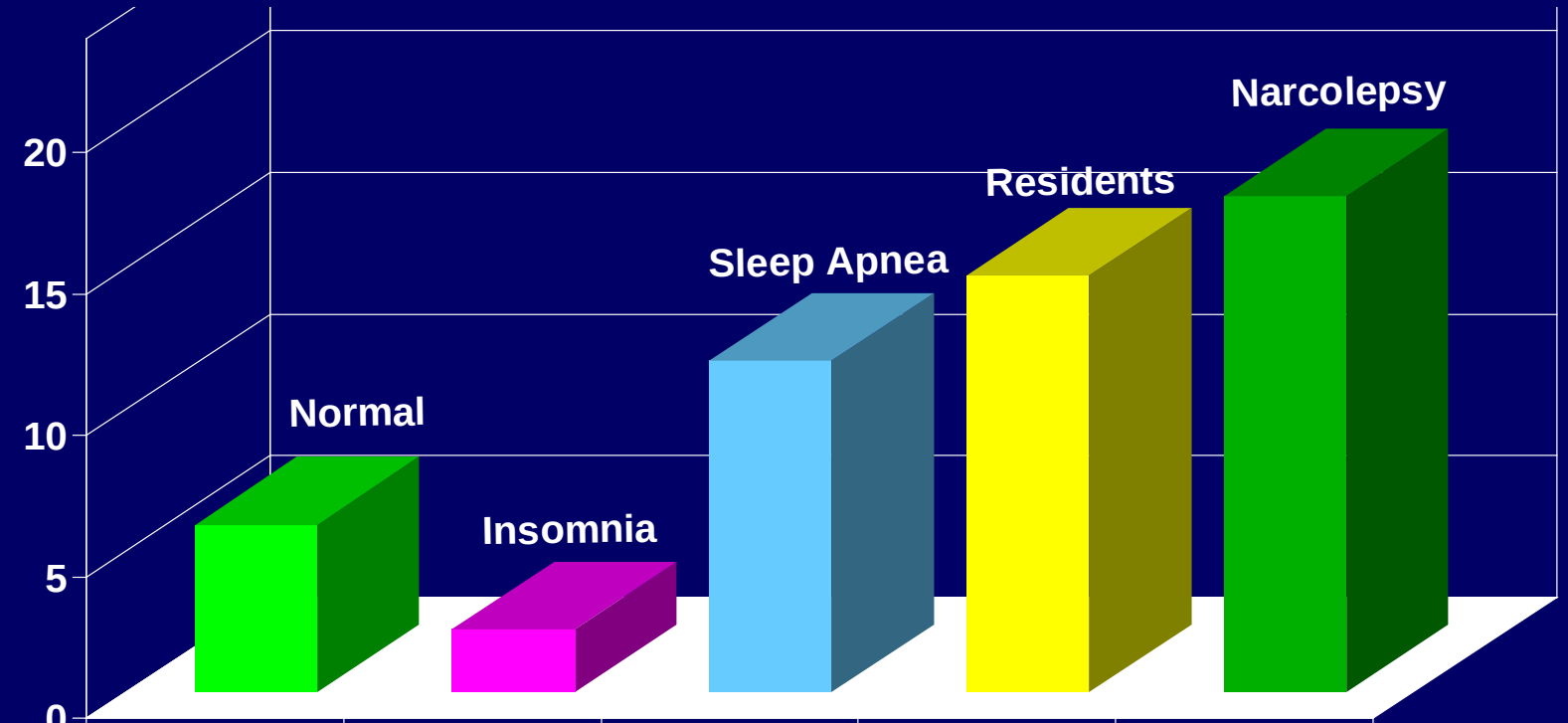
How do we measure sleepiness?

Situation	Chance of dozing (0-3)			
Sitting and reading	0	1	2	3
Watching television	0	1	2	3
Sitting inactive in a public place—for example, a theater or meeting	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after lunch (when you've had no alcohol)	0	1	2	3
In a car, while stopped in traffic	0	1	2	3
			Total Score	

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

Johns MW. *Sleep*. 1991.

Epworth Sleepiness Scale



	Normal	Insomnia	Sleep Apnea	Residents	Narcolepsy
Mean	5.90	2.20	11.70	14.70	17.50

Sleepiness in residents is equivalent to that found in patients with SERIOUS SLEEP DISORDERS.

Mustafa and Strohl, unpublished data. Papp, 2002

Signs of Sleep Debt in the Physician

- In the Hospital
  - Drowsiness or falling asleep in meetings or lectures, especially in the afternoon
  - Frustration/inpatients with coworkers
  - Difficulty with recall
  - Difficulty keeping scheduled
  - Appointments
  - Having to recheck work multiple times

Signs of Sleep Debt in the Physician

- At Home
  - Reliance on the alarm clock to wake up
  - Struggling to wake up at the designated time
  - Fall asleep easily while reading or watching TV
  - Irritability with family members

Consequences of Sleep Loss

- **Surgery:** 20% more errors and 14% more time required to perform simulated laparoscopy post-call (two studies) Taffinder et al, 1998; Grantcharov et al, 2001
- **Internal Medicine:** efficiency and accuracy of ECG interpretation impaired in sleep-deprived interns Lingenfelser et al, 1994
- **Pediatrics:** time required to place an intra-arterial line increased significantly in sleep-deprived Storer et al, 1989

Libby Zion

Excessive Daytime Sleepiness

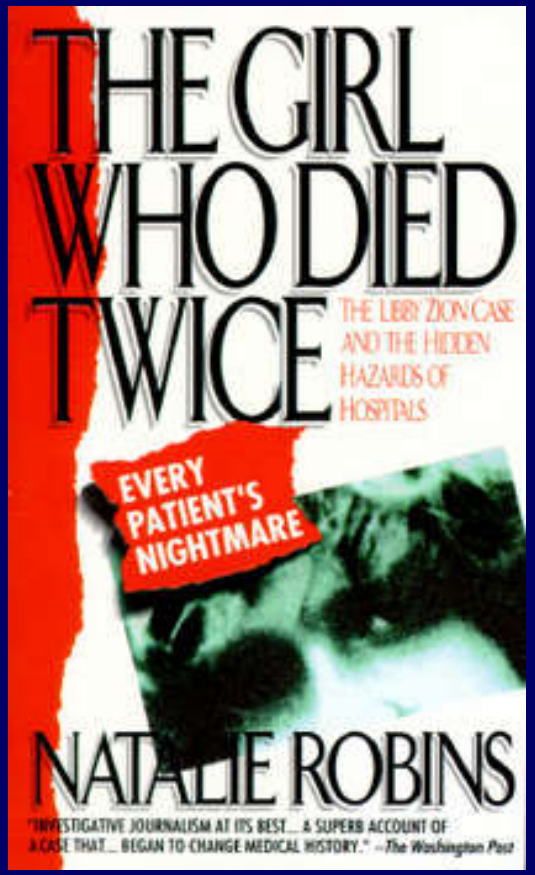
- Insufficient sleep (< 8 hours)
- Disrupted circadian system (night float)
- Fragmented sleep
  - Pager going off every 10 minutes
  - Anxiety of sleep disruption
  - Sleep deprivation may arise from home call
  - Alcohol
- Primary sleep disorders (i.e., obstructive sleep apnea)

Consequences of Sleep Loss: Libby Zion

– Libby Zion, an 18 year old college student, dies in New York Hospital after presenting with fever and flu symptoms 11 hours before.

– Resident administered meperidine (Demerol) and haloperidol (Haldol) for sedation and pain control.

– Home medication included phenelzine (Nardil) , an MAOI.



http://www.courttv.com/archive/casefiles/verdicts/zion.html;
Asch DA. "The Libby Zion Case", *New England Journal of Medicine 1988;318:771-775;*
www.ethicsconsultant.com/system/files/Zion-Case-White3.ppt

Recommendations for Sleep & Safety

- Habits for better sleep: SLEEP HYGIENE
- Compliance with ACGME work hour rules
- Seek medical evaluation for persistent unexplained sleepiness

Sleep Hygiene

- Maintain regular rise & bed times every night including weekends i.e. 11:00 P.M.-6:00 A.M.
- Very hot bath (~15 min. Duration) 1 1/2 hour before bedtime.
- Turn down thermostat, no electric blankets.
- Use very dark curtains or use a sleep mask.

Sleep Hygiene

- No napping especially in afternoon or evening
- Restrict caffeine (not just coffee) 1-2 cups before noon
- Avoid alcohol within 4-6 hour of bedtime
- No food or exercise within 2 hrs of bedtime
- Avoid bright light at night, use the lowest wattage possible

Sleep and Safety

- Short naps can improve performance during long work shifts in the hospital
- A nap taken before driving home may reduce the risk of an automobile accident related to fatigue.
- When not in the hospital, attempt to maintain regular sleep and wake times allowing adequate time for sleep

The NEW ENGLAND JOURNAL of MEDICINE

Perspective

The ACGME's Final Duty-Hour Standards — Special PGY-1 Limits and Strategic Napping

John K. Iglehart

On September 28, the Accreditation Council for Graduate Medical Education (ACGME) released new standards to which residency programs must adhere or risk losing their accreditation.

Recognizing societal demands for improved patient safety, the task force that developed the standards has embraced stricter duty-hour limits and greater supervision for trainees in the first postgraduate year (PGY-1). The new standards reflect many of the recommendations made by the Institute of Medicine (IOM) in a 2008 report[1] but differ from them on one critical issue — how graduate medical education (GME) programs can best prevent harmful medical errors committed by sleep-deprived residents. The IOM recommended that resident shifts uninterrupted 5-hour sleep period. The ACGME task force concluded that such a long sleep period was unworkable, instead recommending "strategic napping" during long shifts.

As the accrediting body for advanced training programs, the ACGME sets and enforces standards related to residents' learning and working environments. It reviews and updates its standards periodically, taking into consideration the scientific literature; the views of consumer, medical, and patient-safety organizations; and related government

the standards is voluntary, nonadherence would jeopardize hospitals' ability to sponsor GME programs and place at risk annual support from Medicare of about $100,000 per resident (a national total of $9.5 billion a year).

The ACGME issued preliminary duty-hour standards in June[2] — updating those adopted in 2003 — and invited comments from interested parties. The largest proportion of the hundreds of comments it received focused on the limits for PGY-1 residents. Whereas the current standards are generally one size fits all (an 80-hour week on average, with the average calculated over a period of 4 weeks, with a maximum on-site duty period of 24 hours, plus 6 hours for transferring patients and learning), the new

Iglehart JK.
NEJM September 28, 2010

ACGME Duty Hour Standards *(Effective 7/1/2011)*

- An 80-hour weekly limit, averaged over four weeks (max)
- Minimum of one day free every week (averaged over 4 weeks)
- PGY-1:
  - No moonlighting
  - 16 hours continuous duty hour limit
  - Should have 10 hours off between duty but must have 8 hours off

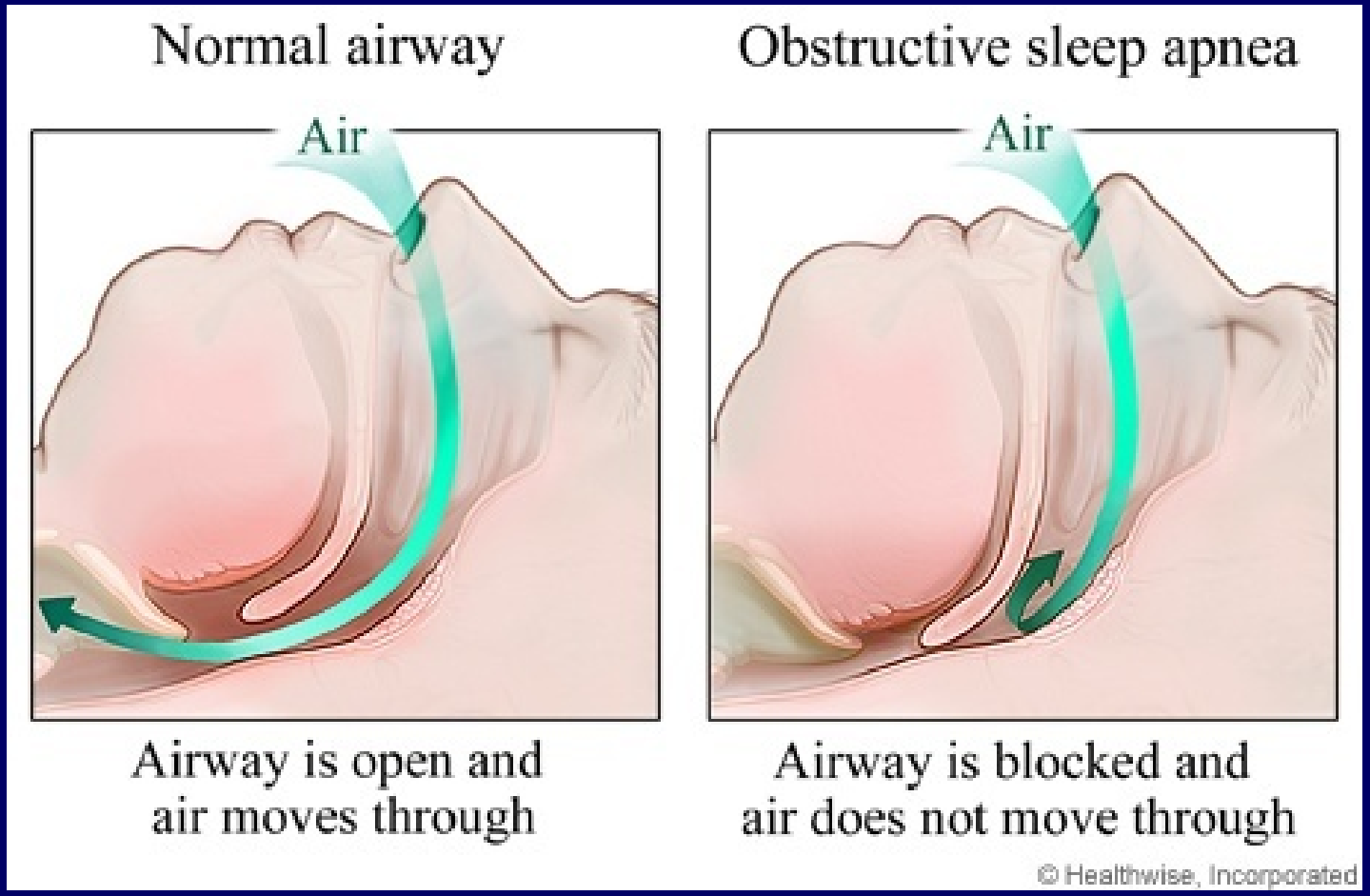
ACGME Duty Hour Standards *(Effective 7/1/2011)*

- PGY-2s and higher:
  - Maximum 24 hours continuous duty
  - Must have 14 hours free of duty after 24 hours in-house
  - In house-call no more than every 3rd night (averaged over 4 weeks)
  - Strategic napping, especially after 16 hours continuous duty, between 10 pm – 8 am must be encouraged
- Programs must manage potential negative effects of fatigue on patient care and learning (naps, back-up call schedules)
- Programs must encourage alertness management

What are the types of sleep problems?

- There are more than 80 types of sleep disorders
  - 50 million Americans suffer from a sleep disorder, yet most go undiagnosed and/or untreated
- Common sleep problems:
  - Snoring
  - Obstructive Sleep Apnea
  - Narcolepsy
  - Restless Leg Syndrome
  - Sleep-walking/ Sleep-talking

Obstructive Sleep Apnea



What is sleep apnea?

- Sleep apnea is a common disorder in which you have one or more pauses in breathing or shallow breaths while you sleep.
  - Can lead to frequent awakening
- Approximately 18 million people have sleep apnea
  - 4% men
  - 2% women

Who is at risk for sleep apnea?

- Male
- Middle-age
- Overweight
- History of snoring
- Genetic disorders
- Large tongue
- Enlarged tonsils
- Small chin, maxilla and mandible
- Short thick neck
  - Males > 17 inches in have increased risk
  - Females > 16 inches in have increased risk

What are the consequences of untreated sleep apnea?

- Cardinal symptom-daytime sleepiness
  - Sleep fragmentation due to repetitive arousals
- Chronic fatigue or tiredness- Females
- Snoring
  - Common
  - Frequently disrupts bed partner
- Witnessed apneic episodes (breathing pauses)

What are the consequences of untreated sleep apnea?

- Awakening w/ headache
- Impotence
- Awakening w/ dry throat
- Awakening gasping for air or with smothering sensation
- Nocturia
- Restless sleep
- Memory impairment-often
  - Lower scores on neurocognitive testing

What are the consequences of untreated sleep apnea?

- Cardiovascular
  - High Blood Pressure
  - Cardiac arrhythmias
  - Transient ischemic attack/stroke
- Metabolic
  - Glucose intolerance/diabetes

What are the consequences of untreated sleep apnea?

- Other
  - Motor Vehicle Accidents
  - Traffic citations
  - Neurocognitive impairment
  - Mood Disorders

How is sleep apnea diagnosed?

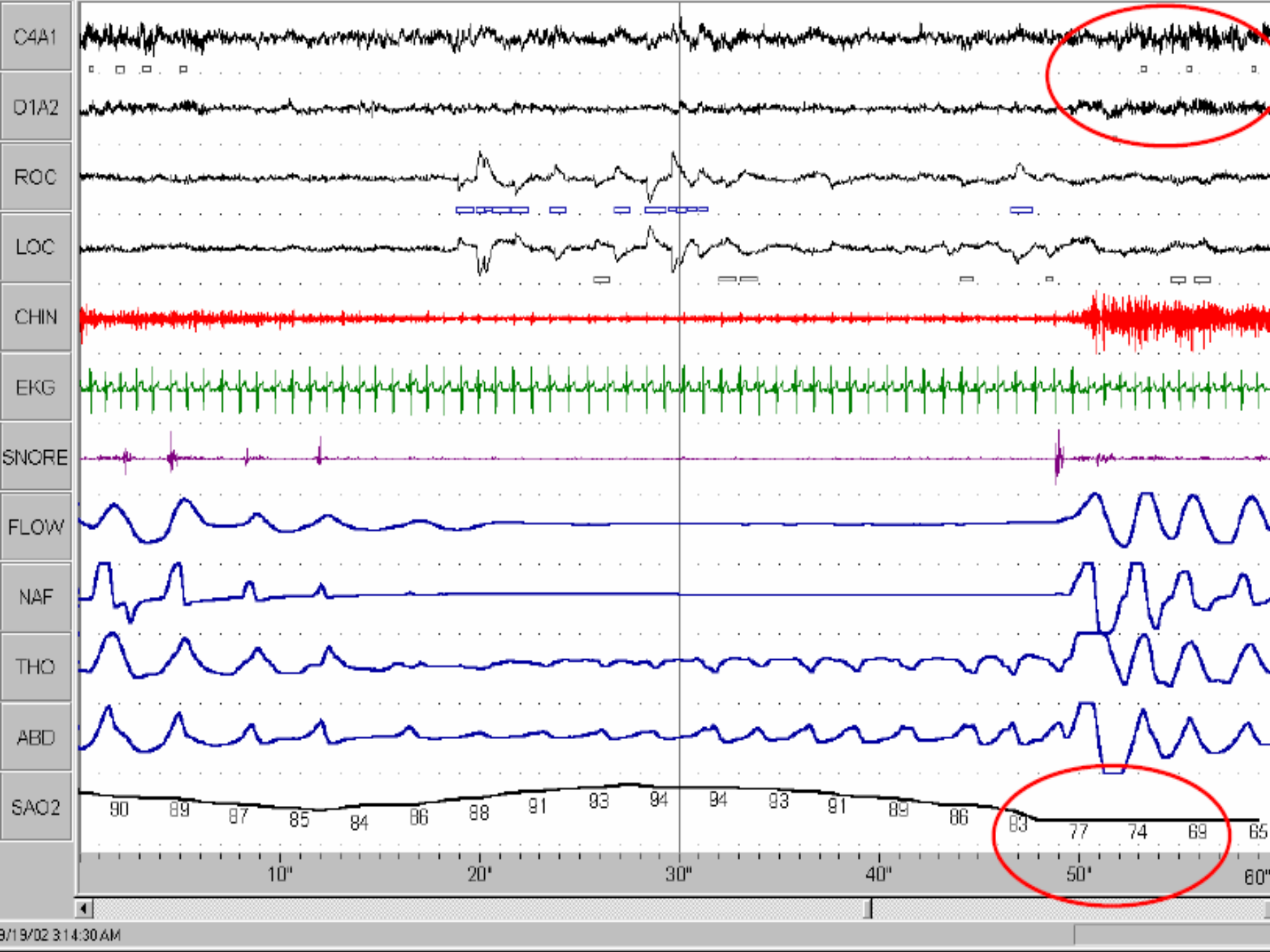
STOP

S (snore)	Have you been told that you snore?	YES / NO
T (tired)	Are you often tired during the day?	YES / NO
O (obstruction)	Do you know if you stop breathing or has anyone witnessed you stop breathing while you are asleep?	YES / NO
P (pressure)	Do you have high blood pressure or on medication to control high blood pressure?	YES / NO

BANG

B (BMI)	Is your body mass index greater than 28?	YES / NO
A (age)	Are you 50 years old or older?	YES / NO
N (neck)	Are you a male with a neck circumference greater than 17 inches, or a female with a neck circumference greater than 16 inches.	YES / NO
G (gender)	Are you a male?	YES / NO

What is polysomnogram?


C4A1
O1A2
ROC
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CHIN
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THO
ABD
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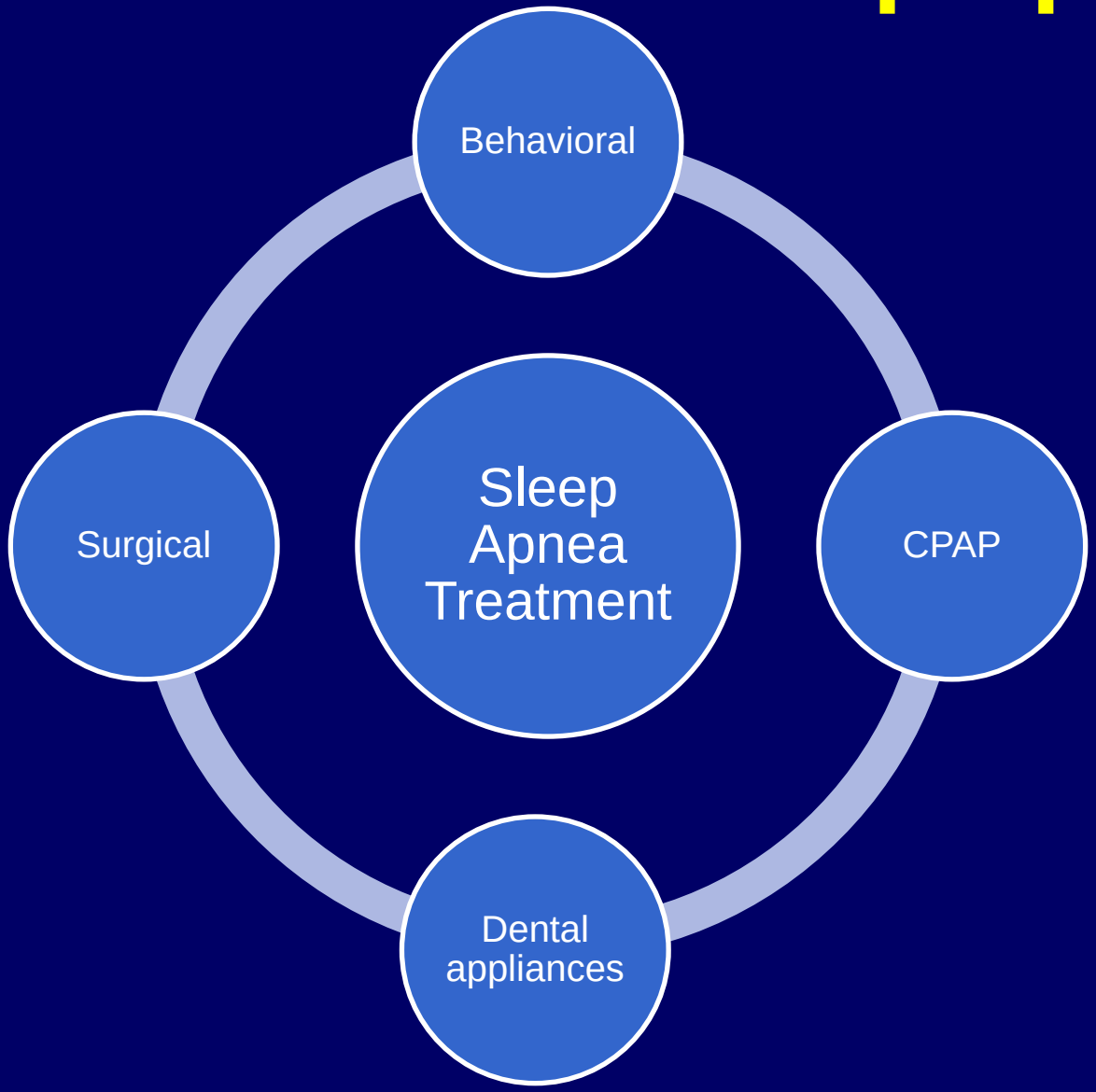
90 89 87 85 84 86 88 91 93 94 94 93 91 89 86 83 77 74 69 65
10" 20" 30" 40" 50" 60"
8/19/02 3:14:30 AM

How do we grade the severity of sleep apnea?

- Apnea Hypopnea Index
  - 5-15 Mild
  - >15-30 Moderate
  - >30 Severe

How do we treat sleep apnea?

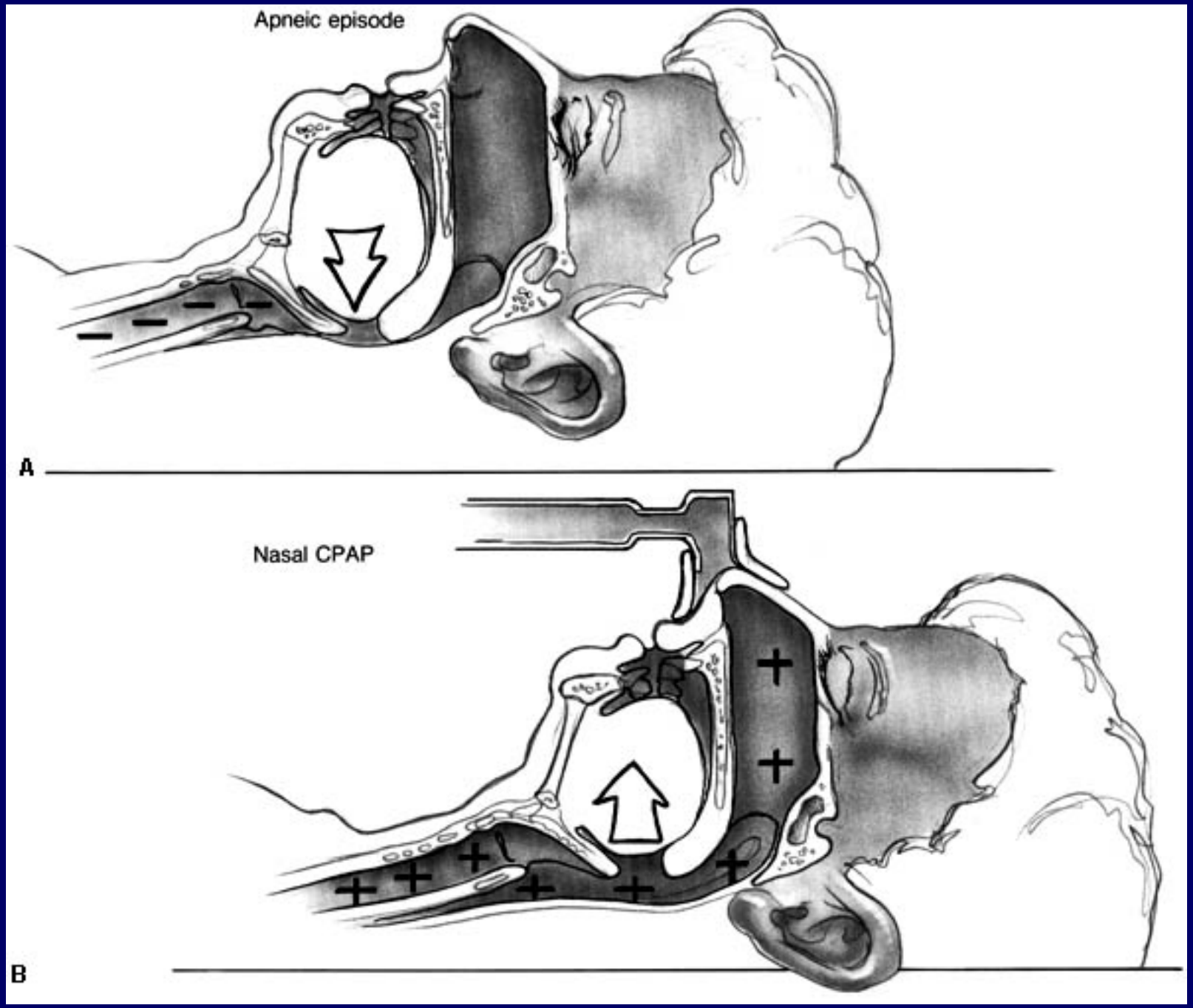


How do we treat sleep apnea?

- Behavioral
  - Sleep Hygiene
  - Weight loss
  - Avoidance of supine position
  - Avoidance of exacerbating substances (e.g. Alcohol)

How do we treat sleep apnea?

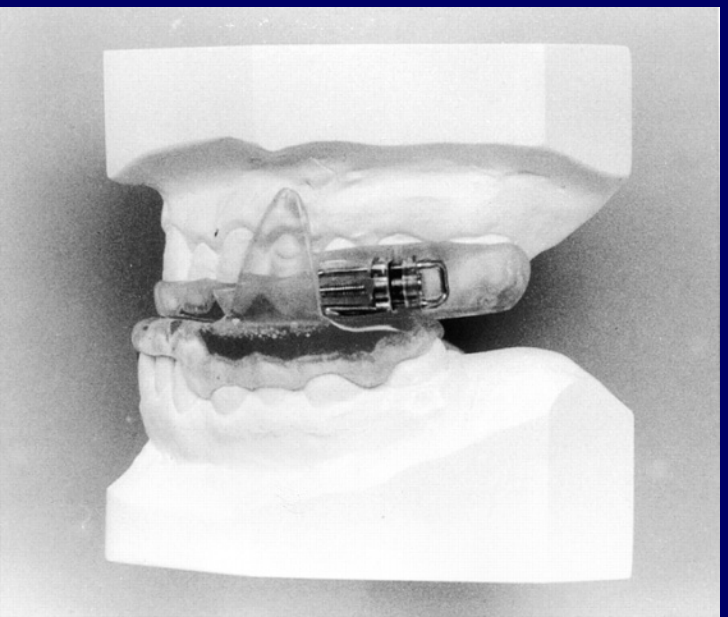
- CPAP
  - Very effective
  - Titrated to limit all respiratory events
  - Side effects

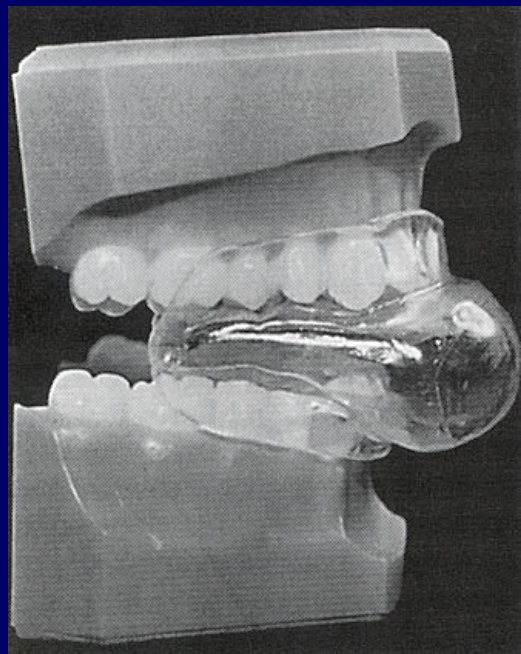

Apneic episode
A
Nasal CPAP
B

Mask Types

How do we treat sleep apnea?

- Two basic types of oral appliances:
  - Advance tongue
  - Advance mandible
- Best for mild/moderate OSA





How do we treat sleep apnea?

- Surgery
  - Bariatric surgery for morbidly obese
  - UPPP
  - Maxillomandibular advancement
  - Tracheotomy