Sleep Disorders

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Learning Objectives

1. To learn an approach to patients with excessive daytime sleepiness
2. To understand the systemic effects of sleep disorders, especially sleep deprivation and sleep-disordered breathing
3. To review epidemiologic and clinical trials evidence that untreated sleep disorders leads to cardiovascular and other systemic disease

EPWORTH SLEEPINESS SCALE

Chance of Dozing
0 = never  1 = slight  2 = moderate  3 = high
- Sitting and reading
- Watching television
- Sitting inactively in a public place
- Riding as a passenger in a car for one hour without a break
- Lying down to rest in the afternoon when circumstances permit
- Sitting and talking with someone
- Sitting quietly after lunch without alcohol
- Sitting in a car as the driver, while stopped for a few minutes in traffic

Upper limit of normal = 10

Other Tests of Sleepiness

1. Multiple Sleep Latency Test: tests ability of subject to fall asleep
2. Maintenance of Wakefulness Test: tests ability of subject to resist falling asleep
Sleep stages

- We cycle through the stages of sleep about every 90 minutes during the night, in the same order.
- Most dreaming occurs during the second half of the night, as REM sleep lasts longer and longer.
  - Stage N1: Very light transitional sleep
  - Stage N2: Light sleep
  - Stage N3: Deep sleep, restorative sleep
  - REM: Rapid eye movement sleep

Sleep throughout life

- Childhood and adolescence
  - Sleep needs range from 18 hrs a day for infants to about 9 hrs a day for teenagers
- Adulthood
  - Amount of deep sleep drops dramatically between age 20 and 40, and average sleep time is 7.5 hours
  - Women’s reproductive cycles affect sleep
    - Especially pregnancy (sleepier first trimester)
    - Also affected by menstrual cycle (sleepier second half of cycle)

Sleep in middle age

- Sleep becomes lighter and nighttime awakenings become more frequent and last longer
- Often wake up after 3 hours of sleep
- Menopause may lead to hot flashes that interrupt sleep repeatedly
- Sleep apnea becomes more common, especially among overweight
- Physically active adults sleep more soundly than their sedentary peers

Sleep among older adults

- Less deep sleep, but dreaming still 20%
- May be dozens of awakenings during the night
- Falling asleep takes longer
- Despite the above, over a 24-hour period older adults generally accumulate the same amount of total sleep as younger people
  - Older adults more likely to nap during the day
- Older adults do need about the same amount of sleep as they did when they were younger
Circadian Problem
Insomnia
Sleep Restriction
Not Enough Sleep
Excessive Daytime Sleepiness

Effects of Sleep Deprivation

Cognitive Effects

Not Sleep Deprivation but Excess Wakefulness

Endocrine Effects

Van Dongen et al. Sleep 2003
Sleep Deprivation and Endocrine Function

Spiegel et al.
Lancet 1999

Sleep Deprivation and Glucose Metabolism

Spiegel et al.
Lancet 1999

Effects on the Immune System

Spiegel et al.
JAMA 2002

Sleep Deprivation and Vaccination Response

Spiegel et al.
JAMA 2002

Effects on Nociception and Pain

Moldofsky Psychosom Med 1976

Sleep Deprivation and Pain
Sleep Deprivation and Pain

Sodium Oxybate in Fibromyalgia

Effects of Sleep Deprivation on Mortality and Cardiovascular Disease

Sleep Deprivation is Pro-inflammatory

Haack et al. Pain 2005


Van Leeuwen et al. PLOS One 2009
Sleep Deprivation is Pro-inflammatory

Mortality and Sleep Duration

Kripke et al. Arch Gen Psy 2002

Mortality and Sleep Duration

Ayas et al. Arch Int Med 2003

SLEEP HYGIENE
If you are having trouble sleeping, this is a list of things you should try to improve your sleep hygiene and the quality of your sleep.

1. Stick to a sleep schedule always even on weekends.
2. Exercise is great, but not too late in the day.
3. Avoid caffeine and nicotine.
4. Avoid alcoholic drinks before bed.
5. Avoid large meals and beverages late at night before going to bed.
6. Don’t take naps after 3 pm. Keep power naps less than 1 Hour.
7. Relax before bed.
8. Take a hot bath before bed.
9. Have a good sleeping environment. Get rid of anything in your bedroom that might distract you from sleep.
10. Have the right sunlight exposure.
11. Don’t lie in bed awake. If you find you still start to panic after staying in bed for more than 20min, get up and do a relaxing activity until you feel sleepy.
13. See a doctor if you continue to have trouble sleeping.

No More Sleepless Nights
Revised Editions of the American Heart Association

Front cover by Philip K. Nishiyama, MD, www.medacademy.com
Don’t look at the clock!

RLS/PLMD
Sleep Disordered Breathing

Lousy Sleep

Excessive Daytime Sleepiness

Obstructive Sleep Apnea

• diagnosed based on the Apnea-Hypopnea Index (AHI) measured during polysomnography, expressed in events per hour (normal <5)

• Apnea: absence of airflow (or tidal volume) for at least 10 seconds

• Hypopnea: reduction in airflow (or tidal volume) to less than 50% of baseline for at least 10 seconds associated with >3% oxygen desaturation

• “Obstructive” denotes that these events occur in the presence of respiratory effort

Obstructive Sleep Apnea

• Results from collapse of the upper airway at the level of the velopharynx and oropharynx

• Is very effectively treated with CPAP, which acts as a pneumatic splint (but up to 30% noncompliant)
55 year old man with severe OSA

Hypertension subgroups that might benefit from treatment of OSA

1. Severe OSA
2. Severe hypertension, especially refractory hypertensives
3. “Non-dippers” on 24 h BP profile

Bazzano et al. Hypertension 2007

Marin et al. Lancet 2005
CARDIOVASCULAR EVENTS AND ALL-CAUSE MORTALITY

Results from multivariable Cox regression model presented as hazard ratios with shading representing confidence levels (99%, 95%, 90%, 80%, and 70%).


http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001599

INCIDENT DIABETES

Results from multivariable Cox regression model presented as hazard ratios with shading representing confidence levels (99%, 95%, 90%, 80%, and 70%).


http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001599

Challenges in performing randomized controlled trials in the treatment of OSA

1. Ethics of leaving patients with OSA untreated for duration of long term studies
2. High rates of noncompliance with CPAP
3. Lack of suitable placebo for CPAP


Figure Legend:

A, Cumulative incidence of hypertension or cardiovascular events for the intervention groups during follow-up with the P value for the incidence density ratio of continuous positive airway pressure (CPAP) vs control (shaded). B, Panel A with CPAP group stratified according to adherence (yes vs no light) and the P value for the incidence density ratio in reference to the control group.
Treatment of Obstructive Sleep Apnea

Treatment Options for OSA

1. Conservative Measures (weight loss, body position, avoid alcohol and sedatives)
2. CPAP – by far the most effective for severe OSA
3. Dental Appliances
4. Surgery, especially if large tonsils

CPAP is incredibly effective (when tolerated)

Initial sleep study

CPAP titration study

Dental Appliance

Uvulopalatopharyngoplasty and/or Tonsillectomy
Summary

- The differential diagnosis of excessive daytime sleepiness comprises:
  - Not enough sleep
  - Poor quality sleep
  - Primary sleepiness

- Sleep deprivation causes deficits in cognition, immune and endocrine function, and may predispose to chronic pain and cardiovascular disease and mortality

- Obstructive sleep apnea is a common cause of poor quality sleep and has been linked to:
  - Hypertension
  - Diabetes
  - Cardiovascular morbidity and mortality