Sleep Deprivation In Residents

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OBJECTIVES

• Learn about normal sleep architecture
• Recognize causes of sleep deprivation
• Recognize the effects of sleep deprivation on performance and health
• Counter-measures to counteract effects of sleep deprivation
Normal Sleep Architecture

- NREM Sleep:
  - Stage N1: Drowsiness
  - Stage N2: Light sleep
  - Stage N3: Deep sleep/Slow wave or Delta sleep
- REM sleep: Dreaming
CIRCADIAN RHYTHMS

- Approximately 24 hours cycle
- **Examples:**
  - sleep-wake cycle
  - temperature regulation
  - Endocrine system
- Malfunctioning of the biological clock causes circadian rhythm disorders
SHIFT WORK

• A schedule that requires you to stay awake when your body wants to sleep and vice-versa

• Shift work schedules:
  - Night shifts
  - Early morning shifts
  - Rotating shifts

• Night owls might find it easier to adapt to night shifts
SHIFT WORK

- It is easier to adapt to shifts in the forward direction
- It is easier to stay up later than to try to fall asleep earlier
Causes of Sleep Deprivation

- Insufficient sleep
- Fragmented sleep
- Circadian rhythm disruption
- Primary sleep disorders (OSAS, narcolepsy etc.)
Circadian rhythm disruptions
- Body temperature
- Respiratory rate
- Hormonal production
- Menstrual cycle
- Urinary excretion
- Cell division

Mental Health
- Stress
- Anxiety
- Depression
- Neuroticism
- Reduced vigilance
- ‘Burnout syndrome’

Brain effects
- Sleep loss
- REM sleep reduction
- Stage 2 sleep reduction
- Fatigue
- Reduced brain volume

Cardiovascular disorders
- 40% increased risk for:
  - Angina pectoris
  - Hypertension
  - Myocardial infarction

Gastrointestinal disorders
- Dyspepsia
- Heartburn
- Abdominal pains
- Flatulence

Reproductive effects
- Spontaneous abortion
- Low birth weight
- Prematurity

Increased cancer
- Breast cancer
- Colorectal cancer
Effects of Sleep deprivation

- Irritability
- Cognitive impairment
- Memory lapses or loss
- Impaired moral judgement
- Severe yawning
- Hallucinations
- Symptoms similar to ADHD
- Impaired immune system
- Increased heart rate variability
- Risk of heart disease
- Decreased reaction time and accuracy
- Tremors
- Aches
- Risk of diabetes Type 2

Other:
- Growth suppression
- Risk of obesity
- Decreased temperature
Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the following situations? Answer considering how you have felt over the past week or so.

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

1. Sitting and reading
2. Watching TV
3. Sitting inactive in a public place (e.g., theater or meeting)
4. As a passenger in a car for an hour without a break
5. Lying down to rest in the afternoon when able
6. Sitting and talking to someone
7. Sitting quietly after a lunch without alcohol
8. In a car while stopped for a few minutes in traffic
Effects of Sleep Deprivation

• Surgery: 20% more errors and 14% more time required to perform simulated laparoscopy post-call (2 studies), Taffinder et al 1998, Grantcharov et al, 2001

• Internal Medicine: efficiency and accuracy of ECG interpretations is impaired in sleep deprived interns, Lingenfelser et al, 1994

• Pediatrics: time needed to place an intra-arterial line is increased with sleep deprivation, Storer et al, 1989
Effects of Sleep Deprivation

- Emergency Medicine: significant reduction in comprehensiveness of history & physical exam documentation in second year residents (Bertram 1988)

- Family Medicine: scores achieved on the ABFM practice in-training exam negatively correlated with pre-test sleep amounts (Jacques et al. 1990)
BOTTOM LINE

• You have to be alert to provide the best possible care to your patients and to yourself
How Much Sleep Is Enough?

• Variable for each individual
• Tolerance to sleep loss varies but humans can’t accurately judge this for themselves
• 8 hours of sleep is needed for optimal performance
• Insufficient sleep creates a sleep debt
ACGME Rules Duty Hour Restriction

- 80 hours maximum /week
- 24 hours maximum/shift; an additional 6 hours are allowed for transfer of care
- 1 day in 7 free of patient care
- In-house call only every 3 nights
- 10 hour minimum rest period between daily duty periods and after in-house call
- Even more restrictive duty-hour policies for some specialties, such as emergency medicine
Alertness Strategies

- Strategic Napping
- Sleep Hygiene
- Caffeine
- Bright Light
- Avoid stimulant drugs, alcohol
STRATEGIC NAPPING

- Naps temporarily improve alertness
- Preventative (pre-call)
- Operational (on the job)
- Short naps: no longer than 30 minutes to avoid sleep inertia
- Long naps: 30 to 180 minutes
STRATEGIC NAPPING

• If possible, take advantage of the circadian “windows of opportunity” (2-5 am and 2-5 pm)
• If not, nap whenever you can
• Allow adequate time to recover from sleep inertia
• Naps take the edge off but do not replace adequate sleep
Sleep Hygiene

• Get adequate sleep prior to anticipated sleep loss
• Regular bedtime and wake-up times
• Conducive sleeping environment: cooler temperature, dark and quiet room
• Avoid heavy exercise, heavy meals, alcohol, stimulants like caffeine within 3 hours prior to bedtime
CAFFEINE

- Strategic consumption is important
- Acts within 15-30 minutes, ½ life is 3-7 hours
- Helps for temporary alertness
- May disrupt subsequent sleep
- Tolerance may develop
Bright Light

• Exposure to bright light when you need to be alert

• Avoid light exposure in the morning after night shift (wear dark glasses while going back home)
Adapting To Night Shifts

• It takes a week of circadian rhythms and sleep patterns to adjust
• Direction of shift rotation affects adaptation
• Bright light exposure during period of night shift
• Avoid light in the morning after night shift
• Protect your sleep
• Nap before work
• Consider “splitting” sleep into 2 four hour periods
Risk Factors For Drowsy Driving

- Sedative medications
- Drinking even small amounts of alcohol
- Other sleep disorders
- Driving long distances without breaks
- Driving alone or on a boring road
Signs of Drowsy Driving

• Trouble focusing on the road
• Difficulty keeping eyes open
• Nodding, repeated yawning
• Drifting from your lane, missing signs/exits
• Closing eyes at stoplights
Safe Driving

- Avoid driving if sleepy
- Get a ride home if really sleepy
- Stop driving if you notice warning signs of sleepiness
- Pull off the road at a safe place and take a short nap if very sleepy
SUMMARY

• Sleep deprivation has the same effect as alcohol intoxication

• Recognition of sleepiness and fatigue and use of alertness strategies is very important

• When sleepiness interferes with your work/health, talk to your supervisors and program director