I'm so Good at Sleep I do it With My Eyes Closed

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Linda S. MacConnell has nothing to disclose

Learning Objectives
Upon completing the activity, the learner will be able to:
1. Discuss the benefits of optimal sleep & risks associated w/ sleep deficiency
2. Compare sleep pathologies:
   A. Sleep-related breathing disorders
   B. Central disorders of sleep
   C. Parasomnias
   D. Sleep-related movement disorders
   E. Other sleep disorders
3. Determine candidates for sleep studies/explain findings of sleep related diagnostics
4. Apply knowledge obtained of pathology and therapeutics (primarily non-pharmacologic) & help patients obtain healthier more restful sleep

Why do we need sleep?

We didn’t learn much about sleep in PA school, unless we slept through that
NIH Study
50-70 mil adults w/ sleep or wakefulness d.o.
1/3 of US get < 7 hours; 1/3 sleepy Q.D.
$50 bil in lost productivity
70% HS students don’t get enough sleep school nights
12-18 mil adults w/OSA/other SA
5-6,000 fatal crashes due to sleepiness

Who Knew?
Here’s a definition: Reversible essential biological function w/ decreased response, movement & metabolism
Why sleep???
Not sure why we sleep: Restoring physical/ psychological f(x) = main purpose
   Evolution: Dangerous vs safety in the dark
   Maybe just got tired and fell asleep

OBJECTIVE:
BENEFITS OF SLEEP & RISKS ASSOCIATED W/ SLEEP DEFICIENCY
What do:
Chernobyl
Three Mile Island
The Exxon Valdez oil spill accident have in common?

Sleep is UNDERRATED!
Sleep d/o = CVA, DM 2, CA, HTN & obesity
It’s NOT a luxury—or a little downtime
How you feel awake = what you do when you sleep
Few sleep recommendations for education of public and HCPs

Why do we need our ZZZzs?
Neural development
   Memories synthesize
Learning
   Emotional regulation
C/V & metabolic regulation
   Cellular toxin removal
Recovery, energy conservation, survival
Sleep on it - Emotional regulation


I'll sleep on it...

Linda Macconnell, 2/22/2017
The IRONY!

V’d importance globally (century esp last 20-30yrs) sleep given vs work and gadgets—Social life?

Co-ink-e-dink?

Increased rates: DM, obesity et al debilitating dz

An Official American Thoracic Society Statement: The Importance of Healthy Sleep

The Importance of Sleep

Not enough ZZZs: Common

Results from:

- Occupational issues (shift work, long shifts)
- Social and family aspects; psychosocial
- Physical pathology: Apnea, insomnia, pain, sleep disorders.

Quality AND Quantity
Body repairs itself during sleep
Awake refreshed

How Much is Enough?

Too much, too little, just right
Varies/person
How long would you sleep w/o an alarm?
How alert after different amounts of sleep?
Refreshed & awake all day, even when bored?
Varies throughout life ~ 6-8 hours/noc
Short sleepers: <6 w/o “catchup”
Some need => 10 hours/noc
Even children and adolescents

How much is Enough?
American Academy of Sleep Medicine &
Sleep Research Society recommend =/>7 hr/pm for good health
National Sleep Foundation updated
recommendations for sleep time thru life:

Sleep duration recommendations

<table>
<thead>
<tr>
<th>Age</th>
<th>Recommended (hours)</th>
<th>May be appropriate (hours)</th>
<th>Not recommended (hours)</th>
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<td>Newborn (0 to 2 months)</td>
<td>10 to 15</td>
<td>8 to 16</td>
<td>Less than 12</td>
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<td>Infant (2 to 5 months)</td>
<td>12 to 15</td>
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<td>Young adults (22 to 64 years)</td>
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<td>Adults Crit (65 years)</td>
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<tr>
<td>Older adults (85 years)</td>
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<td>6 to 10</td>
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</table>

Adapted from: American Academy of Sleep Medicine & National Sleep Foundation’s sleep time duration recommendations: Methodology and rationale summary. Sleep Health 2015; 2:45-50. 
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Sleep Deprivation

Sleep debt:
- Reduced performance,
- Increased risk accidents & death,
- Neg psychological & physical health
  Esp depression; chronic insomnia BIG risk factor for depression et al d.o.
Categories of Sleep Disturbances (International Classification of Sleep Disorders [ICSD])

- Insomnia
- Sleep-related breathing disorders
- Central disorders of hypsomnolence
- Circadian rhythm sleep-wake disorders
- Parasomnias
- Sleep-related movement disorders
- Other sleep disorders

Insomnia

The diagnosis of insomnia = ALL three:
1. a. Not getting to sleep b. Not staying asleep OR c. Waking too early
2. Enough time & place to sleep
3. Daytime difficulty due to lack of sleep

Short-term, long-term or other insomnia overlap and cloudiness or the following test...
Insomnia

Sleep-related breathing disorders

OR

Breathing-related sleep disorders

Breathing-Related Sleep Disorders (BRSD)
Highly under diagnosed
Range of breathing abnls:
  Habitual snoring
  Upper airway resistance syndrome (UARS)
  Obstructive sleep apnea (OSA)
  Obesity hypoventilation syndrome
  Central Sleep Apnea
DDx
Depression
Gastroesophageal reflux disease
Hypothyroidism
Obstructive sleep apnea-Sleep hypopnea
Congestive heart failure
Narcolepsy
Nocturnal asthma

Etiologies
Upper airway collapse:
• CNS/PNS, airway anatomy & neurotransmitters
• Airway anatomy, nasal obstruction, body fat and/or muscle tone
• Small, collapsing airway in combo w/ fall in airway muscular tone
• OSA=obstruction MC @ uvula/soft palate or tongue Neuromuscular dz's risk

PREVALENCE OF OSA IN PATIENTS WITH...
**Demographics**

Age, sex, obesity, & craniofacial size = poorly understood; races =
Stats vary widely! BUT UNDER-DXed
^s w/ age BUT common in kiddos
Severe OSA = M 8X> F (testo driven)
  B4 puberty an P menop M&F ^=

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**Morbidity > Mortality**

Dying in ones’ sleep is RARE
Morbidity:
  Neuropsych or social
    Probs w/: fatigue, concentration
    memory, performance, ^irritability,
    depression, social, ^^risk of MVAs (7X ^
    risk)
  Daytime function and sense of well-
  being. Depression may require cont. tx

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**Consequences of OSA**

Sleepiness, fatigue, poor concentration, poor
neurocognitive performance and increased all-cause and
C/V mortality
Pt Evaluation: Hx ?s

Do you:
- Snore? Anyone complain? (I demo stopping breathing)
- Wake up gasping and choking
- Nocturia
- Insomnia
- Tossing & turning
- Wake up tired (nonrestorative sleep) or w/headache, dry or sore throat

RU Experiencing?:
- Excessive daytime sleepiness (EDS) See Epworth Scores
- Trouble thinking; memory, concentration, Paying attention, AM confusion
- Mood changes: depression & anxiety
- Sex probs: < libido & ^ impotence
- GERD
- HTN
- Depression

Pt. Evaluation: Epworth Sleepiness Scale

How likely RU to fall asleep?
- Sitting and reading
- Watching television
- Sitting inactive in a public place (theater, meeting)
- Lying down for a pm nap
- Sitting and talking to someone
- Sitting quietly after lunch without alcohol
- In a car stopped in traffic
- In a car as a passenger
Pt. Evaluation P.E.

General characteristics
Obesity
Craniofacial dysmorphology
  Micrognathia, retrognathia, maxillary hypoplasia, cleft palate
  Macroglossia

Vitals:
 HTN (45-90% of PT)
  ~30% w/ htn also OSA
 BMI >28
 Collar size M:>17 30% OSA F:>15 "risk

Craniodental exam: alignment; occlusion
Nasal exam: DNS, turb hypertrophy, polyps, masses
Oropharynx: tonsils, long soft palate, uvula, post pharyngeal stenosis, tongue, palate posterior wall, Crowding?
Neck: is it present? Masses? Lymphadenopathy?
Mental Status Exam

Evaluation Contd.

Labs and dx tests:
PFTs r/o Pulm path like noc asthma, ABGs
Imaging: Research protos, Pre-surgical evals
  Somnofluoroscopy
    Pharynx collapse & max airway narrowing
  Cephalometry
    Craniofacial skeleton; awake ltd. Value
Central sleep apnea (CSA)

“Brain stops telling the diaphragm to breath”
Problem w/ airflow & ventilatory effort during sleep
  Primary: idiopathic CSA
  Secondary: Cheyne-Stokes breathing, a medical condition, Rx/substance, or high altitude periodic breathing
Hyper or hypo-ventilation

Risk Factors

Elderly >65
Male
**Comorbidities**
  Heart Failure, CVA
  Acromegaly, renal failure, A fib, low cervical tetraplegia, mitochondrial dz
Meds: chronic use of opioids & methadone
Seeing the Pt

CC: fatigue & sleepiness, poor sleep, insomnia, poor attention, concentration, PND, AM HA, nocturnal angina, moodiness, v’d libido, impotence.
With another CC, health maintenance screening or (in-pt) monitored desats, pauses in breathing, or nocturnal arrhythmias.

Comorbidities
Cheyne-Stokes: Episodic deep labored or overly shallow breathing, hypopnea, and apneic periods
Heart failure
PE: nothing specific; ? peripheral edema, crackles, S3 gallop, JVD, or RUQ pain, (CVA) w/ asymmetric weakness, sensory or cranial nerve abnls, ataxia. Or irregularly irregular pulse (AF)

Cheyne-Stokes Breathing (CSR)
Cyclic breathing; apnea, ^ in frequency & tidal volume (hyperpnea), then v’d breathing frequency & tidal volume, then apnea
MoA: ? ^ lung to brain circulation time, v’d tissue & lung CO₂ and O₂ stores, and ^ ventilatory drive
Comorbidities: M.C. HF or CVA, sedation, nl sleep, acid-base disturbances, prematurity, altitude
Diagnosis — same for patients w/ or w/o HF. Overnight polysomnogram = gold standard
Gold Standard Eval
In-lab Polysomnography:
Primary: ≥5 central apneas and/or hypopneas per hour of sleep; >50 % of total apneas/hypopneas; and there is no evidence of secondary CSA cause

Treating CSA
Treat underlying condition (HF)
D/C medication or substance may improve
CPAP is preferred treatment for CSA
Secondary to HF: reduced ejection fraction can’t tolerate or respond to CPAP, noc. O2 may be best
CHF better treated?
Acetazolamide

Other Central Sleep DOs
Daytime sleepiness not due to other sleep d/o
Narcolepsy type 1 and 2
Idiopathic hypersomnia
Kleine-Levin syndrome
Hypersomnia of medical disorder, medication, substance or psychiatric disorder
Insufficient sleep syndrome
**Kleine-Levin Syndrome**
(Sleeping Beauty Syndrome)

- Rare, complex neuro d/o
- MC teens (little guys and adults)
- Sleep days, wks, mons
- If awake-confused, lethargy, apathy
- Hypersensitive to light/noise
- Hyperphagia and sexuality
- Asymptomatic periods

**Narcolepsy Causes**

*Hypocretin (hi-pa-KREET-in), a chemical in the brain that helps promote wakefulness. Most people who have narcolepsy have low levels of this chemical. What causes these low levels is unknown.*

Possible factors include:
- Heredity: Some people may inherit a gene that affects hypocretin. Up to 10% of people who have narcolepsy report having a relative with the same symptoms.
- Infections
- Brain injuries caused by brain tumors, strokes, or traumas.
- Autoimmune disorders
- Low levels of histamine, a substance in the blood that promotes wakefulness.

Type 2: cataplexy and/or cerebrospinal fluid hypocretin-1 deficiency not present

**Dxing central d.o.s of hypsomnolence**

- Is there sleep deprivation in pts needing longer sleeping?
- Sleep logs and/or actigraphy* >= week b4 objective testing of sleepiness with a Multiple Sleep Latency Test (MSLT) assures regular sleep-wake schedule and adequate sleep time.
- *Actigraphy: non-invasive monitor of sleep awake cycles (some FitBits)
Multiple Sleep Latency Testing (MSLT)
- Evaluates excessive daytime sleepiness
- Measures speed one falls asleep during day
- AKA daytime nap study
- Used to diagnose narcolepsy and idiopathic hypersomnia
  Narcolepsy = >= 2 episodes or REM in 15 min.
  Idiopathic hypersomnia = NO REM
- Day after a sleep study
- Only scientifically validated objective test of excessive sleepiness

Sleep studies (Polysomnography)

Screening Devices
- Epworth Sleepiness (0–10 Normal range | 10–12 Borderline | 12–24 Sleepy)
- STOP-Bang score: snoring, obesity, dyspnea, HTN, age, gender
- Sleep apnea clinical score: neck, BMI, snoring, gasping
- Berlin Questionnaire* 
 Polysonmography on anyone w/ excessive daytime sleepiness vs fatigue
- Snoring/occupation or >=2 clinical features
- Low threshold for dx testing w/ risk: resistant htn, pulm htn, 2ndary polycythemia
## SS/Polysomnogram (PSG)

W/ clinical hx  
Sleep in the lab (mostly),  
Dx S-RBD, narcolepsy, sleep-related movement disorders, some parasomnias.  
Monitors (EEG et al) show sleep in stages  
Terms/scoring rules from the American Academy of Sleep Medicine (AASM)  
Must use AASM scoring manual (being adopted worldwide)

## Polysomnogram

Evaluate sleep d.o. esp SA  
titrate PAP  
Assess current tx if sig. wt.change  
In-lab particularly in dxtic eval of pts w/ advanced CPulm disease (^ of central apneas)  
and in pts w/or w/o comorbid sleep d.o.  
Eval tx w/concern pt not responding w/currently Rx/tx

## SS: the fine print!

**CONTRAINDICATIONS:** Medically stable pt; labs w/o HCP  
Some need accommodations (injuries, etc.)  
Sick pts (URI), short term high-dose opioids, lice or bed bugs = rescheduled.  
Chronic opioid pt & respiratory problems do not stop testing  
In-dwelling devices are not usually a problem  
Portable sleep study may be appropriate in in-pts  
**COMPPLICATIONS:** None to rare. MC = skin irritation due to sticky electrodes also inconvenient to sleep in lab, discomfort of monitors or bed  
Staff must be prepared for emergencies.
SS Glossary

Total recording time: Lights out to lights on.
Total sleep time (TST) in minutes = total of light sleep (stages N1 and N2), deep sleep (stage N3), and rapid eye movement (REM) sleep.
Sleep efficiency (SE) = TST/total recording time; Lights out-lights on
Sleep stage % (SSP) of particular sleep stage is the duration of sleep stage/TST.
Sleep latency in minutes: Lights out to documented sleep.
Sleep stage latency: duration from sleep onset to the initiation of that sleep stage.

What 'chu lookin at?

Sleep stages: ID’ed by EEG, eye movements, submental electromyograph(EMG). (frontal, central, & occipital)
EMG: hypotonia (REM) sleep, detects bruxism.
Respiratory effort
Airflow: Nasal prongs measure nasal pressure
Snoring: There is a microphone attached to the neck AS IF…
+/- End-tidal carbon dioxide (CO2): Mostly in Peds
Transcutaneous PCO2 monitor – Some sleep labs
Oxygen saturation: w/ Pulse oximetry
Electrocardiogram: to detect arrhythmias
Also: Body position and limb movements

Evaluating the SS & jargon:
Apneas: No or almost no airflow (obstructive, central, or mixed)
Hypopnea’s: abnormal reduced airflow "apnea light"
Respiratory effort-related arousals; "Hypopnea light"
Cheyne-Stokes breathing
• AI, RDI: frequency of abnormal respiratory events/hour
• Positions & REM versus non-REM (NREM) sleep stages
Looks at THE BIG PICTURE!
AHI determines severity of sleep apnea
AHI > five w/ comorbidities) > 15 meets diagnostic criteria for OSA
Parasomnias
Disorders of Undesired:
• Abnormal movements during arousals from REM or NREM
• Undesirable physical or verbal behaviors; walking or talking in sleep or sleep-wake transition
• Scary to the patient and the bed partner

NREM
Recurring episodes w/partial awakening
No appropriate response
Dreams not remembered
Partial-complete amnesia for the event
  Confusional arousal, sleep terrors, sleepwalking, sleep-related eating disorder (Not the midnite snack...), nightmares, sexomnia, somniloquy

Rapid Eye Movement Sleep (REM)
REM sleep: Intense vivid dreaming & muscle atonia (essentially paralyzed during REM)
  electromyography (EMG) part of sleep study
  with RBD: No atonia during REM sleep+ patients act out dreams=injury
  Pt remembers the activity
  Risk for neurodegenerative dz esp PD and Lewy Body dementia (>50%)
REM related Parasomnias
REM sleep behavior disorder (RBD)
~0.5%, males>females, 50 years and over.
RBD may also w/certain medications: SSRI, SNRI
Parasomnia due to medication or substance
Nightmare disorder: recurring, scary dreams clear recall, significant distress/impairment. Nightmares Common in PTSD
Dx only when the nightmares clinically sig.
Rx w/ Clonazepam

How to Get the ZZZZZs! Why not?
W/ pathology: treat underlying cause!
Insomnia
   Addressed in other presentations
   Sleep hygiene
   CBT
   Hypnotics
Sleep Apnea
   Mainly obstructive

OSA goals of Tx
Clinical practice guidelines:
AA Sleep Medicine, Am. Thoracic Society, Am.
College of Physicians
Based on severity
Long-term, multidis. mgmt: v’d signs & symptoms of OSA
^ quality sleep, ^ O2 sats, apnea & hypopnea
Benefits: less daytime sleepiness, v’d health costs, hopefully v’d C/V M&M
CPAP:
• Positive pharyngeal wall pressure: inner pressure > outer pressure
• Increases end-expiratory lung volume
• Prevents respiratory events secondary to upper airway collapse

POSITIVE AIRWAY PRESSURE THERAPY

OSA Treatment
Patient Education
Most important point: MVA risk
Modifiable risks: Weight mgmt. exercise
Positional OSA
etoh et.al meds
+ Airway Pressure = initial tx for all

+ Response in most adults to CPAP:
• Fewer respiratory events
• ↑daytime wakefulness-S & O
• Impact on BP and BS control
• ↑Q of life, cognitive function, and depression
• May improve HF outcome and ↓risk of recurring atrial fibrillation and nocturnal arrhythmias
**Oral Appliances**

Dx and evaluate severity
Mild to moderate OSA, AHI of 5 to 30 events per hour
>behavior mod (weight loss, abstinence from alcohol, etc) needed
Pt preference over PAP
Non-compliance, non-responsiveness, refusal of PAP
Easier to use, quiet, no power source.
More portable, appliances may be a good substitute for PAP during travel.

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**Contraindications** to oral appliances

Need rapid tx (severe symptomatic OSA, sleepiness while driving, CV co-morbidities)
use PAP
Big/longed desats start PAP ASAP
TMJ, periodontal disease, bad teeth (no support to retain appliance in mouth, and inadequate
ROM of the jaw = relative contraindications
Mandibular protrusion (<6 mm) may be contraindication, evidence weak
Also need some manual dexterity
~ 1/3 patients may not be candidates for an oral appliance

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**Who wouldn’t want this?**

*Go from this... To this!*

Fits in the palm of your hand!
Sleep & Food
Do not eat w/i 2 hr of bedtime
Good bedtime snacks:
   Edamame, esp w/ perimenopausal
   Combat pm hypoglyc.w/ protein
      eggs, nuts, cheese
   Miso soup = melatonin
   Lo-sugar w. grain cereal & milk/yoghurt
   High-fiber foods throughout the day
   Bananas=Mg&K+&Tryptophan

NIH Research
NIH Sleep Disorders Research Plan: connects sleep d.o. to health, safety risks & new ways to prevent and tx...
   How sleep disorders affect the body (obesity, apnea, inflammation and heart disease)
   Novel methods: Dx and Tx sleep D.O.
   Genetic, environmental and social factors
   This is your brain w/o sleep
   A lifetime of sleep deficiency
   Whether CPAP treatment affects how the body uses glucose (sugar)
   CPAP treatment adherence
Resources
https://www.nhlbi.nih.gov/health-pro/resources/sleep/problem-sleepiness

Mallampati Scores
Where the tongue sits on the mouth, throat.