Overview of Sleep Disorders
Including Insomnia

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Overview of Sleep Disorders
Including Insomnia - Disclosures

• NIH grants - PPG (phenotyping and OSA)
• ResMed Grant/Registry to study OSA/CSA and CPAP in hospitalized patients
• Jazz clinical trial (JZP-110) for daytime sleepiness in OSA
• Inspire CT study to examine upper airway anatomy with hypoglossal nerve stimulation
Overview of Sleep Disorders
Including Insomnia - Outline

• Sleep deprivation:
  – Normals/driving/Maggie’s law
• Sleep disorders causing daytime sleepiness:
  – Restless leg syndrome/periodic limb movements
  – Narcolepsy - use of Provigil/Nuvigil/Xyrem
  – Parasomnias/REM behavior disorder
  – Circadian rhythm disorders (DSPS, non-24)
  – Diagnosis and treatment of insomnia

Normal Sleep Architecture

• NREM - slow wave sleep
  – Three sleep stages (1 - 3) with delta being "deepest" (Stage 3)
  – Stage 2 characterized by K complexes/spindles
Normal Sleep Architecture

- REM - active or rapid eye movement
  - Characteristic EEG pattern (sawtooth waves), bursts of rapid eye movements, muscle atonia

Age-Related Sleep Changes

- Loss of delta sleep with aging
- Teenagers need more sleep than adults
Sleep Cycle
During the Night

- Normal latency to REM sleep is 90 minutes
- 20 - 25% of sleep is REM
- More REM episodes as the night progresses

National Sleep Debt

- Over the past century sleep time has declined 20%
- 1910 survey found that Americans slept an average of 9 hours a night
- Presently Americans sleep ~ 7 hours a night
  - 6 hours 51 minutes on weekdays; 7 hours 37 minutes on weekend (National Sleep Foundation 2013 poll (23-60 y/o)
  www.sleepfoundation.org/2013poll
  - Sleep time has steadily declined in the last ten years
- 80% of adolescents get a less-than-optimal amount of sleep (9+ hours – NSF/2006)
- Most adults need 8 hours of sleep nightly
  - When Bill Clinton was President he slept only 5-6 hours a night
National Sleep Debt

- We live in a 24 hour society:
  - Work, family demands, cable TV, the Internet encroach on our sleep time
  - Individuals who use Internet at night stay up and lose at least one hour of sleep

Consequences of Sleep Deprivation

- Impaired alertness
- Impaired mood
- Decreased performance
  - Reaction time
  - Cognitive tasks
  - Learning and memory
  - Accidents
    - Workplace, MVA
- Health status
  - Obesity
  - Impaired glucose tolerance
  - Increased mortality
Exxon Valdez Oil Spill (March 1989)

Is it Safe to Drive Sleepy?

NO!
**Drowsy Driving: Recognize the Signs**

- Trouble focusing on the road
- Difficulty keeping your eyes open
- Nodding
- Yawning repeatedly
- Lane drifting
- Missing signs or exits
- Not remembering driving the last few miles
- Closing your eyes at stoplights

**Driving Sleepy**

- Department of Transportation estimates that 100,000 automobile accidents yearly are direct result of driver sleepiness/drowsiness
  - 1,500 fatalities and 71,000 injuries per year
  - $12.5 billion in diminished productivity and property loss
- Another one million crashes (1/6 of all crashes) related to driver inattention
  - Fatigue makes inattention more likely
**Driving Sleepy: Who are at Risk?**

- 2012 NSF poll: 24% of respondents report they have driven drowsy in the last month
- Teenagers are at very high risk for sleep related automobile accidents (55% of fall asleep MVA’s)
- American and Canadian long haul truck drivers get fewer than 5 hours sleep night, and some exhibit OSA, contributing to sleepiness
  - Pack et al, Am J Respir Crit Care Med 174; 446-454, 2006

**Sleep Deprivation and Driving**


- 24 hours of sleep deprivation impairs performance as much as 0.10 blood alcohol level (legally drunk)
  - Alcohol makes the sleepy driver more impaired
- Individuals are not good at determining the likelihood that they will fall asleep
- Characteristics of fall asleep accidents:
  - Single vehicle
  - Occurrence at night or mid-afternoon
  - Results in serious injuries
Nightly Sleep Duration

- Chronic curtailment of nightly sleep builds a sleep debt that impairs alertness and performance (PVT = psychomotor vigilance task)
- Individuals are poor judges of their impairment from sleepiness

Drowsy Driving

What does NOT work
- Turning up the radio
- Opening the car window
- Eating, drinking or chewing gum
- Blowing cold air or water on your face
- Slapping or pinching yourself
- Promising yourself a reward for staying awake

Instead, try this
- AVOID driving if drowsy
  - Get a ride/taxi
  - Use public transportation
  - Pull off the road at a safe place
  - Take a nap
  - Talking on the phone
Is Driving Sleepy a Crime?

- Driving while drunk is a crime

- Driving sleepy is not
  - Or is it in New Jersey?

Maggie’s Law

- 20 year old woman (Maggie McDonnell) killed in a head on collision in 1997 in Clementon, NJ
- Man who caused accident had fallen asleep at wheel and told police that he had not slept in 30 hours
  - Jury acquitted him of vehicular homicide and he walked away with a $200 fine for reckless driving
- 2/15/01 - NJ Assemblyman George Geist introduces a bill establishing driving while fatigued as recklessness under vehicular homicide statute
Maggie’s Law

- Bill signed into NJ law, August 5, 2003
- It is now possible to charge a motorist with vehicular homicide (up to 10 years in prison; $100,000 fine) if driver falls asleep and kills another driver
- Driver fatigue is defined as driving after being up for 24 hours
  - What does this mean for housestaff?
- First conviction (8/20/05); 26 year old man who caused a fatal crash in NJ after not having sleep for > 24 hours sentenced to 5 years in prison

Is it Safe to Drive Sleepy?

- No!!
  - Especially in New Jersey!!!
  - ? Housestaff or medical students
## Epworth Sleepiness Scale (ESS)
*(Johns, Sleep 14:540, 1991)*

<table>
<thead>
<tr>
<th>Situation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td></td>
</tr>
<tr>
<td>Watching TV</td>
<td></td>
</tr>
<tr>
<td>Sitting inactive in a public place</td>
<td></td>
</tr>
<tr>
<td>Passenger in car</td>
<td></td>
</tr>
<tr>
<td>Lying down to rest in afternoon</td>
<td></td>
</tr>
<tr>
<td>Sitting talking to someone</td>
<td></td>
</tr>
<tr>
<td>Sitting after lunch without alcohol</td>
<td></td>
</tr>
<tr>
<td>In a car, stopped for minutes in traffic</td>
<td></td>
</tr>
</tbody>
</table>

**Total (normal ≤10)**

**Dozing:** 0 = Never, 1 = Slight Chance, 2 = Mod Chance, 3 = High Chance

- ESS - measures subjective sleepiness; should be performed in office

## Objective Measures of Sleepiness

- Multiple sleep latency test (how quickly can you fall asleep in the dark?)
- Maintenance of wakefulness test (how long can you stay awake in the dark?)
- Standards (Sleep 28; 113-121, 2005)
Epidemiology and Presentation of PLMD/RLS

- Estimated to affect 3 - 5% of the population
  - Prevalence of PLM’s correlated with age - most common in patients over 50 years old
    - 43% develop RLS before age 20; cause of RLS unclear
    - RLS autosomal dominant trait; more common in women
      - 60% of patients with RLS first degree relatives manifest RLS
- PLM’s cause excessive daytime sleepiness
- RLS results in insomnia and difficulty sleeping
- Bed partner often complains of being kicked - sheets “messed up” in morning with PLM’s

Restless Legs Syndrome (RLS)/Periodic Limb Movement Disorder (PLMD)

- Restless Legs Syndrome (essential criteria - http://irlssg.org/diagnostic-criteria/): URGE and no other medical condition
  - An Urge to move the legs, often accompanied by uncomfortable or unpleasant sensations in the legs
  - These sensations are worsened with Rest or inactivity
  - These sensations Get better with movement
  - These sensations are worse in the Evening or night
- Periodic Limb Movement Disorder:
  - Recurrent stereotypic movements of legs during sleep
    - Rhythmic extension of big toe & dorsiflexion of ankle
    - 80% of patients with RLS manifest PLMD
**Periodic Limb Movement Disorder (PLMD)/RLS**

- **Diagnosis with a PSG:**
  - EEG arousals related to increased EMG on leg channels
  - Each movement lasts 0.5 to 10 seconds
  - Interval between movements 5 - 90 seconds
  - Frequency decreases during delta/REM sleep

- **Treat if > 5 - 10 arousals per hour and clinical symptoms**

“[I wish you could stop tossing in bed and get some sleep!”](#)
Prospective Survey on the Natural Course of Restless Legs Syndrome Over Two Years in a Closed Cohort

- Among 1592 valid respondents, only 20 (40%) of 50 RLS-positive subjects at the first survey were repeatedly RLS-positive at the second survey
- The chronic morbidity of RLS seemed to be associated with the existence of depression and subjective sleep disturbance
- Reevaluate treatment - not all subjects may need chronic treatment


Conditions Associated with RLS/PLMD

(AJRCCM 192, 9-10, 2015)

- Iron deficiency anemia - primarily RLS
  - 25% of RLS population are iron deficient
  - Ferritin levels < 50 mcg/l; question repeat blood donors; careful of inflammatory state
  - In a stable patient whose RLS abruptly worsens evaluate for GI bleed
- Uremia/kidney failure
- Neuropathy/spinal cord pathology/Parkinson’s
- Pregnancy - typically in the last trimester; resolves
- Diabetes/rheumatoid arthritis/stress/caffeine/cigs
- Medications - TCA, lithium, dopamine antagonists
**Treatment of RLS/PLMD (AJRCCM 192, 9-10, 2015)**

- **First Line - iron therapy or FDA approved meds:**
  - Iron therapy if iron deficient (325 mg BID/TID)
  - Dopamine agonists:
    - Pramipexole (Mirapex): start with 0.125 mg Qhs
      - In Parkinson’s patients associations with CHF
      - Sleepiness, N/V, compulsive activities (gambling)
      - Monitor for augmentation
    - Ropinirole (Requip): 0.25 - 2.0 mg (1-2 hrs Qhs)
    - Neupro (Rotigotine Transdermal Patches)
      - Dopamine agonist in patch (dosing 1-3 mg/24 hours)
      - Stable around the clock delivery
    - Gabapentin Enacarbil (Horizant - extended release): 600 mg (at 5 PM). Once a day can increase to 1200 mg, (EDS/nausea) better absorption than standard gabapentin

- **Second line agents:**
  - Lyrica (Pregabalin)
  - Carbidopa 50 mg/Levodopa 200 mg (Sinemet)
    - Augmentation common
  - Clonazepam (Klonopin) 0.5 - 2 mg at night
    - May worsen sleep apnea
    - Increase risks of falls at night
    - Sedation and long half life
  - Opiates - Codeine, Methadone, Tylenol #3
    - Nausea/vomiting/constipation/addiction
**Narcolepsy**

- Neurologic condition - etiology:
  - Canine narcolepsy gene identified (*canarc-1*)
    - Encodes a receptor for orexin (hypocretin)
  - Reduction in orexin cells in human brains (hypothalamus) & CSF of patients with narcolepsy (Neuro 57;2253, 2001)
  - Genetic link to HLA antigens (HLA DQB1*0602/HLA-DR2)
    - Autoimmune disorder? Destruction of orexin cells?
- Prevalence comparable to multiple sclerosis
  - Estimated 250,000 - 375,000 afflicted
  - 1 out of 2000 individuals; no gender predilection
  - Age of onset usually in the second decade, but can start at any age; life long disease

**Clinical Presentation of Narcolepsy**

- Diagnostic pentad:
  - Excessive daytime sleepiness
  - Cataplexy - lasts less than 2 minutes
    - Abrupt and reversible loss of muscle tone (bilateral) elicited by strong emotions/laughter; subtle changes
    - Consciousness maintained
  - Hypnogogic hallucinations - vivid dreams at sleep onset
  - Sleep paralysis
  - Disturbed nocturnal sleep - increased arousals
- Length of time of onset to diagnosis: 11 years
Clinical Presentation of Cataplexy

Sites of Cataplexy

% with site

0 20 40 60 80 100 120

Legs/knees  Jaw  Slurred speech  Falling to ground

Adapted from Anic-Labat et al. SLEEP 1999;22

Diagnosis of Narcolepsy

- Suggestive clinical history especially cataplexy
- Polysomnogram:
  - Early REM onset (< 90 minutes)
  - Sleep fragmentation - increased arousals; PLM’s
  - Verify > 6 hrs sleep prior to MSLT
- Multiple Sleep Latency Test (MSLT)
  - 2 or more sleep onset REM periods (SOREMPs) in a series of of four to five 20 minute naps
  - Short latency to stage 1 sleep
  - < 5 minutes
**Treatment of Narcolepsy**

- Short daytime naps/good sleep hygiene
- Stimulants (risk of HTN, MI - T/C EST):
  - Methylphenidate (short/long acting preparations)
    - Ritalin
  - Amphetamine (short/long acting preparations)
    - Dextroamphetamine sulfate (Dexedrin)
    - Adderall
- Modafinil (Provigil) - wakefulness promoting agent
- Armodafinil (Nuvigil) - longer acting R isomer
- Gamma-hydroxybutrate (Xyrem) - approved by FDA
  - Consolidates sleep/effective for cataplexy/improves EDS
- Cataplexy
  - GHB/Tricyclic antidepressants/SSRI

**Modafinil/Armodafinil Indications**

- Provigil/Nuvigil are indicated in patients with EDS:
  - Narcolepsy
  - Obstructive sleep apnea
    - Secondary treatment in patients using CPAP
    - ? Primary Rx for mild/moderate OSA no CPAP
  - Shift work - *(Walsh, Sleep 27, 434 - 439, 2004)*
    - Provigil improves alertness, vigilance and executive function during simulated night shifts
- Provigil dosage (200 - 600 mg in AM/PM); Nuvigil Dosage 150/250 mg in AM. Careful of skin rash
**Xyrem (Gamma-hydroxybutrate - GHB)**

- Neurotransmitter/neuromodulator - mechanism of action unclear. Only one pharmacy prescribes
- FDA approved for cataplexy/EDS in narcoleptics
- Improves cataplexy, daytime alertness and consolidates nocturnal sleep in narcoleptics
  - Significant reductions in catapletic attacks
  - Increases in delta sleep, decreases in nocturnal awakenings
- Dosage (liquid) from 3 - 9 gms/night (start @ 4.5 gms)
  - Given at night since it causes sedation (Q4 hours)
- Generally well tolerated - issues about “date rape”

**Idiopathic Hypersomnolence**

- Idiopathic disorder characterized by chronic sleepiness without cataplexy - not well understood
- Long periods of EDS that impair performance
- Nocturnal sleep is long and often undisturbed
  - Sleep drunkenness in the morning
- Automatic behaviors
- Short latency to stage 1 sleep on MSLT w/o REM
- Age of onset usually in the second decade
- Treat with Provigil/Nuvigil
A wife’s woes: Husband gives bedtime smacks

REM Behavior Disorder
**REM Behavior Disorder**  
*Paparrigopoulos 2005, Int Rev Psychiatry 17:293-300*

- Occurs in older men - may be related to a neurodegenerative disease  
  - ? related to/precipitate Parkinson's disease and dementia with Lewy bodies although the link is unproven  
  - MRI of head; neurologic follow-up  
- History of acting out dreams  
  - Sleep related injuries/aggressive behavior  
- Diagnosis: polysomnograph demonstrating increased EMG tone during REM sleep  
- Treatment with Clonazepam (Klonopin), possibly melatonin

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**Somnambulism (Sleepwalking)**  
*Plazzi 2005, Neurol Sci 26: 193-198*

- Usually occurs in childhood or adolescence  
- Episodes occur during slow wave sleep  
- Episodes last < 10 minutes  
- Positive family history  
- Confusion on waking  
- Minimal recall of events
Somnambulism (Sleepwalking)

- Patients are able to maneuver around obstacles and perform simple tasks
- High risk for injury
  - Jumping out of windows
  - Leaving the house
  - Driving automobiles
  - Climbing ladders
  - Using weapons
Delayed Sleep Phase Syndrome

- Circadian rhythm disorder
- Persistent (> 6 months) inability to fall asleep and arise at conventional clock times
- Sleep onset delayed until early morning (3AM - 6AM) with risetime in early afternoon (11AM - 2PM)
- Patients complain of sleep onset insomnia
- Often presents in adolescents (high school)
- Awakening early because of social/occupational requirements results in daytime sleepiness
- Sleep is normal in pattern and duration

Treatment of Delayed Sleep Phase Syndrome

- Chronotherapy:
  - Bedtime is systematically delayed 2-3 hours each day
  - Patients sleep only 7-8 hours without naps
  - Chronotherapy is maintained until the desired bedtime is reached (11PM or midnight)
  - Bedtime subsequently rigidly maintained
- Early morning bright light therapy (2500 lux) for 1-2 hours and light restriction after 4PM
**Non-24-Hour Sleep - Wake Disorder**

- Chronic circadian rhythm disorder - free running bed time consistently delayed
- Symptoms result when the non-entrained (free-running) endogenous circadian rhythm drifts out of alignment with the desired or conventional sleep–wake schedule
- The majority of patients with non-24 are totally blind, and the failure of entrainment is explained by an absence of photic input to the circadian clock
- New FDA treatment
  - Tasimelteon 20 mg entrains circadian rhythms in some of these patients
Insomnia

• Prevalence rates 15 - 24% of the US population
• Defined as a perceived difficulty with sleep initiation consolidation, duration or quality despite adequate opportunity to sleep coupled with subsequent daytime impairment for at least 3 months
• Daytime impairment
  – Problems with attention, concentration or memory
  – Fatigue, energy reduction, accidents at work or driving
  – Mood disturbances, irritability, worrying about sleep
  – Headaches or GI symptoms

Winkelman, NEJM 373, 1437-44, 2015; Javaheri and Redline, Chest 2017
**Insomnia**

- 35% of population complain about insomnia at some time in a given year
- Insomnia is a perception of inadequate sleep
- Risk groups
  - Women
  - Older adults
  - Shift workers
  - Patients with medical and psychiatric disorders

Winkelman, NEJM 373, 1437-44, 2015

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**Causes of Insomnia**

- Sleep Disorders:
  - Sleep apnea
  - PLM/RLS
  - Circadian rhythm disorders
- Insomnia inducing agents:
  - Caffeine (lasts 8 - 12 hours)/Excedrin
  - Steroids, beta adrenergic agents, antidepressants

Winkelman, NEJM 373, 1437-44, 2015
Causes of Insomnia

- Medical
  - Neurologic conditions – Parkinson’s, Alzheimer’s,
  - Chronic lung disease, CHF
  - Chronic renal failure, pain, reflux
- Psychiatric causes:
  - Depression/anxiety/panic disorders
- Psychophysiologic

Winkelman, NEJM 373, 1437-44, 2015

CV Consequences of Insomnia

- Existing data suggests that insomnia especially when accompanied by short sleep duration is associated with
  - Hypertension
  - Coronary heart disease
  - Acute coronary syndrome
  - Heart failure

Winkelman, NEJM 373, 1437-44, 2015; Javaheri and Redline, Chest 2017
Treatment of Insomnia

- Often remains untreated
- Treatment often self-initiated with over the counter sleep aids (benadryl) and alcohol (this is a problem)
- 20% of the US population uses a medication for insomnia in a given month. Hypnotics are not ideal
- Cognitive behavioral treatment - this is considered first line therapy for all patients with insomnia
  - Studies have shown it works as well as hypnotics
  - Underutilized in clinical practice

Winkelman, NEJM 373, 1437-44, 2015

What is Cognitive Behavioral Therapy?

- Sleep hygiene
- Stimulus control
  - Associate the bed with sleeping and limit its association with stimulating behavior (no TV watching in bed)
- Relaxation training - breathing exercises/meditation
- Cognitive therapy
  - Education in order to correct dysfunctional beliefs regarding health consequences of insomnia
- Sleep restriction
  - Reducing time in bed (TIB) to perceived total sleep time (not less than 5-6 hours; sleep diary) in order to restore the homostatic drive to sleep. Increase TIB gradually

Winkelman, NEJM 373, 1437-44, 2015
Comparative Efficacy: Change in Minutes Awake After Sleep Onset

![Graph showing comparative efficacy](image)

Adapted from Morin, et al. JAMA 1999; 281(11):991-999

Delivery of Cognitive Behavioral Therapy

- Specialized Training
  - Psychologist or nurse practitioner
- Range from 4 to 8 sessions
- Individual or group format
- Assess weekly with sleep diaries
- Emerging telehealth technologies offer a potential way to increase access to treatment
  - Internet based CBT-I (Sleepio and SHUTi - Sleep Healthy Using The Internet)

Winkelman, NEJM 373, 1437-44, 2015
Management of Insomnia (Winkelman, NEJM 373, 1437-44, 2015)

Table 3. Medications Commonly Used for Insomnia.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose in Adults</th>
<th>Half-Life</th>
<th>Most Common Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;65 yr of age</td>
<td>≥65 yr of age</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mg</td>
<td>hr</td>
<td></td>
</tr>
<tr>
<td>Benzodiazepine-receptor agonists</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temazepam (Restoril)</td>
<td>7.5–10</td>
<td>7.5–15</td>
<td>8–10 Daytime sedation, ataxia, anterograde amnesia, complex sleep-related behaviors (e.g., sleepwalking)</td>
</tr>
<tr>
<td>Lorazepam (Ativan)</td>
<td>0.5–2</td>
<td>0.5–1</td>
<td>8–12</td>
</tr>
<tr>
<td>Eszopiclone (Lunesta)</td>
<td>2–3</td>
<td>1–2</td>
<td>6–9 Unpleasant taste</td>
</tr>
<tr>
<td>zaleplon (Ambien)</td>
<td>10–10</td>
<td>7–11</td>
<td>2–4</td>
</tr>
<tr>
<td>Trizolam (Halcion)</td>
<td>0.125–0.5</td>
<td>0.125–0.25</td>
<td>2.5</td>
</tr>
<tr>
<td>zaleplon (Sonata)</td>
<td>5–20</td>
<td>5–10</td>
<td>1</td>
</tr>
<tr>
<td>Antidepressants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trazodone (Desyrel)</td>
<td>25–100</td>
<td>25–100</td>
<td>6–8 Daytime sedation, orthostasis</td>
</tr>
<tr>
<td>Mirtazapine (Remeron)</td>
<td>7.5–30</td>
<td>7.5–30</td>
<td>20–30 Daytime sedation, anticholinergic effects, weight gain</td>
</tr>
<tr>
<td>Doxepin (Sinequan, Silenor)</td>
<td>10–50</td>
<td>10–50</td>
<td>12–18 Daytime sedation, anticholinergic effects, weight gain (not at approved doses)</td>
</tr>
<tr>
<td>Oxirind (Belsomra)</td>
<td>10–20</td>
<td>10–20</td>
<td>9–13 Daytime sedation</td>
</tr>
<tr>
<td>Melatonin agonist: ramelteon (Rozerem)</td>
<td>8</td>
<td>8</td>
<td>1 Daytime sedation</td>
</tr>
<tr>
<td>Anticonvulsant: gabapentin (Neurontin)</td>
<td>100–900</td>
<td>100–900</td>
<td>5–9 Daytime sedation, dizziness, weight gain</td>
</tr>
</tbody>
</table>

Suvorexant - Orexin Receptor Antagonist

- Recommended starting dosage of Suvorexant (Belsomra) is 10 - 20 mg
- Novel mechanism of action - potent and selective antagonist at orexin-1 and orexin-2 receptors
- Short term trials have shown decreased time to sleep onset and increased total sleep time
- Half life 12 hours
- Primary side effect is morning sleepiness

Winkelman, NEJM 373, 1437-44, 2015
What is the Hypnotic of Choice?

- Alcohol - causes significant sleep disruption: bad choice
- Diphenhydramine (Benadryl) - long half life: bad choice
- Temazepam (Restoril) 15 mg ($42-$500/month)
- Low dose of aspirin/Tylenol - very little sleep data
- Zolpidem (Ambien) 10 mg ($169-$364/month)
- Zaleplon (Sonata) 10 mg ($140-220/month) - short acting
- Desyrel (Trazodone) - little sleep data 50 mg ($35-$93/month)
- Melatonin ? appropriate dose (1, 3, 5, 10 mg)
- Eszopiclone (Lunesta) 3 mg ($390/month)
- Rozerem (Ramelteon) 8 mg ($293/mo)
- Suvorexant (Belsomra) 10 - 20 mg, orexin receptor antagonist
- Few head-to-head trials

Source: Penn Outpatient Pharmacy

Zolpidem Is Independently Associated With Increased Risk of Inpatient Falls

- Background:
  - Zolpidem has been reported to decrease balance and is associated with falls
  - Despite that, it is a commonly used hypnotic agent in the inpatient setting
  - Zolpidem use in hospitalized patients may be a significant and potentially modifiable risk factor for falling
- Study objective:
  - To determine whether inpatients administered zolpidem are at greater risk of falling

Kolla BP. Zolpidem independently associated with increased risk of inpatient falls. J Hosp Med. 8, 1-6, 2013
Zolpidem Is Independently Associated With Increased Risk of Inpatient Falls

- Findings: Fall rate among patients who received zolpidem (n=4962) was significantly greater than among patients who were prescribed but did not receive zolpidem (n = 11,358) – 3.04% vs 0.71%; p < 0.001
- After accounting for age, gender, insomnia, delirium, dose, Charlson comorbidity index, Hendrich’s fall risk score, length of stay, visual impairment, gait abnormalities, and dementia/cognitive impairment, zolpidem use remained significantly associated with increased fall risk
  - Adjusted odds ratio [OR] 4.37, 95% confidence interval [CI] = 3.34 - 5.76; p < 0.001

Kolla BP. Zolpidem independently associated with increased risk of inpatient falls. J Hosp Med. 8, 1-6, 2013

Lunesta Movie
New Drug Free Treatment for Insomnia

- Ebb is a new wearable FDA approved therapy for primary insomnia to cool the forehead - adjustable temperature control (prescription device)
- Studies (poster AASM 2017) in 234 patients showed they achieved stage 1 & 2 sleep faster c/t placebo without significant side effects

Overview of Sleep Disorders Including Insomnia - Summary

- Ask about daytime sleepiness - sleep deprivation is common
- Evaluate for PLM’s, narcolepsy, parasomnias and insomnia
- Sleep deprivation can cause motor vehicle accidents
- We need at least 7 - 8 hours of sleep a night!
- Thank you for your attention - any questions??

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