Managing Sleep Health in Primary Care

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Learning Objectives

▪ Communicate risk factors associated with not getting enough sleep
▪ Explain the sleep/wake cycle and circadian rhythms
▪ Identify common sleep disorders in primary care
▪ Use appropriate diagnostic tools to assess patients’ sleep health
Agenda

- What is sleep?
- Sleep stages
- Sleep physiology
- Dreaming
- Sleepiness
- Sleep disorders
- Insomnia and comorbidities
Sleep Perspectives

- Behavioral
  - Reversible
  - Perceptual disengagement from, and unresponsiveness to, the environment

- Neurophysiological
  - Two distinct states: REM sleep and NREM
  - Actively produced, not a result of passive inactivity
  - Highly regulated by homeostatic and circadian processes
  - Produces changes in the entire organism, not just the CNS

- Teleological
  - Necessary for survival; deprivation leads to functional impairments and eventual death
  - Important for clearance of neurotoxic waste products (e.g., beta amyloid) that accumulate in the brain during wakefulness

NREM = non-rapid eye movement

Why is sleep important?

- Cognition and performance
- Mood regulation
- Mental health
- Physical health
- Safety
Amyloid-β Dynamics Are Regulated by Orexin and the Sleep-Wake Cycle

Jae-Eun Kang,1 Miranda M. Lim,1 Randall J. Bateman,1,2,3 James J. Lee,1 Liam P. Smyth,1 John R. Cirrito,1,4 Nobuhira Fujiki,1 Seiji Nishino,1 David M. Holtzman1,2,4,5

Amyloid-β (Aβ) accumulation in the brain extracellular space is a hallmark of Alzheimer’s disease. The factors regulating this process are only partly understood. Aβ aggregation is a concentration-dependent process that is likely responsive to changes in brain interstitial fluid (ISF) levels of Aβ. Using in vivo microdialysis in mice, we found that the amount of ISF Aβ correlated with wakefulness. The amount of ISF Aβ also significantly increased during acute sleep deprivation and during orexin inhibition, but decreased with infusion of a dual orexin receptor antagonist. Chronic sleep restriction significantly increased, and a dual orexin receptor antagonist decreased, Aβ plaque formation in amyloid precursor protein transgenic mice. Thus, the sleep-wake cycle and orexin may play a role in the pathogenesis of Alzheimer’s disease.

Fig. 4 Aβ plaque deposition after chronic sleep restriction and chronic orexin receptor blockade in transgenic mice (A) Mice that underwent chronic sleep restriction for 21 days showed significantly greater Aβ plaque deposition in multiple subregions of the cortex compared to age-matched control mice.

A Paravascular Pathway Facilitates CSF Flow Through the Brain Parenchyma and the Clearance of Interstitial Solutes, Including Amyloid β

Jeffrey J. Iliff,1,6 Minghuan Wang,1,2 Yonghong Liao,1 Benjamin A. Hopf,1 Weigao Peng,1 Georg A. Gundersen,1,6 Helene Benveniste,1,6 G. Edward Vates,1 Rashid Deane,1 Steven A. Goldman,1,7 Erlend A. Nagelhus,1,6 Maiken Nørgaard1,8

Because it lacks a lymphatic circulation, the brain must clear extracellular proteins by an alternative mechanism. The cerebrospinal fluid (CSF) functions as a sink for brain extracellular solutes, but it is not clear how solutes from the brain extracellular space move to the CSF. We demonstrate that a substantial portion of subarachnoid CSF cycles through the brain interstitial space. On the basis of in vivo two-photon imaging of small fluorescent tracers, we show that CSF leaves the parenchyma along paravascular pathways that surround penetrating arteries and that brain interstitial fluid is cleared along paravascular drainage pathways. Animals lacking the water channel aquaporin-4 (AQP4) in astrocytes exhibit slowed CSF influx through this system and a >70% reduction in interstitial fluid clearance, suggesting that the bulk fluid flow between these anatomical influx and efflux routes is supported by astrocytic water transport. Fluorescent-tagged amyloid β, a peptide thought to be pathogenic in Alzheimer’s disease, was transported along this route, and deletion of the Aqp4 gene suppressed the clearance of soluble amyloid β, suggesting that this pathway may remove amyloid β from the central nervous system. Clearance through paravascular flow may also regulate extracellular levels of proteins involved with neurodegenerative conditions, its impairment perhaps contributing to the misaccumulation of soluble proteins.

The glymphatic system supports interstitial solute and fluid clearance from the brain.
Sleep Drives Metabolite Clearance from the Adult Brain

Lulu Xie, Hongyi Kang, Qiwu Xu, Michael J. Chen, Yonghong Liao, Meenakshisundaram Thiyagarajan, John O'Donnell, Daniel J. Christensen, Charles Nicholson, Jeffrey J. Iliff, Takahiro Takano, Rashid Deane, Malken Nedergaard

The conservation of sleep across all animal species suggests that sleep serves a vital function. We here report that sleep has a critical function in ensuring metabolic homeostasis. Using real-time assessments of tetramethylammonium diffusion and two-photon imaging in live mice, we show that natural sleep or anesthesia are associated with a 60% increase in the interstitial space, resulting in a striking increase in convective exchange of cerebrospinal fluid with interstitial fluid. In turn, convective fluxes of interstitial fluid increased the rate of β-amyloid clearance during sleep. Thus, the restorative function of sleep may be a consequence of the enhanced removal of potentially neurotoxic waste products that accumulate in the awake central nervous system.
Sleep Stages

SLEEP ≠ REST
Two States of Sleep

**Rapid eye movement (REM) sleep**
- When dreaming occurs
- “Active brain in a paralyzed body”

**Non-REM sleep**
- 3 stages
- Based primarily on EEG

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**Typical Sleep Architectural Pattern of a Young Human Adult**

Stage I & REM sleep (red) are graphed on the same level because their EEG patterns are very similar.

Sleep Architecture

- Sleep is entered through stage N1
- Orderly progression from stage N1 to N3 and, typically within 90 minutes of sleep onset, to the 1st REM period
- 90-minute cycle of REM-NREM repeats throughout sleep
- As the night progresses
  - REM periods increase in duration and density of eye movements
  - N3 sleep becomes less prominent in the 2nd half of the night
## Sleep Stage Characteristics

<table>
<thead>
<tr>
<th></th>
<th>NREM</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate</td>
<td>Steady</td>
<td>Variable</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Steady</td>
<td>Labile</td>
</tr>
<tr>
<td>Respirations</td>
<td>Regular</td>
<td>Irregular</td>
</tr>
<tr>
<td>Skeletal muscle tone</td>
<td>Normal</td>
<td>Decreased</td>
</tr>
<tr>
<td>Thermoregulation</td>
<td>Waking modes</td>
<td>Decreased</td>
</tr>
<tr>
<td>Penile tumescence</td>
<td>Infrequent</td>
<td>Frequent</td>
</tr>
<tr>
<td>Mental activity</td>
<td>Limited</td>
<td>Dreaming</td>
</tr>
<tr>
<td>Brain $O_2$ consumption</td>
<td>Decreased</td>
<td>Waking level</td>
</tr>
</tbody>
</table>

Sleep Across the Life Span

SLEEP DURATION RECOMMENDATIONS

NEWBORN 0-3 months
0-3 months
INFANT 4-11 months
4-11 months
TODDLER 1-2 years
1-2 years
PRE-SCHOOL 3-5 years
3-5 years
SCHOOL AGE 6-13 years
6-13 years
TEEN 14-17 years
14-17 years
YOUNG ADULT 18-25 years
18-25 years
ADULT 26-64 years
26-64 years
OLDER ADULT 65+
65+

HOURS OF SLEEP
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Recommended

May be Appropriate

Not Recommended

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http://dx.doi.org/10.1016/j.sleh.2014.12.010
Sleep Physiology
Brainstem Mechanisms Underlying Sleep and Arousal

Orexin = Hypocretin

- Hypothalamic peptides (OX1 and OX2)
  - Localized in the dorsolateral hypothalamus
  - Wide projections throughout brain and spinal column
- Peptide neurotransmitters involved in
  - Arousal
  - Locomotion
  - Metabolism (energy and appetite control)
  - Increase blood pressure & heart rate

Flip Flop Switch Model of Arousal and Sleep

Dreaming
When do we dream?

- Dreaming occurs in all stages of sleep
- 80% of persons who are awakened during REM sleep and sleep onset (N1 & N2)
- 40% of persons who are awakened from a deep sleep
### REM and Non-REM Dreams

<table>
<thead>
<tr>
<th>DREAMS</th>
<th>N1 &amp; N2</th>
<th>N3</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simpler, shorter and have fewer associations than REM sleep dreams</td>
<td>More diffuse (e.g., about a color or an emotion)</td>
<td>Tend to be bizarre and detailed, with storyline plot associations</td>
</tr>
<tr>
<td></td>
<td>Highest recall during sleep stages with EEG patterns most like those in the waking state</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Frightening Dreams

<table>
<thead>
<tr>
<th>TYPE OF DREAM</th>
<th>INCIDENCE</th>
<th>SYMPTOMS</th>
<th>SLEEP STAGE</th>
<th>ASSOCIATED FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent nightmares in children</td>
<td>20% to 30%, declines with age</td>
<td>Frightening, detailed plots</td>
<td>REM sleep, usually late in sleep (4 - 6 a.m.)</td>
<td>Usually no pathology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difficult return to sleep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent nightmares in adults</td>
<td>5% to 8%</td>
<td>Increased awakenings</td>
<td>REM sleep</td>
<td>“Thin-boundary” / creative personality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daytime memory impairment and anxiety</td>
<td></td>
<td>May have associated psychopathology</td>
</tr>
<tr>
<td>PTSD</td>
<td>8% - 68% of veterans &gt;25% of trauma victims</td>
<td>Stereotypic dreams of the trauma</td>
<td>REM sleep and sleep onset</td>
<td>Significant trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intense rage, fear, grief</td>
<td></td>
<td>Daytime hyper-arousability &amp; anxiety</td>
</tr>
<tr>
<td>REM sleep behavior disorder</td>
<td>Most common in late middle age and in men</td>
<td>Acting out of dreams</td>
<td>REM sleep ↑ REM EMG tone</td>
<td>Degenerative neurologic illness in 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nocturnal injuries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night terrors</td>
<td>1% to 4% of children Declines with age Rare in adults</td>
<td>Blood-curdling screams Autonomic discharge Limited recall</td>
<td>Deep sleep, early (1-3 a.m.) Stages 3 &amp; 4 arousals on PSG</td>
<td>No pathology in children Psychiatric &amp; neurologic disorders in adults</td>
</tr>
</tbody>
</table>

REM = rapid eye movement; EMG = electromyography

Sleepiness
Sleepiness: How do patients describe it?

- “I’m tired all the time”
- “I have no energy”
- “I feel fatigued”
- “I feel depressed”
- “I don’t feel rested”
- “I don’t sleep well”

Patients Also Mean Other Things

“TIRED”

<table>
<thead>
<tr>
<th>Sleepiness</th>
<th>Fatigue</th>
<th>Lack of motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendency to fall asleep or inability to stay awake</td>
<td>Sensation of weariness, tiredness, exhaustion, loss of energy; the desire to rest</td>
<td>“I don’t feel like doing anything…”</td>
</tr>
<tr>
<td>Improved by sleep</td>
<td>Improved by rest, exertion makes it worse</td>
<td></td>
</tr>
</tbody>
</table>
% of US Adults Reporting that They Are So Sleepy it Interferes with Their Daily Activities

- At least a few days per month: 37%
- At least a few days per week: 16%

Assessment Options: Sleep Parameters

- **Subjective**: based on self-report
  - Epworth
  - Insomnia Severity Scale
  - Diaries
  - Often do not reflect objective sleep measures

- **Objective**: Sleep lab or home sleep monitor

- Wearable technology (eg, Fitbit) increasingly capable of more objective sleep assessment: eg, total sleep time, slow wave sleep, REM sleep
  - Not reimbursable, not validated in clinical practice
## Epworth Sleepiness Scale

Rate the chances of dozing in sedentary situations

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Slight</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Watching television</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sitting, inactive in a public place (eg, a movie theater or a meeting)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>As a passenger in a car for an hour without a break</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Lying down to rest in the afternoon when circumstances permit</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sitting quietly after lunch without alcohol</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>In a car, while stopped for a few minutes in the traffic</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Score $\geq 10$ Prompts Further Evaluation

Worldwide Prevalence of ESS Scores >10

N=35,327 survey respondents aged 39 ± 15.3 years.¹
ESS, Epworth Sleepiness Scale
Categories of Sleepiness

- Insufficient sleep
  - Factitious
  - Insomnia
- Poor quality sleep
  - Obstructive sleep apnea
  - Restless Legs Syndrome
- Disturbed timing of sleep
  - Circadian rhythm disorders
- Medications and substances
  - Rx, OTC, herbals
  - Illicit drugs, alcohol
- Brain “damage”
  - MS, Parkinson’s, TBI, stroke, Alzheimer's
  - Narcolepsy
Sleep Disorders
Sleep-Wake Disorders: Prevalence in Adults

- **Obstructive Sleep Apnea**
  - 3%-28%

- **Shift Work Disorder**
  - 8%-32%*

- **Insufficient Sleep Syndrome**
  - 26%

- **Comorbid Insomnias**
  - 6%

- **Restless Legs Syndrome**
  - 10%-15%

- **Narcolepsy**
  - 0.06%†

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*Among night and rotating shift workers; †Prevalence of hypersomnias such as narcolepsy without cataplexy may be higher.

How to Diagnose the Cause of Sleepiness

- Get detailed sleep/wake history
  - Determine whether sleepy, fatigue, or depression
- Quantify degree of sleepiness: ESS
- Start probing for the causes, looking for clues
  - Insufficient Sleep Syndrome: doesn’t get enough sleep
  - OSA: loud snoring, waking up choking, witnesses apneas, waking with sore throat, headache, enuresis, nocturia
  - RLS: uncomfortable feelings in legs prevent sleep, need to move them to relieve symptoms
  - PLMD: no clues except excessive sleepiness
  - Narcolepsy: hypnogogic/hypnopompic hallucinations, sleep paralysis, cataplexy
# Obstructive Sleep Apnea

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Physical Findings</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Loud Snoring</td>
<td>▪ Large neck</td>
<td>▪ CPAP/BiPAP/Auto-AP</td>
</tr>
<tr>
<td>▪ Gasping, choking</td>
<td>▪ Crowded pharynx</td>
<td>▪ Oral appliance</td>
</tr>
<tr>
<td>▪ Witnessed apneas</td>
<td>▪ Obesity</td>
<td>▪ Surgery</td>
</tr>
<tr>
<td>▪ Morning headaches, sore throat</td>
<td>▪ Micrognathia, short chin</td>
<td>▪ Weight loss</td>
</tr>
<tr>
<td>▪ Enuresis/nocturia</td>
<td></td>
<td>▪ Positioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ “Provent”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ “Inspire”</td>
</tr>
</tbody>
</table>
Screening for OSA: STOP-BANG Method

STOP Questionnaire*
- Snoring
- Tiredness (daytime)
- Observed you stop breathing during sleep
- High blood Pressure

BANG†
- BMI > 35
- Age > 50 years
- Neck circumference > 40 cm (~ 16 in)
- Gender: Male

* High risk = Yes to > 2 of 4 STOP items
† High risk = Yes to > 3 of 8 STOP-BANG items

Airway Assessment: OSA Mallampati Scale

Odds of OSA increase >2-fold for every 1-point increase

Class I
Class II
Class III
Class IV

### Restless Leg Syndrome (RLS)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Etiology</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| ▪ Irresistible urge to move legs usually with unpleasant sensations  
▪ Relief with movement  
▪ Worse at night  
▪ Worse with rest | ▪ Dopaminergic dysfunction  
▪ Iron deficiency  
▪ Renal insufficiencies  
▪ Peripheral neuropathies  
▪ 25% secondary | ▪ Dopaminergic agents  
▪ Iron if deficient  
▪ Sedative hypnotics  
▪ Anticonvulsants  
▪ Opiates  
▪ Sleep hygiene |

Periodic Limb Movement Disorder (PLMD) vs. RLS

- Substantial overlap
  - Up to 85% of RLS patients have PLMD
  - 30% of PLMD patients have RLS
- RLS diagnosis is made clinically
- PLMD diagnosis is made via PSG
  - No other daytime clues, just sleepiness
- Treatments are the same
Insomnia and Comorbidities
Insomnia

As a disorder:

▪ Trouble getting to sleep and/or
▪ Trouble staying asleep and/or
▪ Waking up too early and/or
▪ Occurring more days of the week than not
▪ Ongoing for over 3 months
Why Should PCP’s be Proactive about Insomnia?

- Very **prevalent** in primary care
  - But patients don’t tell you
- **Serious consequences**
  - Day to day life
  - Poor outcome on mental and physical health
- Insomnia is a **clue**
  - Most insomnia is co-morbid
- **Easy to identify**

**Treatment**

- Relieves an **upsetting symptom**
- Improves **next day consequences**
- **Improves outcome** of co-morbidity
  - Psychiatric
  - Medical
- **Majority is done by PCP**
Insomnia Risk Factors

- Age (older)
- Sex (especially post-\(^1\) and perimenopausal\(^2\) females)
- Divorce / separation / widowhood
- Psychiatric illness (mood and anxiety disorders)
- Medical conditions
- Cigarette smoking
- Alcohol and coffee consumption
- Certain prescription drugs

Insomnia Screening and Follow-up

- **Sleep Schedule:** Do you have trouble getting to sleep, staying asleep, or waking up too early?
- **Daytime consequences:** Do you feel like you have slept well throughout the day?
- **Sleep timing:** When do you go to bed? …Wake up? …Middle of the night awakening? …How long does it take you to fall back to sleep?
- **Treatments:** What remedies have you tried? Any previous Rx’s?
- **Sleep hygiene/lifestyle issues:** Alcohol? Smoking? Exercise? Medications that cause insomnia?
- **Duration, frequency, prior:** How long has this been going on?…How often?…Have you had it before?...

How Frequent are Comorbidities?

How Does Inadequate Sleep Increase CVD?

- Total sleep time (TST) < 5 hours compared to TST > 5 hours
- Higher glucose & cortisol levels
- HPA-associated endocrine & metabolic imbalances
- Hypercholesterolemia even after controlling for other risk factors

**Night time BP:** Nighttime SBP higher and day-to-night SBP dipping was lower (-8% vs -15%, P < 0.01) in insomniacs

**Atherosclerosis:** Total sleep time (P = 0.005), and sleep quality (P = 0.05) contributed to increased carotid intima-media thickness

**Inflammation:** Serum CRP levels higher and increased at a steeper rate


Does insomnia contribute to development of hypertension?

Prospective Follow-up

- Active duty in US Military
  - Excluded: Chronic insomnia prior to 1/1/1998
- Without hypertension at baseline
- Chronic insomnia led to higher risk of hypertension (aHR 2.00)

Rate of Developing Hypertension (per 10,000 person-years)

- Controls: 46.2
- Insomnia: 95.6

Does Insomnia Increase Risk of CVDs?

How Much Does Insomnia Contribute to CV Mortality?

Health Professionals Follow-Up Study
- US men free of cancer
- Insomnia symptoms in 2004, followed through 2010
- Adjusted for age, lifestyle factors, and common chronic conditions

Metaanalysis of 13 Prospective Studies
- 122,501 subjects followed for 3-20 yrs
- Insomnia increased risk by 45% of developing or dying from CVD
  - (RR 1.45, 1.29-1.62; p < 0.00001)

How Does Insomnia Contribute to Diabetes Risk?

Insulin Resistance Associated with Subjective Sleep Complaints In Those without Diabetes

<table>
<thead>
<tr>
<th>ORs Adjusted for</th>
<th>Insomnia OR</th>
<th>Daytime Sleepiness OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex and age</td>
<td>1.68 (1.09–2.58)</td>
<td>1.80 (1.22–2.66)</td>
</tr>
<tr>
<td>Fully*</td>
<td>1.24 (0.74–2.09)</td>
<td>1.75 (1.10–2.77)</td>
</tr>
</tbody>
</table>

*Adjusting for sex, age, alcohol consumption, smoking, exercise, occupational status, BMI, and family history of diabetes


Does Treating Insomnia Lower Blood Pressure?

Standard BP treatment + estazolam vs. Standard BP treatment + placebo

- Insomnia treatment efficacy
  - Estazolam: 67.3% \((P < 0.001)\)
  - Placebo: 14.0%
- Goal BP (< 140/90 mmHg)
  - Estazolam: 74.8% \((P < 0.001)\)
  - Placebo: 50.5%

Does Insomnia Increase Risk of Psychiatric Disorders?

![Incidence (%) over 3.5 years](image)

- **Major depression**: 31.1% (Insomnia) vs. 5% (No Insomnia)
- **Any anxiety disorder**: 35.9% (Insomnia) vs. 21% (No Insomnia)
- **Alcohol abuse/dep**: 30% (Insomnia) vs. 18% (No Insomnia)
- **Drug abuse/dep**: 14.4% (Insomnia) vs. 10% (No Insomnia)

Does Treating Insomnia Improve Comorbidities?

% Remaining at High Risk

**By Sleep Quality**

- 4 Months: Poor (40%), Good (60%)
- 16 Months: Poor (20%), Good (80%)

**By Intervention**

- 4 Months: Control (60%), Tai Chi (40%)
- 16 Months: Control (20%), Tai Chi (80%)

**ORs of Remaining at High Risk**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>4 months</th>
<th>16 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT</td>
<td>.21 (.03-1.47)</td>
<td>.06 (.005-.669)</td>
</tr>
<tr>
<td>TCC</td>
<td>NS</td>
<td>.10 (.008-1.29)</td>
</tr>
</tbody>
</table>

2-hour group sessions weekly for 4 mo with a 16-mo evaluation

Risk score based on 8 biomarkers: HDL, LDL, triglycerides, C-reactive protein, fibrinogen, HA1c, glucose, insulin
- *High risk = 4 or more abnormal*

How is Insomnia Best Conceptualized to Guide Treatment?

- Genetic: heritability 42% - 57% in chronic insomnia
- Final common pathway: Autonomic and CNS hyperarousal
  - Greater whole-brain metabolism during both sleep and wake periods
  - Increased secretion of corticotropin and cortisol throughout sleep-wake cycle
- Sleep-wake regulation imbalance
  - Overactivity of arousal systems
  - Hypoactivity of sleep-inducing systems
  - Both
- Failure of wake-promoting structures to deactivate during the transition from waking to sleep states

Stepwise Approach for Managing Insomnia

Patient Education: Most Powerful Tool

- Inform WHY management is so important
  - Consequences
- Emphasize keeping regimented sleep schedule
  - Wake up same time every day
  - Naps usually not a good idea
- Emphasize sleeping long enough
  - Can’t catch up on weekends
- Emphasize lifestyle measures
  - Alcohol, exercise, smoking, caffeine, diet (no large meals)
Treatments: CBT and/or Medications?

- **Address the co-morbid condition** as well as the insomnia
- Discuss with patient pros and cons of meds and CBT
  - Medications:
    - Which are best applicable?
    - Habit forming?
    - How long to use?
    - Side effects?
  - CBT: at your discretion—ability, time, interest
- **Allow patient to voice his/her concerns, fears, and needs**
How Does Cognitive Behavioral Therapy Compare To Pharmacotherapy?

CBT-I Components
- Sleep hygiene education
- Cognitive therapy
- Sleep restriction therapy
- Stimulus control therapy
- Relaxation training

Sleep Hygiene
- Regular wake time
- Limit time awake and in bed
- Limit napping during the day
- Avoid clock watching if awake
- Avoid caffeine (after 2 PM), alcohol after dinner, or eating dinner just before bedtime
- Avoid stressful activities in the evening

Treating Insomnia: Choosing the Right Pharmacotherapy

- Trouble with sleep initiation only: rapid and short acting
  - Ramelteon, triazolam, zaleplon, zolpidem

- Trouble staying asleep with sleep initiation problems: rapid and long acting
  - Eszopiclone, temazepam, zolpidem ER, zolpidem (if awakes early in evening), suvorexant

- Trouble staying asleep without sleep initiation problems
  - Doxepin (taken at sleep onset), sublingual zolpidem (taken if one awakens)

- Issues with controlled substances: both of these unscheduled
  - Ramelteon, doxepin

- Generic medications
  - Temazepam, triazolam, zaleplon, zolpidem, eszopiclone
When to Consider Referral to a Sleep Expert

- Suspected obstructive sleep apnea or narcolepsy
- Violent behaviors or unusual parasomnias
- Daytime tiredness (sleepiness) that you can’t figure out
- Insomnia fails to respond to behavioral and/or pharmacologic therapy after an appropriate interval
- You don’t feel comfortable treating the condition

Additional Resources

For additional resources, visit:

- [Sleepfoundation.org](http://Sleepfoundation.org)
- [Sleep.org](http://Sleep.org)
- [Sleephealthjournal.org](http://Sleephealthjournal.org)