



Sleep Health:

Healthy Sleep
Healthy Heart



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Disclosures



- No Relevant Financial Disclosures
- No Relevant Non-Financial Disclosures
- No Discussion of Off-Label Uses

INTENTION: *Evidenced Based vs Evidence Biased*



Traditional wisdom for health...

1. Eat Your Vegetables
2. Go Outside and Play
3. Get Your Sleep

- Grandma

Traditional wisdom has touted the importance of sleep.
Now, sleep has gone prime time with modern science.

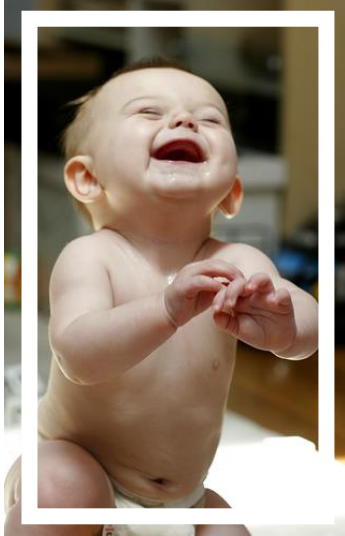
The function & promise of sleep



10. **RESTORE:** Cool brain and body
9. **RESET:** Regulate ion channels
8. **REPAIR:** Optimize physiological growth
7. **ANTI-INFLAMMATORY:** Reduce inflammatory markers
6. **IMPROVE MOOD:** Soothe emotions & mental fatigue
5. **HEART HEALTH:** Actively cardio-protective
4. **BRAIN HEALTH:** Enhances neuro-plasticity
3. **MEMORY:** Improve memory formation & consolidation
2. **JOY:** Connects us physically, mentally & emotionally
1. **ENERGY:** Replete energy stores

Sleep honors health & healing

Optimal sleep



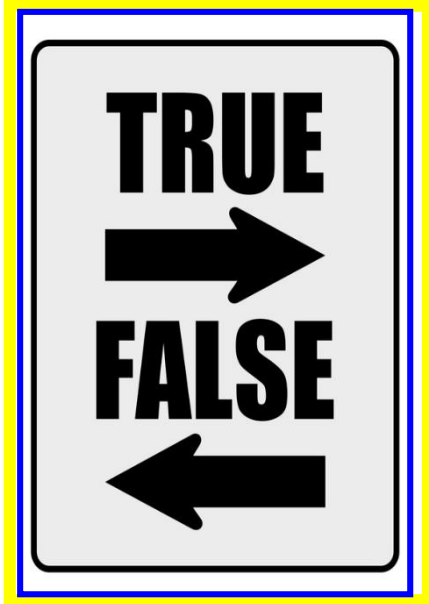
☑ Quantity

The most common recommendation is for people to extend their sleep time

☑ Quality

1. Person may be *aware* of disordered sleep
2. Person may be *unaware* of disordered sleep

Quantity AND Quality are needed



Sleep myths

We all wish that we could sleep... like a baby

Teenagers are the “best” sleepers

~~We need less sleep as we get older~~

Most ALL adults need 7-9 hours...

Sleep changes in adults

Less Deep Sleep

More Arousable

... yet able to Cope with Arousals

Sleep evolves through adulthood

So, we must evolve our lifestyle to promote sleep

A brief history in sleep



Epidemic of sleep problems
began > 100 years ago
the advent of electricity

Our great grandparents slept
 $1\frac{1}{2}$ – 2 hours longer than us

Today, we give ourselves
one less sleep cycle

Stages of sleep



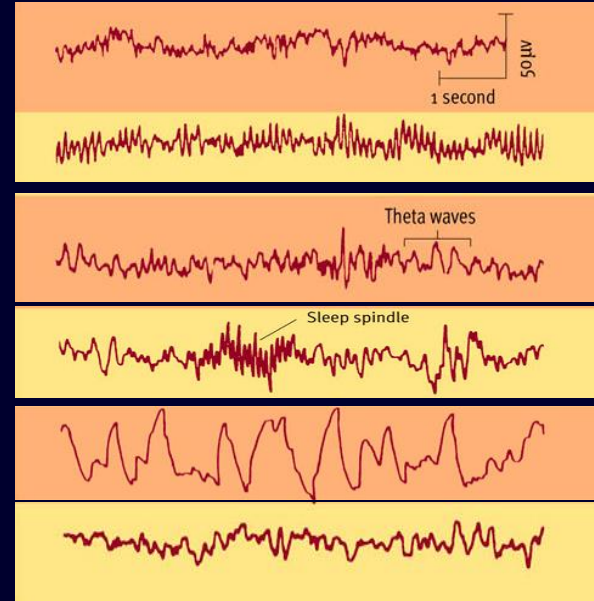
Wake = resting,
eyes closed

Stage 1: transitional 5 %

Stage 2: typical 50 - 55 %

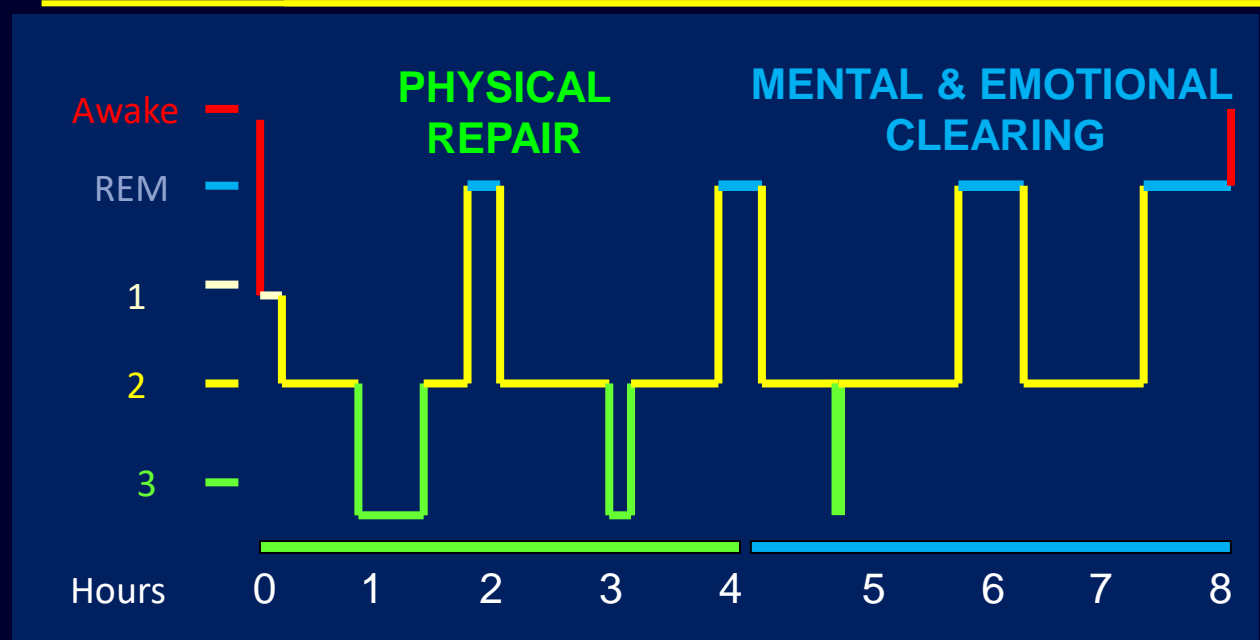
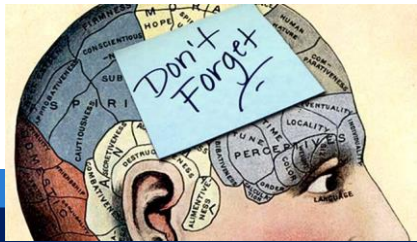
Stage 3: "deep" 15 - 25 %

R.E.M. : "dream" 15 - 25 %



RECOVERY SLEEP = key opportunity

Optimal sleep cycles



Declarative Memory
Filtering Data
"Just the Facts"

Making Connections
Creativity
Problem Solving

Disrupters: arousals & awakenings



- Sleep Apnea/Snoring
- Periodic Limb Movements
- Bruxism (Teeth Grinding)
- Pain & Discomfort
- Meds / Caffeine / Alcohol
- Room Environment
- Medical Conditions
 - Psychiatric, (Depression/ Anxiety)
 - Hormonal, Menopause
 - Urological (Bladder*)
 - Neurological
 - Cardiovascular
 - Autoimmune
 - Inflammatory

Sleep ↔ **Health**

Sleep apnea: signs and symptoms



- **↑ NECK SIZE** > 17" in men & > 16" in women
- **↓ CHIN** - Recessed jaw
- **↓ NASAL AIRWAY** - Stuff or narrow
- Deviated septum
- Fracture
- **FAMILY HISTORY**
- **ALCOHOL OR SEDATIVES**
- **MEN** of all ages; **WOMEN** after menopause

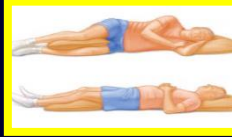
Of all people with apnea,
many without traditional risk factors

Sleep apnea: treatment options



CPAP
GOLD
STANDARD

Sleep Position
(Side vs. Back)



Dental
Device



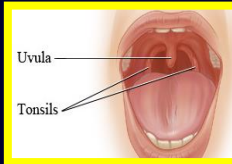
Improve
Nasal Airway



Alcohol
(Timing)



Surgery



Weight
Loss
(10%)



It is very important to treat apnea

Consequences of poor sleep:

Sleepiness !





It's NOT 'normal' to:

- Fall asleep if reading quietly in the afternoon
- “Drift off” at afternoon meetings
- Sleep on airplanes (excluding red-eye flights)
- Fall asleep watching TV in the early evenings
- Sleep when you are a passenger in a car
- “Doze off” while waiting at red lights or stop signs

Sleepiness: **RED FLAGS SIGNS**



Be curious... if you heard yourself say:

- “I do not need sleep...”
- “I am fine with 4-5 hours of sleep...”
- “Yes, I sleep... I get 10 or more hours every night.”
- “I catch up on sleep over the weekends.”
- “I am a great sleeper...
... I can sleep anytime, anywhere.”

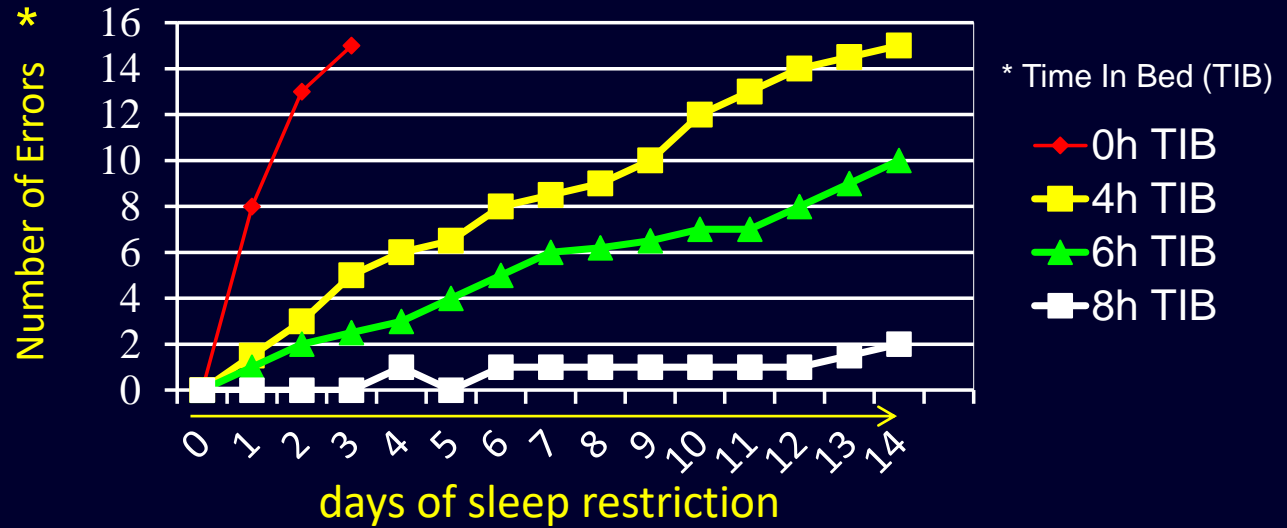
Sleepiness: RED FLAGS SIGNS

Consequences of poor sleep:



ADD-like symptoms

ERRORS



Sleep Deprivation Accumulates

Over time, we may have less insight into our impairment

Consequences of poor sleep:

Brain Chemistry sends the following message:

- Give me **SUGAR** (Neuropeptide Y)
- Give me **FAT** (Galanin)
- Give me **NOW** (Ghrelin & Leptin)

Reduced Production and/or Release of

- Testosterone
- Growth Hormone
- Repair Proteins

Sleepy brain *craving* brain & *sedentary* body



Consequences of poor sleep:



Sleep Restriction/
Insufficient Sleep Recovery

Chronic Hypoxia &/or
Frequent Arousals

Stress & Autonomic System Activation

↑ Catecholamines, Blood Pressure, LV Afterload, Blood Glucose

↑ Leukocytes, Inflammatory Cytokines, CRP, Oxidative Stress

Pro-inflammatory, Platelet Aggregation, ↓NO, Endothelial Injury

Cardiovascular Comorbidities

DISORDERED SLEEP



MECHANISM

- Inflammation
- Metabolic
- Vascular
- Hormonal

RISK FACTORS

- Hypertension
- Obesity
- Diabetes
- Hyperlipidemia

OUTCOMES

- Heart Disease
- Stroke
- Dementia
- Early Death

Obstructive Sleep Apnea

Apnea (Full collapse ≥ 10 sec)
Hypopnea (Partial “ ”)
Index (Per hour)

0 - 5 = NORMAL

5 - 15 = MILD *

15 - 30 = MODERATE

30 + = SEVERE

OSA & inflammation

	Control	Mild OSA	Severe OSA
BMI	28.3 \pm 1.3	27.9 \pm 1.0	28.1 \pm 0.06
AHI	3.3 \pm 0.6	11.0 \pm 0.9	48.4 \pm 0.04
Low SaO ₂	95.2 \pm 2.6	83.7 \pm 1.7	75.7 \pm 2.1
CRP (mg/L)	0.90 \pm 0.2	1.5 \pm 0.3	2.8 \pm 0.4
IL-6 (pg/mL)	0.91 \pm 0.15	1.23 \pm 0.14	2.25 \pm 0.28
IL-18 (pg/mL)	181.9 \pm 20.3	209.7 \pm 27.0	273.5 \pm 16.8

*Brown, J Clin Sleep Med 2007
Minoguchi, Am J Respir Crit Care Med 2005

Sleep apnea: CPAP results



CPAP
GOLD
STANDARD

- Reduce CRP, TNF- α and IL-6
- Reversal of endothelial dysfunction via SDMA and ADMA
- Increases Nitric Oxide

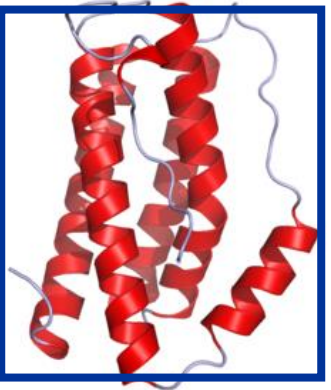
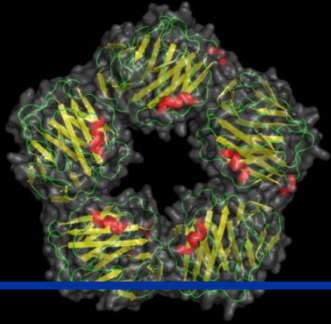
Sleep duration & inflammation

Elevated *hs*-CRP & IL-6

U Shaped Impact

- Short Sleep Duration < 5 hours
- Long Sleep Duration > 9 hours

Stronger correlation in women than men



Sleep duration and immunity

Short Sleep Duration (< 6 hours)

Negative effect in vivo
antibody response to novel antigen

Hepatitis B Vaccination
Influenza Vaccination

Possible explanation for poor sleep with
increased susceptibility to infectious disease



Sleep duration & blood pressure

- Sleep-Related Breathing Disorders promote non-dipping of nocturnal blood pressure
 - Even mild OSA associated with increased risk of developing hypertension in 4 years
 - (OR 1.42: [1.13-1.78])
 - Moderate to Severe even greater risk
 - (OR 2.9: [1.5- 5.6])



Sleep apnea: hypertension results



CPAP
GOLD
STANDARD

- CPAP lowers diurnal & nocturnal blood pressure
- Therapeutic CPAP versus sham CPAP reduced diurnal systolic by 6.7 & diastolic by 4.9 mmHg among males over a 6 week period
- Greater reductions in those with more severe OSA

“Syndrome Z”

Syndrome X + Sleep Disturbance

Proposed Model Fit with Syndrome X
Sleep Disturbance: $(0.82 \pm 0.03; p < 0.01)$

greater model fit than

- Insulin Resistance $(0.67 \pm 0.05; p < 0.01)$
- Hypertension $(0.64 \pm 0.04; p < 0.01)$
- Dyslipidemia $(0.60 \pm 0.05; p < 0.01)$
- **Obesity: Model Fit $(0.85 \pm 0.02; p < 0.01)$**



Sleep apnea: weight loss results



CPAP
GOLD
STANDARD

- CPAP treatment alone does not necessarily lead to weight reduction
- Best achieved when individuals participate in cognitive–behavioral weight-reduction programs
- Weight loss following laparoscopic gastric banding reduced AHI (baseline: 61.6; post-treatment: 13.4)

Sleep apnea: diabetes results



CPAP
GOLD
STANDARD

- Abnormal Glucose Intolerance
 - AHI 5- 15 [OR 1.20 (0.98 – 1.64)]
 - AHI > 15 [OR 1.46 (1.09 – 1.97)]
- Patients with Type 2 diabetes and OSA, mean sleeping glucose decreased from baseline (122.0) to post-treatment (102.9 mg/dl)
- Insulin sensitivity improved even among non-diabetics

Sleep apnea: dyslipidemia



CPAP
GOLD
STANDARD

- In OSA, greater HDL dysfunction & oxidized LDL levels;
- AHI explained 30% of variance in HDL dysfunction in OSA
- Positive airway pressure improved abnormal lipid & lipoprotein with 6-month follow up showing an HDL increase by 5.8%
- Non-calcified, mixed plaque found in severe vs mild OSA 63 % vs. 16 % ($P < 0.0001$) controlled OR 7.0 (1.9 – 26.5)
- CPAP (AHI > 50) after 6 months reduced carotid IMT weighted mean difference by 0.121 mm (0.019 – 0.223)

Severe OSA and heart disease

Sleep Heart Health Study notes

OR (95% CI)

Heart failure

2.38 (1.22–4.62)

Stroke

1.58 (1.02–2.46)

Coronary heart disease

1.27 (0.99–1.62)

Atrial fibrillation

4.02 (1.03–15.74)

Non-sustained ventricular tachycardia

3.40 (1.03–11.20)

Complex ventricular ectopy

1.74 (1.11–2.74)



**Of all with apnea,
only 10-20% know of their diagnosis**

Severe OSA and heart disease

OSA and Cardiovascular Disease RR (95% CI)

MI (males); low vs high quartiles	23.3 (3.9–139.9)
Stroke 10 years after coronary angio	2.89 (1.37–6.09)

Untreated OSA after 10 years OR (95% CI)

Fatal Myocardial Infarction & Strokes	2.87 (1.17–7.51)
Non Fatal Cardiac Events	3.17 (1.12–7.52)



Sleep apnea: CPAP results



CPAP
GOLD
STANDARD

- In CHF, improve left ventricular function
- Improve fatal and non-fatal cardiovascular events with risk reduction of 64% over 6 years;
Number Needed to Treat = 3.5
- CVD morbidity and mortality increases only among untreated patients over a 10 year follow up

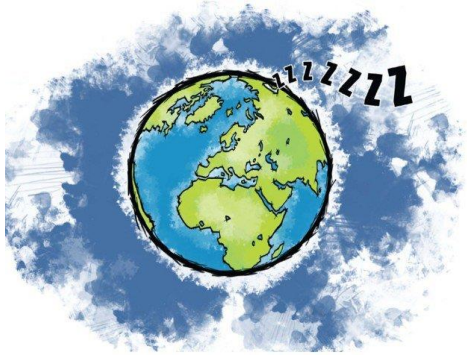
Sleep apnea: CPAP results



CPAP
GOLD
STANDARD

- Improved insulin sensitivity and reduced systemic inflammation, oxidative stress and global CVD risk
- ≥ 4 hours/ night CPAP use reduced 10 year risk of CV events from 18.8 to 13.9 %
- Metabolic syndrome decreased by 45% after 12 months of CPAP treatment

Physiology and sleep



From Awake to Sleep

- Brain Waves Slow
- Heart Rate Slow
- Blood Pressure Drops
- Breathing Rate Slow

From NREM to REM

- Brain Waves Faster
- Heart Rate Faster
- Blood Pressure Increases
- Breathing Rate Faster
- Sexually Aroused
- Rapid Eye Movement
- Muscle Tone Drops *

↑REM AHI: associated with higher incidence of CV events in those with CV disease

Chronic insomnia



- **Dissatisfaction with quantity or quality of sleep**
- **Repeated difficulty with sleep:**
 - Initiation
 - Maintenance
 - Early AM awakening with inability to return to sleep
- **Daytime distress or impairment:**
Social, Occupational, Educational, or Behavioral
- **At least three nights per week and three weeks**
- Rule out psychiatric, medical or other sleep disorders

CBT-I

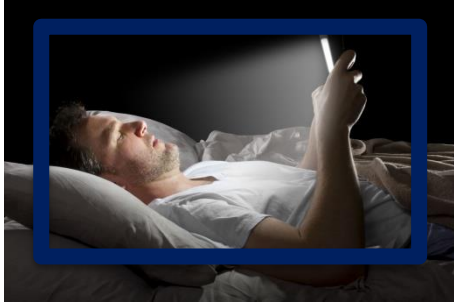
Cognitive Behavioral Therapy for Insomnia



Components	Description
Cognitive Therapy	<input checked="" type="checkbox"/> Targets dysfunctional beliefs and attitudes about sleep
Sleep Restriction	<input checked="" type="checkbox"/> Restricts bedtime to actual sleep time
Stimulus Control	<input checked="" type="checkbox"/> Associate bed with sleep; limits stimulating behavior
Sleep Hygiene	<input checked="" type="checkbox"/> Teaches practices that help relax close to bedtime
Relaxation Training	<input checked="" type="checkbox"/> Advises on behaviors & environment that impact sleep

Face to Face CBT-I is the best
Many online CBT-I sources show benefits

'Stimulus control'



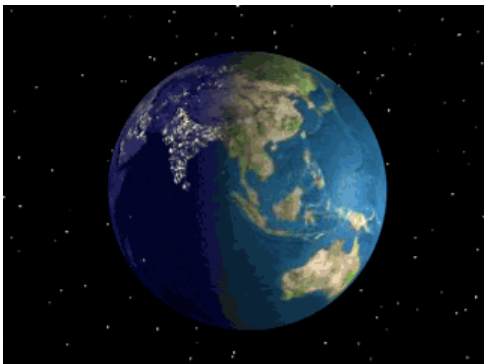
Any activity that is not sleep in bed,
will train the brain and body
that it is okay not to sleep in bed

Avoid Blue Light in the Bedroom:
(TV, Computer, Cell Phones)

Create a room that is focused on
sleep and/or intimacy

Daytime Lifestyle sets up Sleep

Sleep sets up next Daytime



Alcohol and sleep



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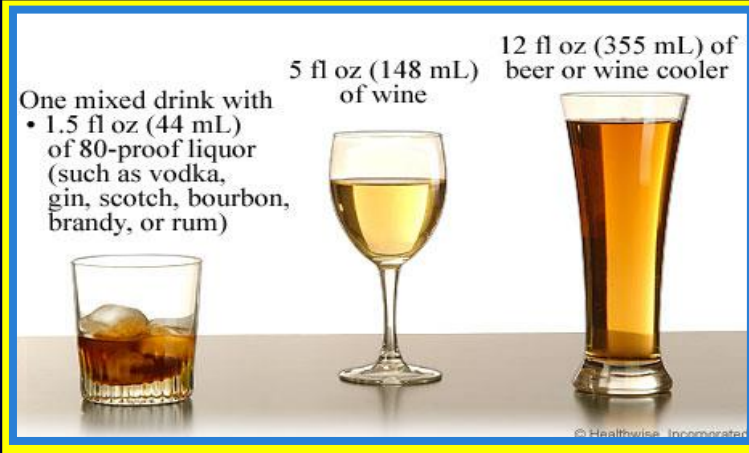
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One mixed drink with
• 1.5 fl oz (44 mL)
of 80-proof liquor
(such as vodka,
gin, scotch, bourbon,
brandy, or rum)

5 fl oz (148 mL)
of wine

12 fl oz (355 mL) of
beer or wine cooler



Following EVERY(1) SERVING, **SLEEP** impacted for 2 hours

1st hour of ↑ sedation, followed by
2nd hour of ↑ arousal or withdrawal

Caffeine and sleep

SOURCES OF CAFFEINE

- Coffee
- Energy Drinks
- Espresso
- Headache Medicine
- Tea
- Cola
- Chocolate
- Decaffeinated Coffee



It *may* take up to 7 hours, to metabolize Caffeine by 50%

A full cup at 8 AM... 1/4 cup at 10 PM
Caffeine blocks brain chemical that induces deep sleep

Exercise and deep sleep

BY ADDING EXERCISE:

TIME TO FALL
ASLEEP

DEEP SLEEP
AND REM
SLEEP

NIGHTTIME
AWAKENINGS

- Exercise breaks down of ATP and promotes \uparrow adenosine
- \uparrow adenosine enhances deep sleep



Adenosine is blocked by caffeine

BETTER SLEEP TIPS



- Schedule adequate number of hours
(include nap time)
- Schedule same time, everyday of the week
(if needed, vary by one hour or less)
- 1 hour before bed, start to ramp down:
 - “Turn Off” Computers, Phones, TVs
 - Dim the lights & promote darkness
 - Consider aromatherapy &/or a warm shower or bath

CREATE A RITUAL BEFORE BEDTIME

BETTER SLEEP TIPS



- **If busy brain, seek a recitation**

- Recite poem, prayer, hymn or mantra
- Count breaths
- Progressive relaxation from toe to head

if and when the mind wanders, and it will..

SMILE... and START OVER...

- **If still awake after 20 minutes, GET OUT OF BED**

- Read under a soft light
- Gentle stretch or yoga
- Relaxation techniques

CREATE A RITUAL BEFORE BEDTIME

Rx for optimal sleep & health

DEA# GB000000 Lic. # ME 000000

Param Dedhia, MD
• Sleep Medicine •

NAME _____ AGE _____
ADDRESS _____ DATE _____

Rx

A Good Night's Sleep

(SIGNATURE) _____

LABEL
REFILL 0 1 2 3 4 5 PRN

DRS -NAT FINEC T
1-800-635-0800

(1) Quantity and (2) Quality

Daytime Lifestyle ↔ Nighttime Sleep

Create Night Time Rituals

THANK YOU

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