# Dreaming of Sleep: The Challenges and Benefits

Muna Irfan Assistant Professor Department of Neurology, University of Minnesota Program Director of Sleep Medicine Fellowship, HHC Medical Director of Sleep Services VA Minneapolis



 To provide introduction to sleep, its function and common sleep disorders



- To understand the changes in sleep with age
- To identify common sleep disorders

### Sleep Disorders



FG +0.0 SG +0.0 Time -10.00 Rear View

 How to move the needle on sleep health and wellness in our communities?



Unique Features of Sleep Medicine

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1. Most Evidence Based Therapies are Non-Pharmacological.

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In contrast to Neurology, for example

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  - 2. Solutions Require Knowledge Transfer In Contrast to Pneumonia

- Unique Features of Sleep Medicine
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  - 2. Solutions Require Knowledge Transfer In Contrast to Pneumonia

Sleep Medicine Fellowship Experience

3. Sleep solutions are relatively easy to implement.

Contrast...

Obesity where the answers are obvious but extremely difficult in practice

Sleep solutions are often paradoxically difficult to understand but then once understood they are (relatively) easy to implement

 How to move the needle on sleep health and wellness in our communities?



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  - 2. Knowledge transfer sleep conditions
  - 3. Knowledge transfer sleep solutions

#### Contents

#### Introduction to Sleep

- Some functions and consequences of inadequate sleep
- Sleep in aging
- Motivating the audience to improve their sleep
- Sleep Disorders
  - Can't Sleep, Too Sleepy, Weird Things

#### Importance of Sleep

#### CDC study

o correlated sleep with happiness

controlled for education, income, employment



#### Sleep and the Health of the Brain



## Sleep Maintains Healthy Brain CellsNeurons:Synapses:

• 100 billion neurons • 100 trillion synapses

### Recent Breakthrough: CNS Metabolite/Toxin Clearance

- 2012 breakthrough
- Sleep Serves to clear out toxic metabolites from the brain
- Clears beta-amyloid (Alzheimers, Concussions) pathology



(Xie 2013, Lucke-Wold et al 2015)



### Sleep and Insight

 Yesterday Voted #1 Rock Song all time by

Rolling Stone

BBC Radio 2

MTV

 The most covered Rock and Roll song of all time.

2,200 different recordings





#### Sir Paul McCartney

 melody came to him in a dream

 Felt so familiar he assumed that he had merely remembered it.

Was very concerned he was subconsciously plagiarizing.



#### Sir Paul McCartney

 "For about a month I went round to people in the music business and asked them whether they had ever heard it before. Eventually it became like handing something into the police. I thought if no-one claimed it after a few weeks then I could have it."



### Sleep and its functions

- Growth
- Immune function
- Brain development
- Synaptic homeostasis
- Memory
- Unlearning theory
- Glymphatic system

### Sleep Cycle



### Sleep Stages

#### **NREM** sleep

#### N1 (lightest)

- If awoken, most would not even believe
- Drop in Body Temperature
- N2 (Intermediate)
  - OSA, Seizures
- N3 (Deepest Sleep)
  - Most Refreshing Sleep

#### **REM Sleep**

- Brain Activity similar to wakefulness
- dreams
- Skeletal muscle paralysis
- Relatively light stage of sleep (ie very easy to awaken out of)
- Ectothermia

### Sleep & Aging

#### NSF recommends 6><9 hrs of sleep with

- better cognition
- mental health
- physical health
- quality of life

Miner B, Kryger MH. Sleep in the Aging Population. *Sleep Med Clin*. 2016;12(1):31-38.

Sleep & Aging



PerspectiveNeurobiology of Sleep and Microbiomics in Aging

Larson-Prior 2017

#### CHANGES IN SLEEP ARCHITECTURE:

### Most by 60 except sleep efficiency continues to decline 90 & beyond

	Decreased	Increased
Sleep Parameter	<ul> <li>Total sleep time</li> <li>Sleep efficiency</li> <li>Slow wave sleep</li> <li>Rapid eye movement sleep</li> </ul>	<ul> <li>Time awake after sleep onset (WASO)</li> <li>Number of arousals from sleep</li> <li>Sleep latency</li> </ul>

#### CHANGES IN SLEEP ARCHITECTURE:

#### PHASE ADVANCE:

- Earlier onset of sleep in the evening
- Earlier morning awakening
- NAPPING
- mixed results

#### MANAGEMENT

- Medical, psychiatric, and psychosocial factors
- Approach as multifactorial geriatric health condition

### NREM/REM Cycle



Cat in NREM



Cat in REM

#### Sleep Education

- Sleep Disorders are:
  - Common, Distressing
  - Numerous comorbidities/early mortality
- Suboptimal Sleep is nearly universal

(National Sleep Foundation-2014 Sleep in America Poll)

## Sleep and Performance in the Workplace

- presenteeism
- absenteeism
- Poor
   productivity



#### Acute Consequences

- Daytime sleepiness
- Slow reaction time
- Poor memory

- Poor judgment
- Irritability
- Distractibility



#### Chronic Consequences

- Obesity
- Heart disease
- Diabetes
- Cancer
- Dementia
- Depression and mood disorders
  - More to Come...


# Sleep Education: Motivating the Audience

Get a new approach

# Sleep Education: High Performance Athletes

- Great interest in optimizing
   neurological performance
- Ruthlessly objective
  - A 5-8% improvement in brain processing speed can have dramatic changes in outcome

(Winter et al 2009, Venter 2012, Thun et al 2015)



ABC Sports

## Sleep Routines







Roger Federer 11-12 hrs

Usain Bolt 8-10 hrs Lebron James 12 hrs

(Abrams 2011, McCann 2012)



http://dx.doi.org/10.5664/jcsm.3256

#### Treatment of Obstructive Sleep Apnea Syndrome with Nasal Positive Airway Pressure Improves Golf Performance

Marc L. Benton, M.D., F.A.A.S.M.; Neil S. Friedman, R.N.

- Controlled Study Using Golfers recently diagnosed with OSA
- Correction with CPAP resulted in a mean drop in handicap from 12.4 to 11.0
  - Greater response amongst skilled golfers
    - 9.2 to 6.3



(Benton et al 2013)

#### **Review of Sleep Problems**

I. Can't fall asleep

II. Too sleepy during the day

III. Something weird is happening during sleep



## Can't Fall Asleep

- 30% of adults will describe some difficulty falling asleep annually
  - One third (10% total population) have daytime dysfunction
- 5.5 million office visits (US)
  - Sedative Rx
    - 1999-5.3 million
    - 2010-20.8 million

(Roth 2007, Ford et al 2014)

### I. Can't Sleep

#### The Three Causes

 Circadian (night owl, morning lark)
 Restlessness
 Mind won't shut off (Overactive brain)



### Circadian (Biological clock) Delay

Modern problem

#### Two Causes

- Evening exposure to lights
- Relative absence of morning sunlight



Galileo spacecraft-NASA

#### Can't fall asleep and hard to wake up

"I go to bed at 11 pm. I lay in bed trying to sleep, but my brain will not shut down. It takes me at least an hour (sometimes several) to fall asleep"

#### Can't fall asleep and hard to wake up

"Once I fall asleep, I will usually sleep well until the alarm goes off, but then I need to hit the snooze button. I could sleep a lot longer"







• THIS IS NOT

THIS IS NOT AN OVERACTIVE BRAIN!!!

THIS IS NOT AN OVERACTIVE BRAIN!!!
YOU DO NOT NEED A PILL FOR THIS

THE GOAL IS TO SHIFT YOUR SLEEP
 TIMING

## Circadian Delay Protocol

1<sup>st</sup> thing to do-sunlight or 10,000 lux light exposure 30-120 minutes in AM

2<sup>nd</sup> thing to do-low dose 0.5-1mg melatonin 2-6 hours prior to bedtime (some flexibility)

3<sup>rd</sup> thing to do...

## Circadian advancement

Early morning awakening

- Light before bedtime
- reassurance

"I lay in bed and I can't get comfortable. I feel like I could fall asleep, but I can't because of this urge to rollover, adjust position, get up and walk..... If it wasn't for these sensations I could fall asleep"



You have restlessness if you answer yes to the following questions

- 1. Do you have discomfort at night?
- 2. Does this discomfort compel you to move?
- 3. Does movement make it better?
- 4. Does this interfere with your ability to sleep?



## Restless Legs Syndrome-The Vexing Syndrome

- Symptoms often vague or difficult to describe
  - Often only history given is "I cant fall asleep"
  - The discomfort they do feel is often misattributed to some other diagnosis
    - "Oh that's just my back pain"
    - "That's my diabetic neuropathy"
    - "I get anxious at night"

## Non-Motor Symptoms

**Restless Smoking** 

•

•

- Patients will describe a need to smoke in order to "calm down and fall asleep"
  - Smokers without RLS do not describe this experience
- Restless Eating
  - urge to eat, not driven by hunger but instead a perception that eating will make it easier to fall asleep

THIS IS NOT AN OVERACTIVE BRAIN!!!

#### THIS IS NOT AN OVERACTIVE BRAIN!!!

 YOU DO NOT NEED A SLEEPING PILL FOR THIS

# THE GOAL IS NOT TO "SHUT DOWN YOUR BRAIN"

 THE GOAL IS TO ELIMINATE THE RESTLESSNESS THEN YOU SHOULD NATURALLY FALL ASLEEP

#### Overactive Brain

"I am exhausted during the day but I cannot nap"

# What About Sleeping Pills?

- Commonly prescribed (zolpidem, eszopiclone..etc)
- Sleeping Pills have concerning adverse side effects.
- Only modest improvement on *objective* sleep efficiency
  - Primarily improve *subjective* sleep efficiency

	Pre Treatment	Post Treatment
Subjective Sleep Efficiency	40%	
Objective Sleep Efficiency		

	Pre Treatment	Post Treatment
Subjective Sleep Efficiency	40%	
Objective Sleep Efficiency	66%	

	Pre Treatment	Post Treatment
Subjective Sleep Efficiency	40%	
Objective Sleep Efficiency	66%	75%

	Pre Treatment	Post Treatment
Subjective Sleep Efficiency	40%	95%
Objective Sleep Efficiency	66%	75%

# Best Therapy for an Overactive Brain...

# Best Therapy for an Overactive Brain...

#### Cognitive Behavioral Therapy for Insomnia

CBT-I

## Can't Sleep Management Review

 Once circadian delay and Restlessness have been <u>RUTHLESSLY</u> excluded...

pursue CBT-I
# Sleep Cycle



## Have a comfortable flight



## Excessive sleepiness

#### MOST COMMON CAUSE?

- Sleep Deprivation (or mistiming)
- Sleep Disordered Breathing
- Narcolepsy

### Excessive sleepiness

MOST COMMON CAUSE?

Sleep Deprivation (or mistiming)

### Excessive sleepiness

MOST COMMON CAUSE?

Sleep Deprivation (or mistiming)

...Sleep MD anecdote

## sleep apnea

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MRSDC

#### REM-sleep behavior disorder (RBD)



#### Used with Permission of Carlos Schenck MD

## Conclusion

- sleep is fascinating and important
- sleep disorders are common, frequently misdiagnosed, and most importantly treatable



## Conclusion

http://etc.ch/LPpt

## Thank you

