

# Resident Fatigue

A Primer For Residents

Andrew Martin, MD

Chair, Pulmonary Department

Deborah Heart and Lung Center

Clinical Associate Professor of Medicine

[MartinA@Deborah.org](mailto:MartinA@Deborah.org)

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# Pre-Test Questions

1. Drivers can accurately rate their degree of impairment due to drowsiness.

True or False

2. Effective measures to prevent falling asleep while driving are:
  - A. Cold air in the face
  - B. Playing loud music
  - C. Stop and take a nap
  - D. All of the above

Choose the best answer

3. In the state of New Jersey, driving sleepy is considered an aggravating factor in a fatal motor vehicle accident.

True or False

4. Circadian rhythms influence wakefulness independently with or without sleep deprivation.

True or False

5. Residents are at increased risk for automobile accidents following a night on call.

True or False

6. The U.S. National Highway Traffic Safety Administration (NHTSA) estimates that drowsy driving accounts for how many traffic fatalities annually?

A. About 750 or 2% of total traffic fatalities

B. About 1500 or 4% of total traffic fatalities

C. About 3000 or 8% of total traffic fatalities

Choose the best answer

7. Sleep related accidents are more common in the elderly than in young people.

True or False

8. There are warning signs that can alert a driver to the danger of falling asleep while driving.

True or False

9. Twenty four hours of wakefulness impairs psycho-motor performance as much as what level of blood alcohol?

A. 0.02%

B. 0.05%

C. 0.10%

D. 0.15%

Choose the best answer

10. The two peak times for traffic accidents are:

- A. Late morning (10 AM) and late evening (11PM)
- B. Early morning (2AM) and mid-afternoon (2PM)
- C. Early morning (2AM) and early evening (7PM)
- D. Late morning (10AM) and early evening (7PM)

Choose the best answer

# ACGME COMMON PROGRAM REQUIREMENTS

rev 2013

- **VI.C.3. - Alertness Management/Fatigue Mitigation: The sponsoring institution must provide adequate sleep facilities and/or safe transportation options for residents who may be too fatigued to safely return home.**
- **VI.G.1 - Maximum Hours of Work Per Week: Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities and all moonlighting.**
- **VI.G.2.b) - Time spent by residents in Internal and External Moonlighting (as defined in the ACGME Glossary of Terms) must be counted towards the 80-hour Maximum Weekly Hour Limit.**
- **VI.G.4.a) - Maximum Duty Period Length: Duty periods of PGY-1 residents must not exceed 16 hours in duration.**

# The Concepts of Sleep

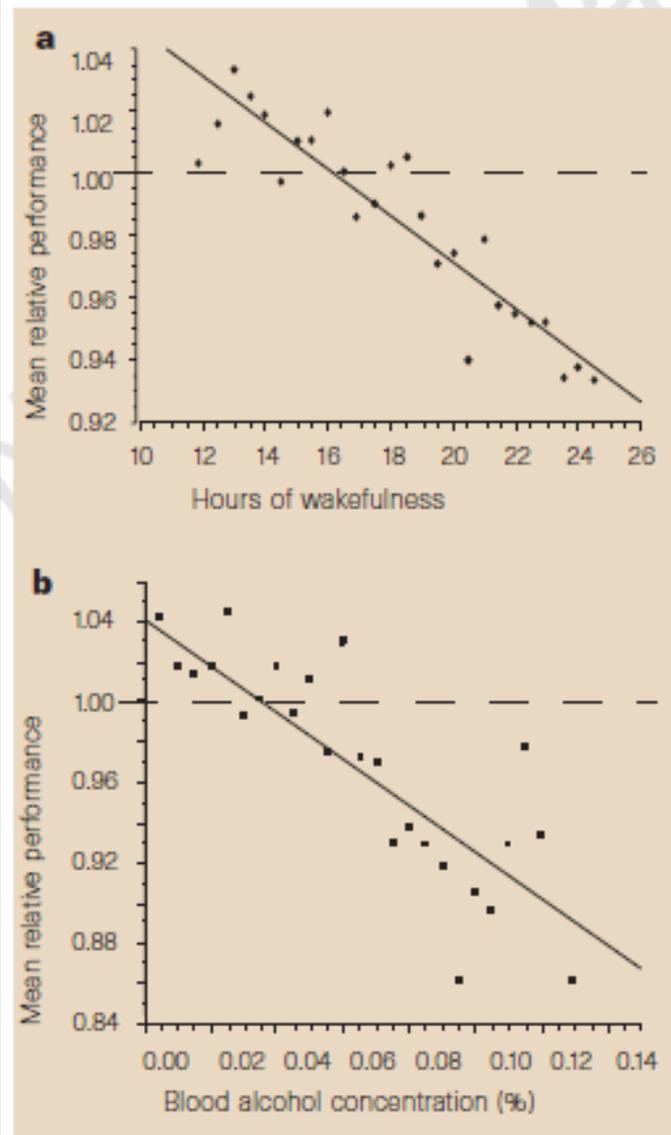
- Everybody needs sleep
- Sleep deprivation causes drowsiness
- Drowsiness decreases attentiveness and increases reaction time
- Sleep debt must be paid back eventually
- Micro-sleeps
- You cannot learn to function without sleep!

# Sleep and Medical Errors

- Fatigue and distress are associated with increased rates of self-perceived medical errors.

JAMA 2009 302:1294-1300

Performance on a computer-administered test of hand–eye coordination (an unpredictable tracking task).

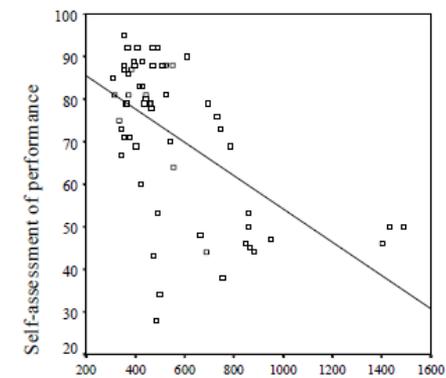


**Figure 1** Scatter plot and linear regression of mean relative performance levels against **a**, time, between the tenth and twenty-sixth hour of sustained wakefulness ( $F_{1,24}=132.9$ ,  $P<0.05$ ,  $R^2=0.92$ ); and **b**, blood alcohol concentrations up to 0.13%, ( $F_{1,24}=54.4$ ,  $P<0.05$ ,  $R^2=0.69$ ).

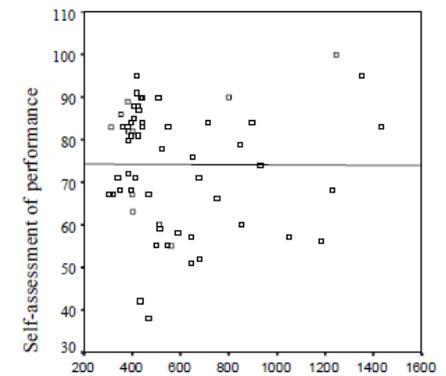
•Dawson D, Reid K Nature 1997

Counterbalanced study involving 3 experimental conditions: laboratory after controlled habitual sleep (8.5 hours), driving after controlled habitual sleep (8.5 hours) (Road 1), and driving after reduced sleep (2 hours) (Road 2). For road conditions, RT was measured during rest stops on a 120 km drive every 105 minutes.

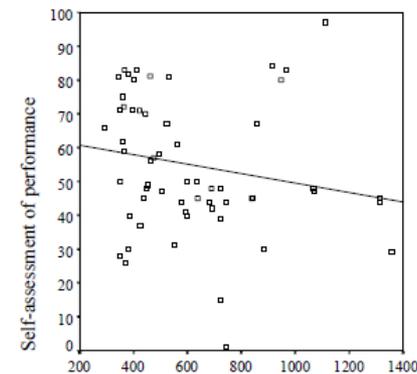
Philip et al. SLEEP 2003



RT - Laboratory



RT - Road 1



RT - Road 2

Figure 2—Correlation between reaction time (RT) and self-assessment of performance in the 3 conditions (Laboratory,  $r = -0.58$ ; Road 1,  $r = -0.004$ ; Road 2,  $r = -0.19$ ).

# Did You Know?

A majority of police officers surveyed report having stopped a driver that they thought was under the influence of alcohol only to find that the driver was simply sleepy.



# Automobile Accidents and Sleep

- The US Department of Transportation estimates that 100,000 accidents reported are due to drowsiness and/or fatigue. These crashes result in 1550 deaths annually (4% of traffic fatalities) and \$12.5 billion in monetary losses.
- Contrary to popular belief, the elderly are at lower risk for sleep related accidents than young adults.

# Characteristics of Sleep Related Accidents

- The problem occurs during late night/ early morning or midafternoon.
- The crash is likely to be serious.
- A single vehicle leaves the roadway.
- The crash occurs on a high-speed road.
- The driver does not attempt to avoid a crash.
- The driver is alone in the vehicle.

# Call and Automobile Accidents

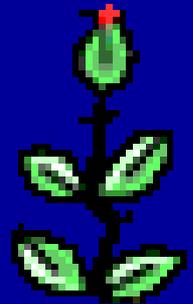
- 2373 residents were surveyed about call hours and motor vehicle accidents.
- The risk of having a documented automobile accident more than doubled after an extended work shift.
- Near miss accidents were more than five times more likely to occur after extended shifts.

# Call and Driving Performance

- Residents on different call rotations were tested on driving simulator.
- Compared heavy call plus placebo and light call with BAC of .04% to .05% (about half the legal limit)
- Results were similar

Arnedt JT et al, JAMA 2005

# Sleep and Driving Facts



- The circadian rhythm
- Sleep tendency peaks between 2AM and 6AM and again between 2PM and 6PM.
- Motor vehicle accidents peak during these times.
- 24 hours without sleep impairs drivers as much as a BAC of 0.1%
- Subjects do not estimate accurately their degree of impairment.

# The Law

- In 1997 Maggie McDonnell, a 20 year old college student was killed in a head-on collision with a driver who admitted to having been sleepless for 30 hours, as well as drug use. He was given a suspended jail sentence and a \$200 fine.
- Criminal homicide constitutes vehicular homicide when it is caused by driving a vehicle or vessel recklessly.

# Maggie's Law

- In 2003 Maggie's Law was passed in New Jersey. This law establishes driving while fatigued as recklessness under the vehicular homicide statute.
- Proof that the defendant fell asleep while driving or was driving after having been without sleep for a period in excess of 24 consecutive hours can give rise to a charge of vehicular homicide.

# Warning Signs

- Trouble keeping your eyes open
- Trouble keeping your head up
- Daydream or wandering thoughts
- Drifting across lanes
- Missed signs or exits

# Warning Signs

- Frequent yawning or rubbing your eyes
- Irritability or restlessness
- Drifting off the road or hitting rumble strips
- If you think you might be sleepy, you are!

# Counter Measures

## Driving

- Ineffective
  - Rolling down the window
  - Loud music
  - Caffeine – takes 30 minutes to work, can still get micro sleeps
- Effective
  - Sleep – pull over and take a 15 – 30 minute nap

# Counter Measures Working

TAKE A NAP!

ROOMS WILL BE PROVIDED.

# Summary

- Fatigue causes:
  - Increased risk for automobile accidents
  - Increased risk for making medical errors

Mokhlesi and Gozal; AJRCCM 2010; 181:545-549

- Be aware of the problem because you may not be aware of the problem!

# References

- Richardson GS, Carskadon MA, Orav EJ, Dement WC; Circadian variation of sleep tendency in elderly and young adult subjects. *Sleep* 5:S82-S94, 1982
- Dawson D, Reid K; Fatigue, alcohol and performance impairment. *Nature* 388: 235, 1997
- Philip et al; Fatigue, Sleep Restriction, and Performance in Automobile Drivers: A Controlled Study in a Natural Environment. *SLEEP* 26:277-80 2003
- Barger et al.; Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med* 352:125-34, 2005
- Arnedt JT et al. Neurobehavioral performance of Residents After Heavy Night Call vs After Alcohol Ingestion. *JAMA* 294:1025-1033, 2005

# Post Test

# Question 1

## True or False

Drivers can accurately rate their degree of impairment due to drowsiness.

# Question 1

Drivers can accurately rate their degree of impairment due to drowsiness.

False – . Phillip et al. Sleep 2003

## Question 2

Choose the best answer

Effective measures to prevent falling asleep while driving are:

- A. Cold air in the face
- B. Playing loud music
- C. Stop and take a nap
- D. All of the above

## Question 2

Effective measures to prevent falling asleep while driving are:

C. Stop and take a nap.

Cold air and loud music are not effective in keeping sleepy drivers awake.

# Question 3

## True or False

In the state of New Jersey, driving sleepy is considered an aggravating factor in a fatal motor vehicle accident.

# Question 3

In the state of New Jersey, driving sleepy is considered an aggravating factor in a fatal motor vehicle accident.

**TRUE – Maggie's Law**

# Question 4

## True or False

Circadian rhythms influence wakefulness independently with or without sleep deprivation.

# Question 4

Circadian rhythms influence wakefulness independently with or without sleep deprivation.

**TRUE**

# Question 5

## True or False

Residents are at increased risk for automobile accidents following a night on call.

# Question 5

Residents are at increased risk for automobile accidents following a night on call.

**TRUE**

# Question 6

## Choose the best answer

The U.S. National Highway Traffic Safety Administration (NHTSA) estimates that drowsy driving accounts for how many traffic fatalities annually?

- A. About 750 or 2% of total traffic fatalities
- B. About 1500 or 4% of total traffic fatalities
- C. About 3000 or 8% of total traffic fatalities

# Question 6

The U.S. National Highway Traffic Safety Administration (NHTSA) estimates that drowsy driving accounts for how many traffic fatalities annually?

**B. About 1500 or 4% of total traffic fatalities**

# Question 7

## True or False

Sleep related accidents are more common in the elderly than in young people.

# Question 7

Sleep related accidents are more common in the elderly than in young people.

**FALSE**

# Question 8

## True or False

There are warning signs that can alert a driver to the danger of falling asleep while driving.

# Question 8

There are warning signs that can alert a driver to the danger of falling asleep while driving.

**TRUE**

# Question 9

## Choose the best answer

Twenty four hours of wakefulness impairs psycho-motor performance as much as what level of blood alcohol?

- A. 0.02%
- B. 0.05%
- C. 0.10%
- D. 0.15%

# Question 9

Twenty four hours of wakefulness impairs psycho-motor performance as much as what level of blood alcohol?

C. 0.10%

# Question 10

## Choose the best answer

The two peak times for traffic accidents are:

- A. Late morning (10 AM) and late evening (11PM)
- B. Early morning (2AM) and mid-afternoon (2PM)
- C. Early morning (2AM) and early evening (7PM)
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# Question 10

The two peak times for traffic accidents are:

B. Early morning (2AM) and mid-afternoon (2PM)