University of Southern California
Otolaryngology Grand Rounds

Dangers of Sleepiness in the Workforce

SLEEP, ALERTNESS, AND FATIGUE EDUCATION IN RESIDENCY

8/15/2020

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CONFLICT OF INTEREST DISCLOSURES

UNIVERSITY OF IOWA HEALTH CARE

[X] 1. I do not have any potential conflicts of interest to disclose, **OR**

2. I wish to disclose the following potential conflicts of interest:

Type of Potential Conflict	Details of Potential Conflict
Grant/Research Support	
Consultant	
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Financial support	
Other	

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BACKGROUND

This lecture (in part) is a product developed by the American Academy of Sleep Medicine

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Learning Objectives

1. Recognize:
    a. factors putting you at risk for sleepiness
    b. sleep loss' impact on your professional/personal life
    c. sleepiness symptoms
    d. common misconceptions about sleep/sleep loss
2. Develop personal/program alertness strategies.

I. Background; Sleep

- What is the basic human behavior “Sleep”?

Clinical Sleep

- “In its simplest/most positive terms, sleep is a desired state of unconsciousness.”
  - **The AASM Manual for the Scoring of Sleep and Associated Events: 2007**

Clinical Sleep

- **Is sleep required for living?**

Clinical Sleep

- **Yes!**
- Rechtschaffen A, et al. Physiological correlates of prolonged sleep deprivation in rats. **Science 1983**:4606 (221);182-184.
  - Stimuli severely reduced sleep in rats; experimental rats died (controls did not).

Clinical Sleep

- What factors make humans sleepy?

Clinical Sleep

- Sleepiness; regulated by 2 major factors:
  - 1. **HOMEOSTATIC**
  - 2. **CIRCADIAN RHYTHMS**

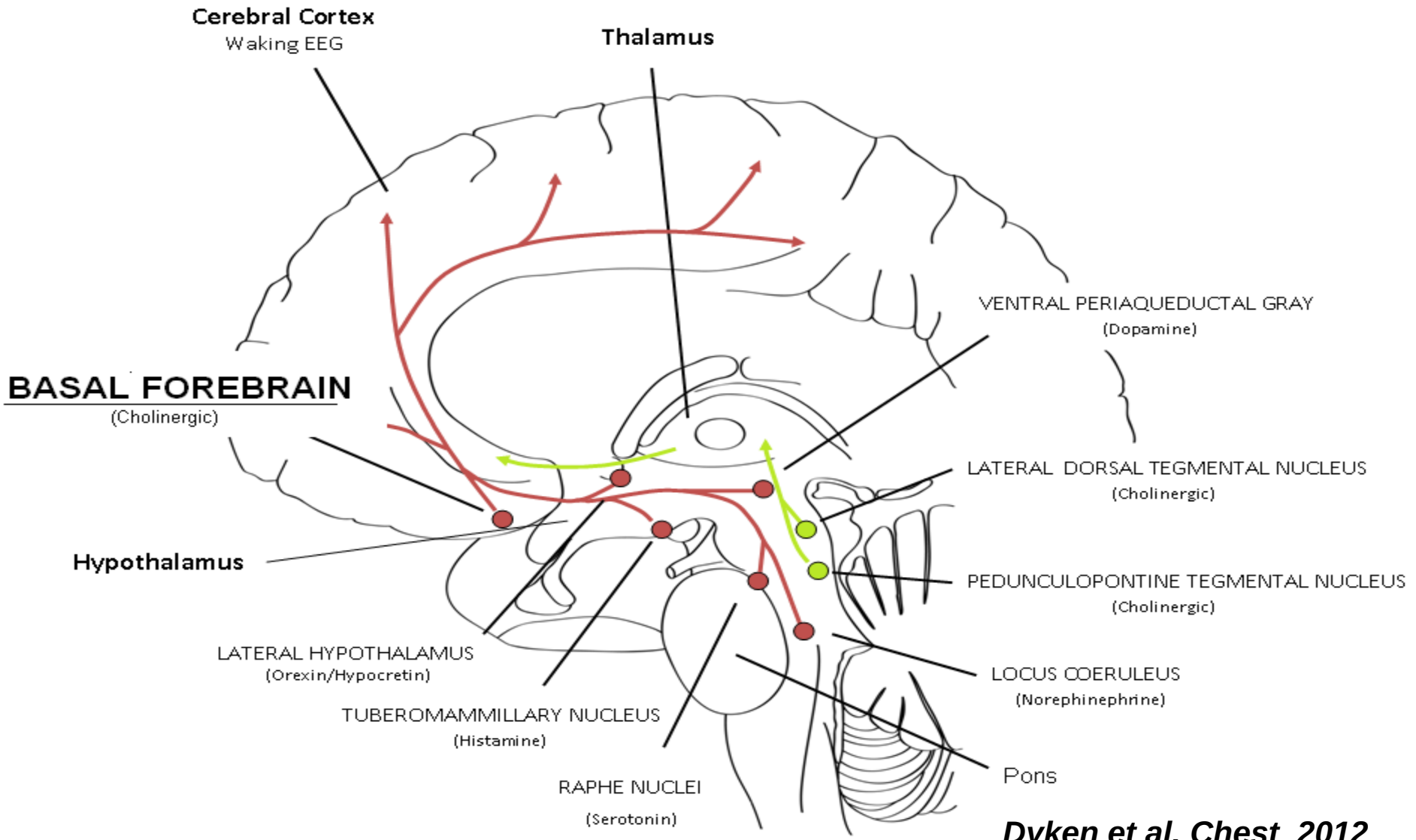
1. Homeostatic Sleep Regulation

- **SLEEP HOMEOSTASIS**
  - Dependent on mechanisms that;
  - “-augment sleep propensity when sleep is curtailed ---”.
    - Borbély AA. Elsevier; 1980:151-161.

Homeostatic Sleep Regulation

- Homeostatic effects on basal forebrain (BF)
  (nucleus accumbens/basalis, diagonal band Broca, substantia inominata, medial septal nuclei)
- ATP; broken down during day
  - **Adenosine** acts on BF neurons
    - Inhibits ACH release
    - causes sleepiness

WAKEFULNESS



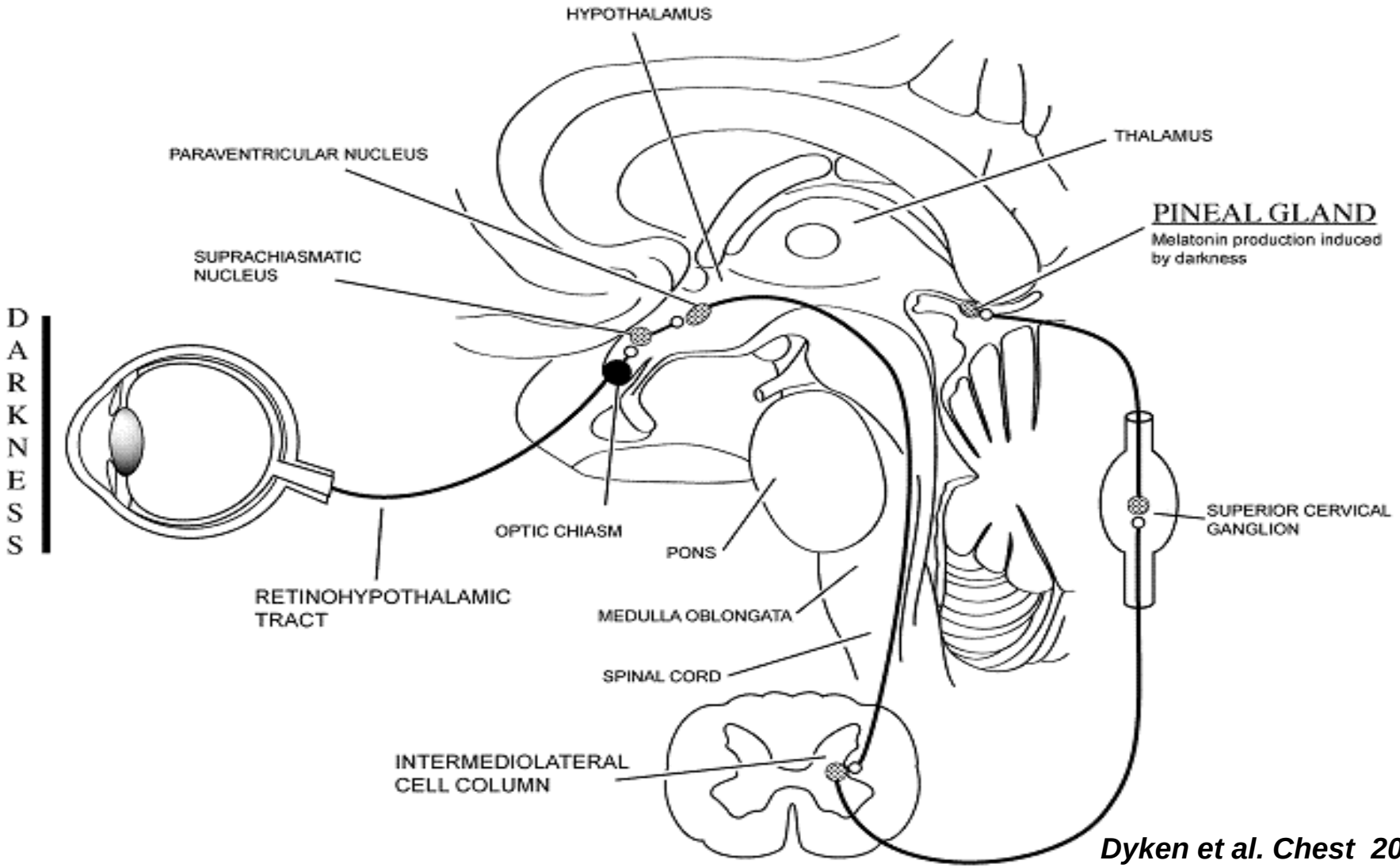
Dyken et al. Chest 2012

2. Circadian Sleep Regulation

- **Circadian rhythm (CR)**
- Biological process with entrainable 24-hr oscillation
  - driven by brain circadian clock (**Suprachiasmatic Nucleus [SCN]**)
  - adjusts (entrains) to environment external cues (zeitgebers; daylight)
    - Humans; awake in daylight, sleepy during dark (night)

Circadian Sleep Regulation

- Daylight promotes wakefulness through;
  - Retinohypothalamic tract (RHT) activation of SCN, inhibits sleep mechanisms of hypothalamic paraventricular nucleus (**PVH**).
- Darkness; (night)
  - disinhibits **PVH** to stimulate upper thoracic intermediolateral cell columns (**IML**), that excite the superior cervical ganglia (**SCG**), to induce pineal gland melatonin (sleep promoting hormone) production.



Dyken et al. Chest 2012

II. Sleepiness in Residency

- Underestimated
- Studies address this using subjective sleepiness measure; (The **Epworth Sleepiness Scale** [ESS])

Measures of Sleepiness: ESS

TABLE 1. *The Epworth sleepiness scale*

THE EPWORTH SLEEPINESS SCALE

Name: _____

Today's date: _____ Your age (years): _____

Your sex (male = M; female = F): _____

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the *most appropriate number* for each situation:

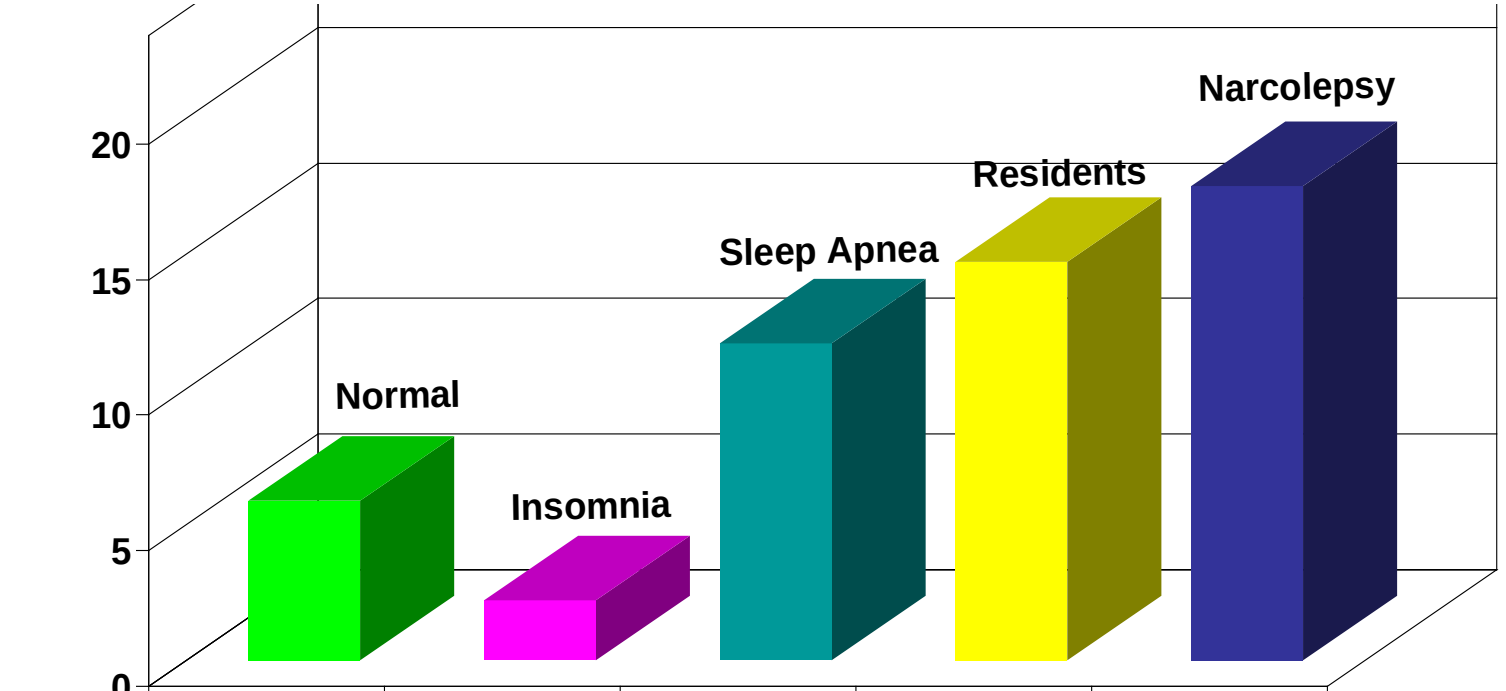
0 = would *never* doze
1 = *slight* chance of dozing
2 = *moderate* change of dozing
3 = *high* chance of dozing

Situation	Chance of dozing
Sitting and reading	
Watching TV	
Sitting, inactive in a public place (e.g. a theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in the traffic	

Thank you for your cooperation

A score ≥ 10 suggests excessive daytime sleepiness. **Johns MW.** Sleep 1991;14:540-545

Epworth Sleepiness Scale



	Normal	Insomnia	Sleep Apnea	Residents	Narcolepsy
Mean	5.90	2.20	11.70	14.70	17.50

Sleepiness in residents = that in serious sleep disorders.
Mustafa and Strohl, unpublished data. Papp, 2002

Why are residents sleepy?

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Sleep Deprivation

1. Insufficient sleep
   on call loss/inadequate recovery
2. Fragmented sleep
   phone/pages
3. Circadian Rhythm disruption
   night call/rotating shifts
4. Primary sleep disorders
   sleep apnea, etc.
   (68 diagnostic categories; ICSD; 3rd Ed, AASM, 2014)

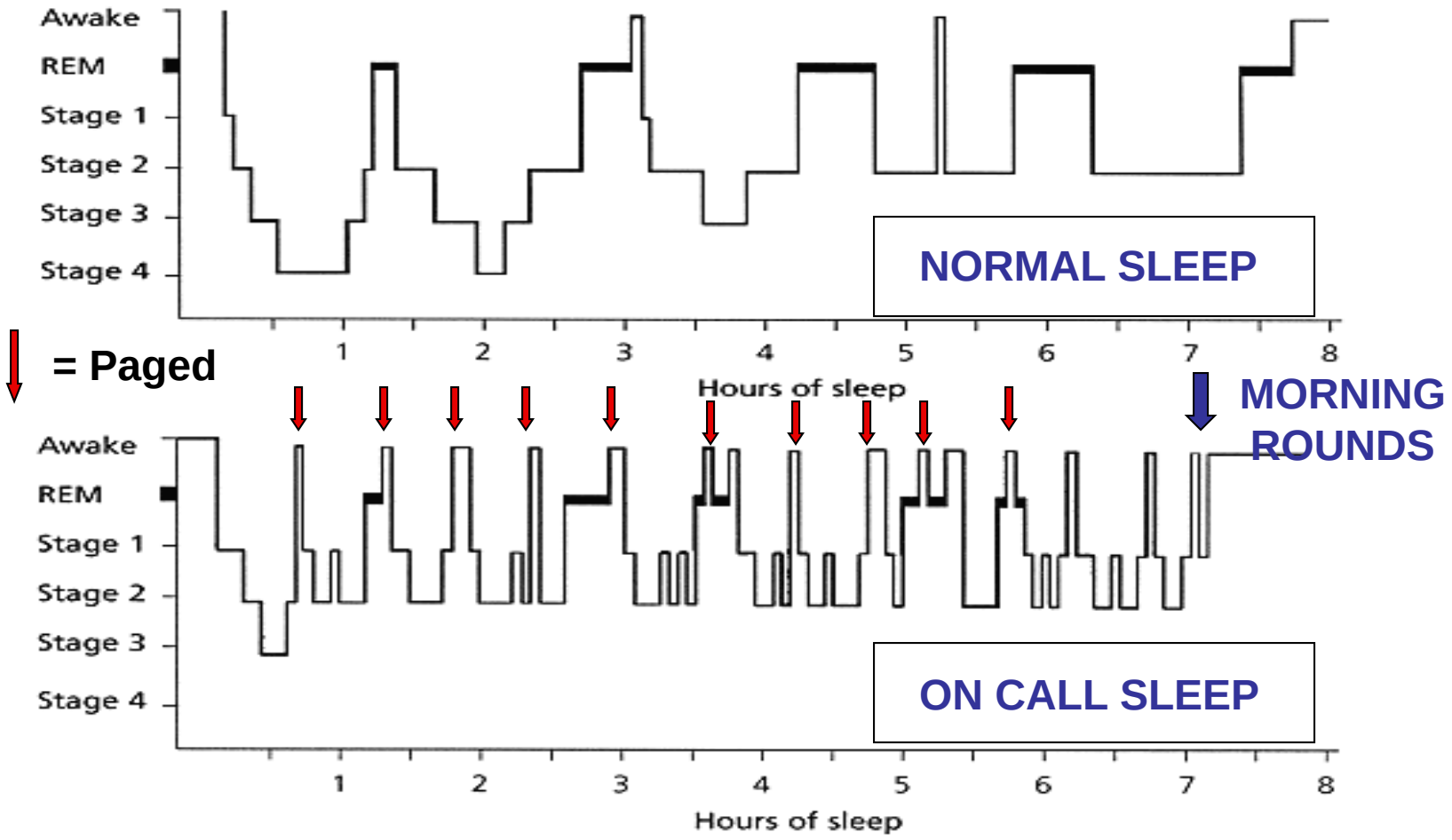
1. Insufficient sleep

- Adults; 7-9 hrs sleep; optimal
  - Genetically determined
    (We don’t adapt to sleep loss)
  - We don’t accurately judge tolerance to sleep deprivation.
  - “Sleep debts” must be paid off.

2. Fragmented sleep

- Sleepiness effects of fragmented sleep; similar to sleep deprivation.

Sleep Fragmentation Affects Sleep Quality

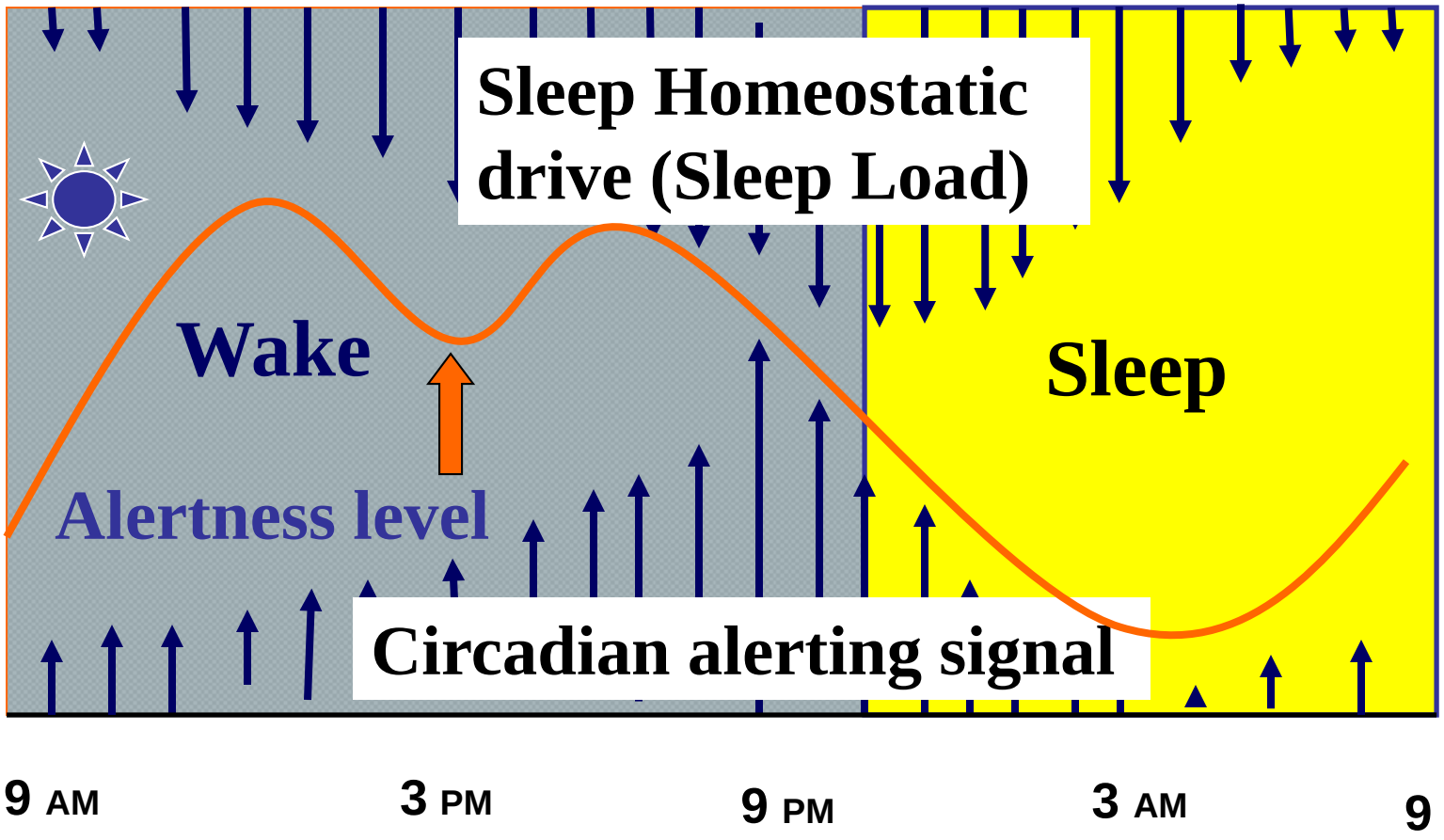


3. Circadian rhythm disruption

- Circadian demand for sleep
  - **Suprachiasmatic nucleus (SCN)**
    - circadian rhythms do not adjust instantly

      - Aschoff. Chronobiologia. 1975

Interaction of Circadian Rhythms and Sleep



Myth:

“ Boring noon conferences put me to sleep.”

Fact:

Environment unmasks;

DOES NOT CAUSE SLEEPINESS

Carbohydrate consumption/Circadian rhythms can contribute

Circadian rhythm disruption

- **Human error catastrophes**
  - parallel natural sleepiness times
    - Midnight - 6 am
    - 1 - 3 pm
    - MVAs peak; early am/mid-afternoon

      - Mitler. Sleep.11, 1988. NTSB: Safety Study, Vol 1-2, 1990. US Congr Off Tech Assess: US Gov Print Office, 1988.

4. Primary sleep disorders

1. OSA
2. RLS
3. PLMD
4. Insomnia
   a. Coronavirus Pandemic-Related Insomnia
5. Circadian Rhythm Sleep-Wake Disorders (CRSWDs)
   a. Coronavirus Pandemic-Related CRSWD
7. Parasomnias
   i. Coronavirus Pandemic-Related Nightmare disorder

Coronavirus Pandemic-Related Insomnia

- **<u>Pandemic anxiety</u>**
  Autonomic/SNS; get-up + go/"flight-or-fight" response; adrenaline

  Colin A Espie, Professor Sleep Medicine; Oxford

Coronavirus Pandemic-Related Insomnia

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- **TREATMENT**
  CDC highlights sleep in managing stress/insomnia; recommends:

- 1. Avoid excessive exposure to media coverage COVID-19.
  2. Keep healthy: relax/deep breaths, stretch, meditate, diet, exercise, sleep, avoid alcohol/drugs.
  3. Stay active/do activities you enjoy
  4. Connect with others (phone/Skype/Face-Time)
  5. Maintain “peace of mind” with hope/positive thinking/practice kindness
  6. Call PCP if needed

Coronavirus Pandemic-Related CRSWD

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- **Circadian rhythm disruption**
  - Loss of job/working remotely:
    "not getting up as early, less daylight, body clock (circadian) disruption/malaise, when "sleeping outside normal times”; disrupts normal sleep patterns with fragmented/lighter sleep.

Coronavirus Pandemic-Related CRSWD

- **Treatment**:
  Donn Posner, Stanford adjunct clinical associate professor
- 1. "routine AT/BT (more daylight)
- 2. exercise/walk outside; natural/sunlight (zeitgeber), "helps keep circadian rhythm
- 3. Don’t nap
- 4. Excess screen time, especially later in evening, blue light from screens can suppress melatonin. Wind down screen time; avoid 1-hr before bed; +/or settings/apps reduce/filter blue light.
- 5. Night; Sleep hygiene/CBTI
  (progressive relaxation/stimulus control)

Coronavirus Pandemic-Related Nightmares

- Worse in health care professionals; stress = dreams with more emotions/anxiety
- > 600 reports, ≥ 5 international research teams
- " --- may be one of the mechanisms used by the sleeping brain to induce emotional regulation."
  Perrine Ruby, researcher; the Lyon Neuroscience Research Center

Coronavirus Pandemic-Related Nightmares

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- **Stress** produces dreams similar to those triggered by psychedelic drugs which cause **serotonin release, turning off dorsal prefrontal cortex**, resulting in **“emotional disinhibition”.**
  Patrick McNamara, Associate professor of Neurology Boston University School of Medicine
- French study, 3/2020; pandemic caused 35 % increase in dream recall, and 15 % more negative dreams
- Study, Italian Association of Sleep Medicine; pandemic has led to many **nightmares and parasomnias** similar to those found in PTSD.

Coronavirus Pandemic-Related Nightmares

- Nightmares in which people process traumas follow two patterns:
  Deirdre Barrett, Assistant Professor of psychology, Harvard
  author of *The Committee of Sleep*

    1. Directly re-enact traumatic event
    2. Fantastical; symbols stand for the trauma

- In Barrett's 3/2020 sample of coronavirus dreams, subjects reported dreaming they caught or were dying from COVID-19.

Coronavirus Pandemic-Related Nightmares

- **TREATMENT**
- Finnish researchers;
- **peace of mind;** leads to a “positive dream affect”
- “negative dream affect,” results in dreams that are upsetting.
- **“Dream Mastery Techniques”;** “scripting” dreams, to how the patient wants the nightmare to be different (write it down and rehearse it before bed).

Coronavirus Pandemic-Related Sleep Disorders Summary

- Coronavirus Pandemic-Related
  - Insomnia
  - CRSWD
  - Nightmares
- *Why We Sleep (*Matthew Walker); poor/less sleep, lowers antibody response; increases infection risk.

III. Consequences of Sleep Deprivation

Sleepiness;

"an unseen threat to public health"

(danger parallels work)

- Mitler. Principals and Practice of Sleep Medicine. 1994: p 453-462.

General Consequences of Sleep Deprivation for Society

- COTA/Bureau of Labor; Statistics on Shift Work;1991:
  $ 70 billion/yr

  Tasto: Health Conseq of Shiftwork. Project URU-4426, TechnicReport, Stanford Research Institute, 1978

- Chernobyl/Three Mile Island/Exxon Valdez/Space Shuttle Challenger disasters

  The Chernobyl Accident. Wash DC, US Gov Print Off, 1986
  Three Mile Island. Ann NY Acad Sci 365:1981
  Case study: Exxon Valdez. Time, 1989

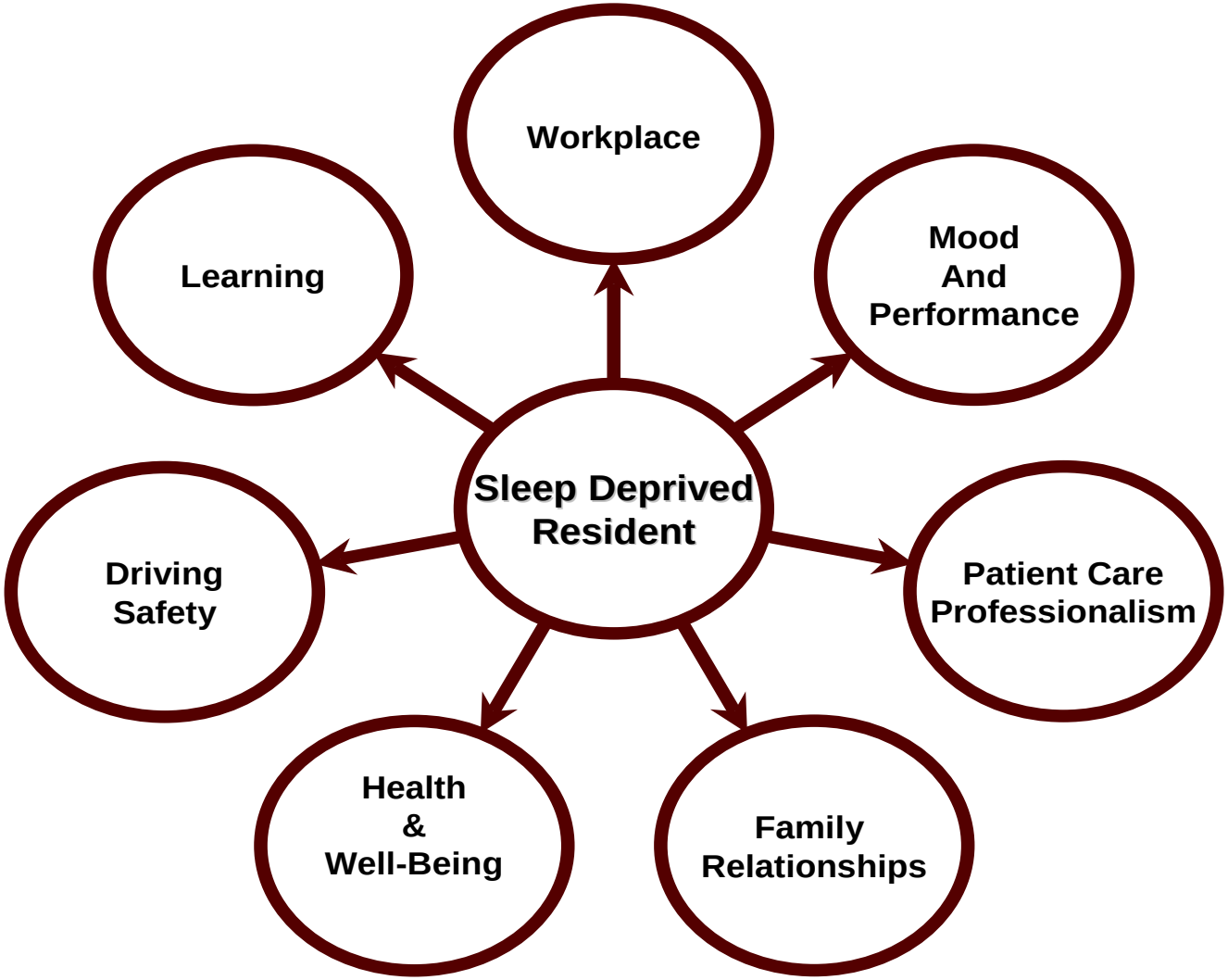
- Great Britain Study
  Sleep = 83% fatal MVAs with loss of consciousness

- U.S. DOT
  - 100,000 MVAs/year
  - 71, 000 injuries
  - 1500 fatalities
  - 12.5 billion dollars/year

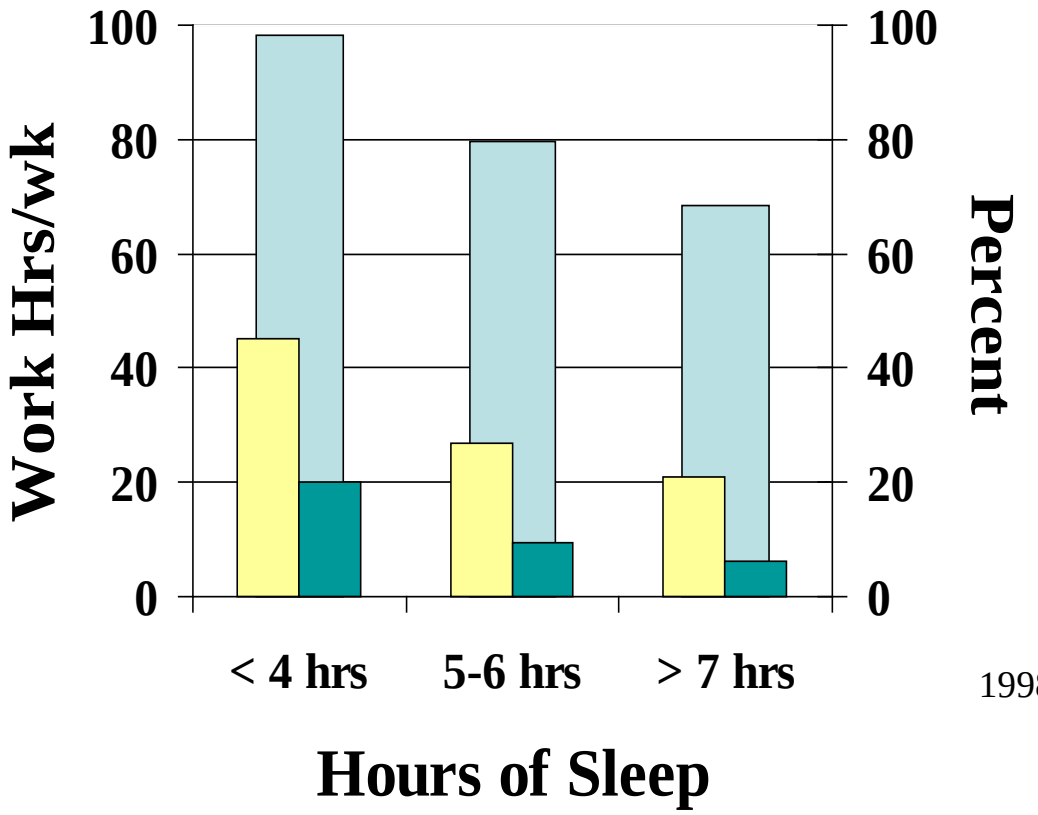
MEDICAL SLEEP-RELATED ERRORS

- **Libby Zion**
  - The Libby Zion case. NEJM, 1988
- **Surgery**
  - post-op sx complications 45% higher if resident post-call: Haynes et al, 1995
  - post-call; 20% more errors, Taffinder et al, 1998
  - sx residents; less operations if more frequent call; Sawyer et al, 1999
  - 14% more time to perform simulated laparoscopy; Grantcharov et al, 2001
- **Surveys**
  - > 60 % anesthesiologists report; Gravenstein, 1990
- **Case Reviews**:
  - 3% anesthesia incidents; Morris 2000
  - 5% “preventable incidents”
  - 10% drug errors Williamson 1993; Williamson 1993
- Internal Med: sleep-deprived interns; reduced efficiency/accuracy EKG interp; Lingenfelser et al, 1994
- Peds: sleep-deprivation; significant increased time to place intra-arterial line; Store et al, 1989
- ER Med: sleep-deprived 2nd yr residents; significant reductions in comprehensive H&P documentation: Bertram 1988
  - 58% ER residents report near-crashes, 80% post night-shift, increased with # of night shifts/month; Steele et al 1999
- Family Med: pre-test sleep; strong correlation with ABFM in-training exams ; Jacques et al 1990
  - 50% greater risk; blood-borne pathogen exposure incidents (needle-stick, lacerations) in residents between 10pm and 6am; Parks 2000
  - Residents working longer hrs report decreased satisfaction/motivation with learning; Baldwin et al 1997

Consequences for the Resident

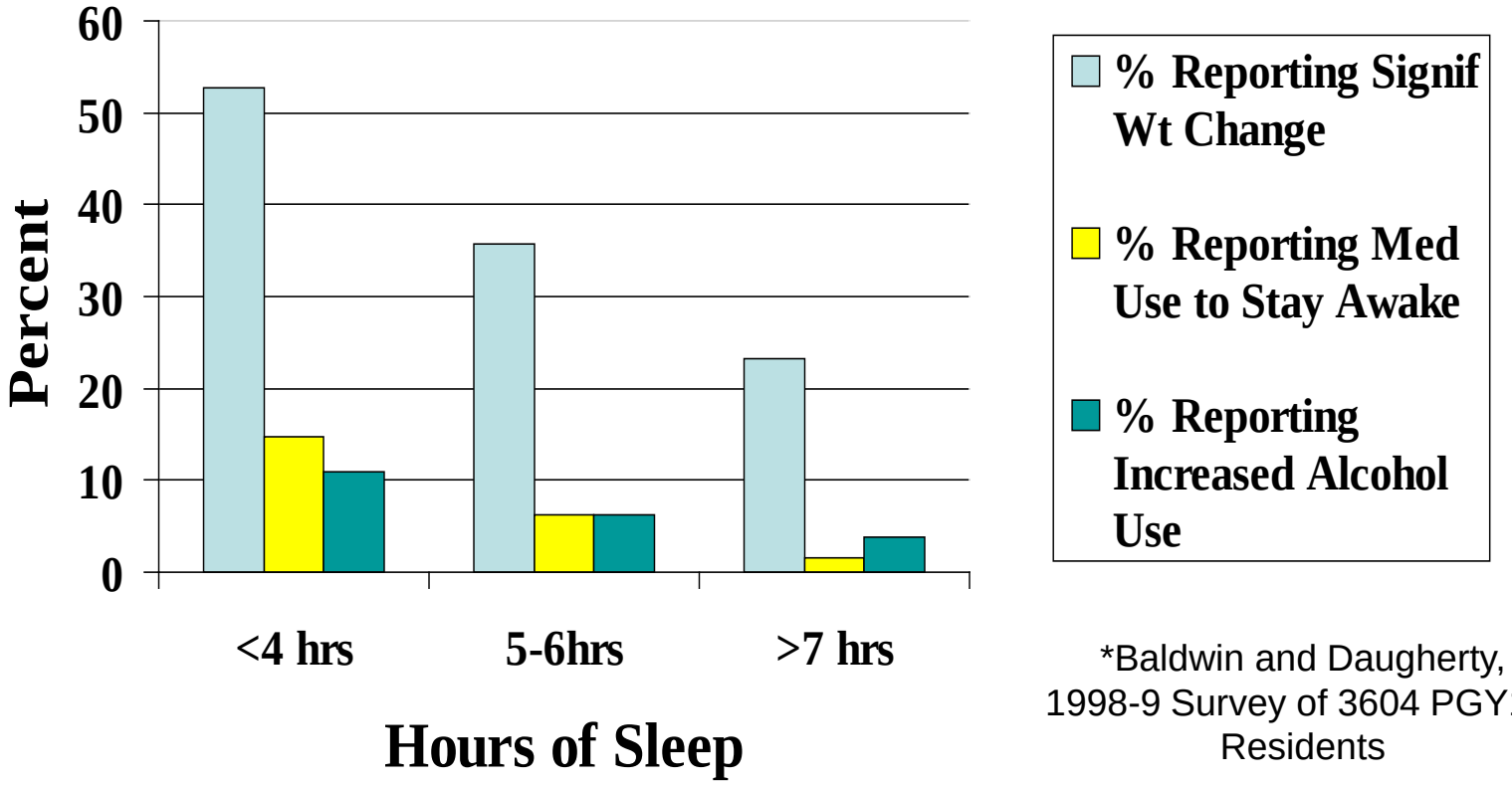


Work Hours, Medical Errors, and Workplace Conflicts by Average Daily Hours of Sleep*



*Baldwin and Daugherty, 1998-9 Survey of 3604 PGY1,2 Residents

Adverse Health Consequences by Average Daily Hours of Sleep*



*Baldwin and Daugherty, 1998-9 Survey of 3604 PGY1,2 Residents

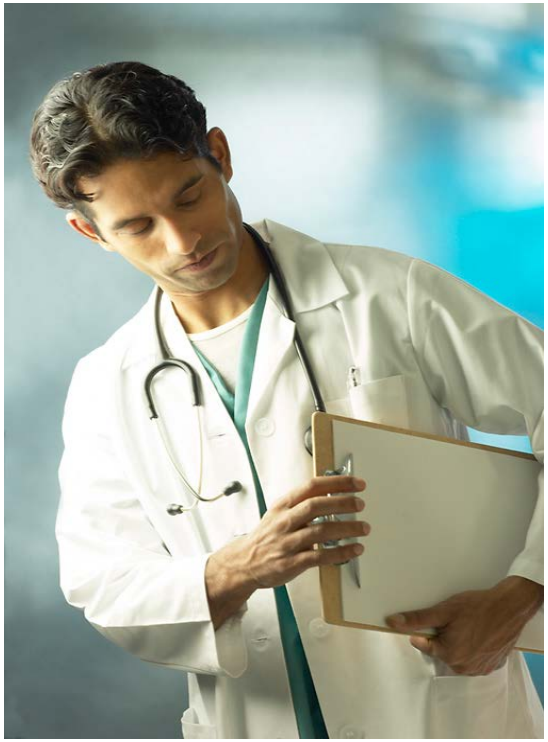
Impact on Professionalism

An ACGME Core Competency

Residents must demonstrate commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.

"Patients become the enemy…they stand between you and a few hours of sleep."

IV. Recognizing Sleepiness



- **Myth:** "If I can just get through the night (on call), I'm fine in the morning."
- **Fact:** Performance declines after 15-16 hrs continued wakefulness.
- **Fact:** Period of lowest alertness when up all night; between 6- 11am (morning rounds/driving home)

Estimating Sleepiness

Myth: "I can tell how tired I am ---
--- know when I'm not functioning ---."

Fact: Sleepy people:
underestimate sleepiness
overestimate alertness.

Fact: The sleepier/the *less accurate* impairment perceived.

Fact: You can fall asleep briefly ("microsleeps") without knowing it!

Anesthesia Resident Study

- Residents; not perceive sleep half the time they had fallen asleep.
- Residents wrong 76% of time when reporting having stayed awake.

Howard et al 2002

Warning Signs of Sleepiness

- Falling asleep (conferences/rounds)
- Feeling restless/irritable
- Having to check work repeatedly
- Having difficulty focusing on patient care
- Feeling you don’t care

V. Alertness Management Strategies

To Survive Night Float

- **Routine adequate (7-9 hrs) sleep** before anticipated sleep loss; Start out without deficit!
- **Routine Good Sleep Hygiene**
  - **Cognitive Behavioral Techniques** (CBT)
    - cognitive
    - sleep restriction
    - stimulus control
    - relaxation therapies
- **Naps**

Routine Good Sleep Hygiene

- Routine bed/waking time (protect sleep time)
- Positive pre-sleep routine/Relax
- Sleeping environment (?):
  - Cooler
  - Dark (eye/room shades)
  - Quiet
    - turn off phone/pager
    - ear plugs/white noise machine
- Avoid bedtime hunger; no heavy meals within 3 hrs of sleep
- Regular exercise; avoid heavy exercise within 3 hrs of sleep

NAPS

Pros: temporarily improves alertness

Types: preventative (pre-call)

operational (on the job)

Length: short naps: ≤ 30 mins;

avoid sleep inertia (waking from N3 [SWS])

Timing: -- circadian "windows of opportunity";

(2-5 am/2-5 pm)

Bottom line: naps take off edge; not replace adequate sleep

On Call Sleepiness

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CAFFEINE

Adenosine receptor antagonist

Effects; 15 – 30 mins; half-life 3-7 hrs

Cons:

- disrupts subsequent sleep
- tolerance
- diuretic

On Call Sleepiness

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BRIGHT LIGHT THERAPY

Sleep diary; monitor sleepiest hours
5 K-10 K lux of illuminance; 30-40 mins
melatonin suppression

Glickman et al. J Biol Rhythms 2003

HORNE-OSTBERG QUESTIONNAIRE

SUBJECT CODE:_____ **DATE:**_____

QUESTION 1
Considering your own feelings, at what time would you get up if you were entirely free to plan your day?

Time: .....

QUESTION 2
Considering only your own feelings, at what time would you go to bed if you were entirely free to plan your day?
Time: .....

QUESTION 3
If there is a specific time you have to get up in the morning, to what extent are you dependent on being woken up by an alarm clock?

a. Not at all dependent [ ]
b. Slightly dependent [ ]
c. Fairly dependent [ ]
d. Very dependent [ ]

INSTRUCTIONS
a) Please read each question very carefully before answering.
b) Answer all questions.
c) Answer questions in numerical order.
d) Each question should be answered independently of others. Do **NOT** go back and check your answers.
e) For some questions, you are required to respond by placing a cross alongside your answer. In such cases, select **ONE** answer only.
f) Please answer each question as honestly as possible. Both your answers and results will be kept in strict confidence.

QUESTION 4
Assuming adequate environmental conditions, how easy do you find getting up in the morning?

a. Not at all easy [ ]
b. Slightly easy [ ]
c. Fairly easy [ ]
d. Very easy [ ]

QUESTION 5
How alert do you feel during the first half hour after having woken in the morning?

a. Not at all alert [ ]
b. Slightly alert [ ]
c. Fairly alert [ ]
d. Very alert [ ]

QUESTION 6
How is your appetite during the first half hour after having woken in the morning?

a. Not at all good [ ]
b. Slightly good [ ]
c. Fairly good [ ]
d. Very good [ ]

QUESTION 7
During the first half hour after having woken in the morning, how tired do you feel?

a. Very tired [ ]
b. Slightly tired [ ]
c. Fairly refreshed [ ]
d. Very refreshed [ ]

Adapting To Night Shifts

- **Myth:** "I get used to night shifts right away."
- **Fact:** It takes at least a wk for circadian rhythms and sleep patterns to adjust.
- **Fact:** Adjustment often includes physical and mental symptoms (jet lag).
- **Fact:** Direction of shift rotation affects adaptation
  (forward/clockwise easier to adapt)

End of Call; Driving Home

- Avoid driving drowsy
- Get transportation home
  (UIHC cab service)
- Coffee, follow by 20-30 min nap (alarm); before going home post-call
- Stop driving at safe place/take short nap
- Bright light exposure

Approved by GMEC 11/11/2011

UNIVERSITY OF IOWA HOSPITALS AND CLINICS
GME POLICY ON TAXI TRANSPORTATION FOR HOUSE STAFF

The University of Iowa Hospitals and Clinics (UIHC) and its Graduate Medical Education Committee (GMEC) provide safe transportation for our resident and fellow physicians who either do not have access to call rooms or who are too fatigued to return safely home. Funding for eligible taxi rides is provided by UIHC through the GME budget.

The following process must be followed:

 The house staff member must place the call for a taxi ride when he/she is immediately ready to leave the premises.

 The house staff member who called for the ride must be the only passenger in the cab.

 The cab company must be a local cab company:

– In the Iowa City/Coralville area:

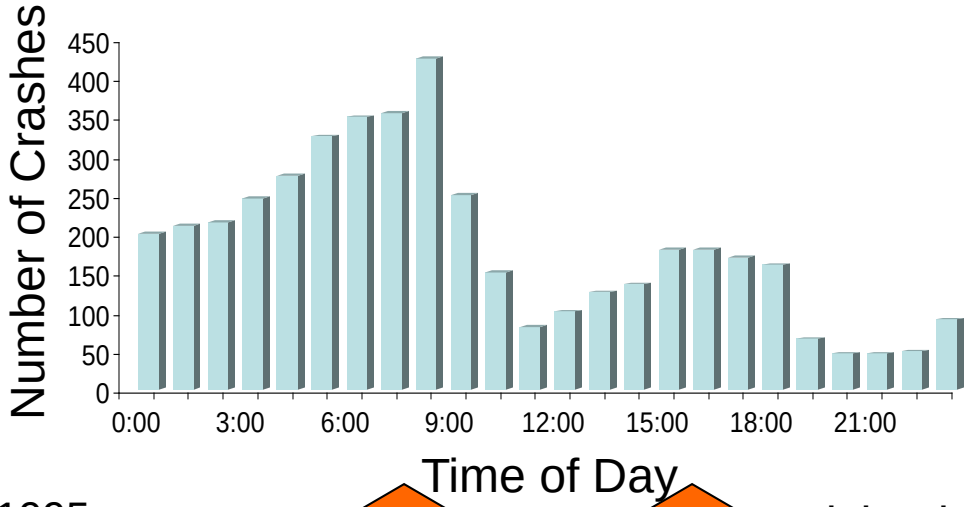
1. Call Yellow Cab Company at 319/338-9777
(a special contract to serve GME needs exists with Yellow Cab Company).
2. Request to be picked up at a specified location at UIHC or VAMC.
3. Show the driver the resident or fellow physician's UIHC identification badge (that reads "Resident Physician," "Fellow Physician," or "Resident Dentist"). GME will be charged for the ride; cash payments are not necessary.
4. The destination of the taxi ride must be the house staff member's local home as listed in his/her MedHub records (taxi rides to a parked car or return taxi rides to site of origination are not provided by this policy).

– For the limited number of house staff members who are scheduled for required rotations outside of Iowa City:

1. Call a cab company local to the community.
2. Pay the cab directly for the fare and request a receipt.
3. Bring the receipt to the GME Office within 30 days and before the expiration of the resident/fellow's GME contract.
4. The destination of the taxi ride must be the local apartment or housing of that external site.

Risk Factors for Drowsy Driving

- Sedatives; even small amounts alcohol
- Sleep disorders (sleep apnea)
- Driving
  - long distances without breaks
  - alone
  - boring road



Pack et al 1995

Driving home post-call

Recovery from Sleep Loss

Myth: "All I need is 5 to 6 hrs the night after call and I'm fine."

Fact: Recovery from sleep loss; 2 nights extended sleep to restore baseline alertness.

Fact: Recovery sleep; greater deep/N3/SWS (counters effects of sleep loss)

Drugs

- **Melatonin:** little data in residents
- **Hypnotics:** may be helpful in *specific* situations (persistent insomnia)
- **AVOID:** stimulants
- **AVOID:** alcohol;
  induces sleep onset, disrupts sleep continuity

Summary

- Sleepiness
  - an impairment
  - cannot be eliminated; can be managed
    - Recognition/alertness management strategies
  - when it interferes with performance/health, talk to your supervisors/program director
  - Management; a shared responsibility through a “culture of support” in training programs.

“Patients have a right to expect a healthy, alert, responsible, and responsive physician.”

January 1994 statement by American College of Surgeons

Re-approved and re-issued June 2002

Learning Objectives

1. Recognize:

    a. factors putting you at risk for sleepiness
    b. sleep loss' impact on your professional/personal life
    c. sleepiness symptoms
    d. common misconceptions about sleep/sleep loss

2. Develop personal/program alertness strategies.
    - No "magic bullets"
    - Know your own vulnerability to sleep loss.
    - Learn what works for you from a range of strategies.