Work Schedule & Work-related Fatigue - Reflections on the Future of Nursing IOM Report & Research about Sleep & Fatigue

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Outline

1. Sleep & fatigue in nurses
2. Negative impacts to employers
3. Basic sleep & fatigue physiology
4. Problems linked to shift work, long work hours
5. Strategies to reduce risks
ANA respondents reported “stress & overwork” – top area of concern

(ANA 2011 Health & Safety Survey)
Trends
U.S. Healthcare Industry Sector

Sleep ≤ 6 hours per day

1985 & 1990 28%
2004 – 07 32%

( Luckhaupt, Tak, Calvert, 2010)
52% night healthcare workers reported ≤ 6 hours sleep per day

(Luckhaupt, 2012)
50 - 70 million Americans have chronic sleep disorders or intermittent sleep problems

(Colten & Altevogt, 2006)
Other Factors Why Not Getting Enough Sleep

• Shift work, long work hours
• Economic & social pressures
• Lots to do
• Do not know importance of sleep
Shift Work, Long Work Hours

- Disrupt Circadian Rhythms
- Disturb Sleep
- Disturb Family & Social Life

- Worker
- Family
- Employer
- Community
Long Hours $\rightarrow$ shorter sleep & sleep disturbances

(Hayashi et al. 1996; Kageyama et al. 1998; Park et al. 2001; Nakanishi et al. 1999; Sasaki et al. 1999; Sasaki et al. 1999)
Shift work → Shorter Sleep & Sleep Disturbances

long-term insomnia, excessive sleepiness
32% night workers
26% rotating workers
(Drake et al. 2005)

↓ sleep length: nights, rotating shifts
(Pilcher et al. 2000)
Estimated Fatigue-Related Productivity Losses a Year

$116.5 billion for U.S.

$2,000 - $10,000 per employee

(Moore-Ede, 2011; Rosekind et al. 2010; Sirois, 2007)
Impacts to Employer

↓ productivity

↑ worker errors

↑ absenteeism

↑ turnover - failure to retain skilled nurses

↑ costs for healthcare & worker’s comp.

↑ early disability

(Hanna et al., 2005; Landrigan et al., 2004; Rogers et al., 2004; Thomas & Raynar, 1997;)
Long Work Hours in Nurses Linked to Patient Care Errors

> 13 hour shifts → ↑ patient dissatisfaction; doubled burnout & job dissatisfaction

≥ 12 hour shifts → ↑ 2-3 X risk for care errors

> 40 hours / week → ↑ care errors by 46%

Long work hours, etc → ↑ patient mortality

(Stimpfel et al., 2012; Rogers et al, 2004; Scott et al., 2006; Trinkoff et al. 2011)
Impacts to Community

• Medical errors (Landrigan et al. 2004; Rogers et al. 2004)

• Automobile crashes 20% due to drowsy driving (Connor et al., 2002; Horne & Reyner, 1995)
10% of nurses reported crash due to fatigue/shift work

(ANA 2011 Health & Safety Survey)
Impacts to Community (Continued)

• Industrial disasters (Mitler et al. 1988; Folkard & Lombardi 2006)

• Loss of nurses due to demanding work hours (Peter Hart Associates 2001)

• Other effects? Voting? Costs of public assistance & health insurance due to early disability?
Possible Legal Consequences

(State v. S Robb, 2005; M Jacobs, 2010; Marthe, 1999)
Fatigue One Factor

Medication error

Death of Young Mother

(Smetzer et al. 2010; Wisconsin Department of Regulation & Licensing, 2006)
Bureau of Labor Statistics - 2011
Nonfatal Occupational Injury & Illness
Number of Cases/100 FTE requiring days away from work

3.5  All US Private Industry

1)  5.5  Agriculture Forestry Fishing Hunting
2)  5.0  Transportation & Warehousing
     5.0  Healthcare Social Assistance
         ▪ 6.8  Hospitals
         ▪ 7.8  Nursing & residential care

(www.bls.gov/news.release/archives/osh_10252012.pdf  Table 1)
Hazards in Healthcare Work Environment

- Life threatening infectious organisms
- Chemicals
- Lifting & repetitive tasks
- Psychological hazards - stress
- Workplace violence
- Shift work, long work hours
- Suboptimal organization of work

(NORA Healthcare and Social Assistance Sector Council, 2009)
Adequate sleep can help reduce risks from these hazards
Basics on
Sleep
Circadian Rhythms
Fatigue
Sleep - important for life & health

(Everson, 2009)
During sleep, brain & body are busy getting us ready for a new day.

(National Heart, Lung, and Blood Institute. , 2011)
Forming memories

(National Heart, Lung, and Blood Institute, 2011)
Immune system is active

(National Heart, Lung, and Blood Institute. , 2011)
Gives our heart a rest -
Heart rate & blood pressure ↓ 10%

(National Heart, Lung, and Blood Institute, 2011)
Understand our sleep system
Awake – low voltage – random, fast

Delta Sleep – \( \frac{1}{2} \) to 2 cps – delta waves > 75 \( \mu \)V
REM – rapid eye movement sleep

Non-REM – sleep stages 1, 2, 3, 4
Figure 4. A typical hypnogram from a young, healthy adult. Light-gray areas represent non-rapid eye movement (NREM) sleep.
What determines times of sleep

2 process model:

1. Build-up of sleep pressure
2. Circadian clock in the brain

(Scheer & Shea 2009)
1. Build-up of Sleep Pressure
2. Suprachiasmatic Nuclei – circadian clock

Light signals to back of eye
Wakefulness Rhythm Driven by Circadian Clock

Wakefulness

Awake 11pm Sleep 7am Awake
1. Sleep Pressure &
2. Circadian Clock
Work Together
Difficult to –
sleep during daytime,
work at night
sleep pressure

wakefulness

evening boost in wakefulness

nap

wakefulness

sleep pressure

mid-afternoon dip

noon 6 PM
Sleep Duration

- Individual inherited trait
- Most adults need 7 – 9 hours
- Few need ≤ 6 or > 9 hours

(Epstein, 2007; Luyster et al., 2012; National Sleep Foundation)
Good sleep quality needed to fulfill need for sleep
- not interrupted by frequent arousals or awakenings
Sleep Debt

For example:

sleep need  slept  sleep debt
8 hours  -  6 hours  =  2 hours

5 days x 2 hours = 10 hours sleep debt
Microsleeps

Short episodes of sleep a few seconds long

(Goel et al., 2009)
DANGER!
Transition from Wake to Sleep

ON / OFF
Switch
in the brain

(Awake
Sleep)

(Schwartz and Roth, 2008)
Know Warning Signs – Sleep Is Imminent

- Difficulty focusing, frequent blinking, heavy eyelids
- Daydreaming, wandering/disconnected thoughts
- Yawning repeatedly or rubbing your eyes
- Trouble keeping your head up
- Feeling restless & irritable

(www.drowsydriving.org)
Without Enough Sleep

• Reduce performance - slower to react
• Less able to learn
• Impaired ability to make decisions
• Risky behavior ↑

(Goel et al., 2009)
Impairs Performance Similar to Alcohol Intoxication

17 hours awake
similar to
BAC 0.05%

24 hours awake
similar to
BAC 0.10%

(Dawson & Reid, 1997; Williamson & Feyer, 2000; Falleti et al. 2003; Arendt et al. 2005; Howard et al., 2007; Yegneswaran & Shapiro, 2007; Elmenhorst et al., 2009)
Critical Misconceptions About Ability to Overcome Poor Performance Due to Sleep Loss

I can recognize own poor performance. Did Not

My experience with sleep loss, motivation, & professionalism help. NO EVIDENCE

(Arendt et al., 2005; Van Dongen et al., 2003)
3 Factors Increase Fatigue-Related Risks

1. Time of day – dip in alertness due to circadian rhythms
   • 2 AM to 6 AM
   • 12 AM to 2 AM
   • 2 PM to 5 PM
2. Time awake – sleep debt
3. Time on task - monotonous tasks

(Wesensten, et al., 2004)
Fatigue One Factor

↓

Medication error

↓

Death of Young Mother

(Smetzer et al. 2010; Wisconsin Department of Regulation & Licensing, 2006)
Performance When Sleep Deprived

- Individual differences
- Inherited trait
- Researchers are looking at genes
- Small percent of people are more resistant

(Van Dongen & Belenky, 2009)
Relative Risk of Incidents – 5 Studies

(adapted from Folkard & Lombardi, 2006)
Injury Risk - Work Hours

Folkard & Lombardi (2006) 4 studies
- 10-hr shifts $\uparrow$ risk 13%
- 12-hr shifts $\uparrow$ risk 28%

Dembe et al. (2005) possible dose response - work hours $\uparrow$, injury rate $\uparrow$
Estimated Risk of Incidents 48-h Shifts

(adapted from Folkard & Lombardi, 2006)
Negative Impacts on Other Body Systems
• immune system less able to fight pathogens

• insulin blood sugar system disrupted

• appetite hormones off balance → overeat

(Van Cauter & Speigel, 1999)
Obesity Linked to Poor Sleep

Studies of

• Short sleepers
• Shift workers
• Long work hours

(Antunes, 2010; Nakamura, 1998; Shields, 1999)
Negative Health Behaviors

Smoking
Decrease physical activity

not all studies report significant findings

(Bushnell et al., 2010; Nakamura et al. 1998; Shields 1999; Trinkoff & Storr 1998)
Diseases Linked to Shift Work
Gastrointestinal Complaints & Disorders

(Caruso et al. 2004; Knutsson & Boggild, 2010)
Psychological Complaints: mood, personality, personal relationships

(Rohr et al. 2003)
Cardiovascular Disease

Epidemiologic support possible but could be explained by chance, bias, confounding

Evidence for metabolic disturbance, ↑ smoking

(Frost, et al., 2009; Puttonen et al., 2010)
Cancer

Shift work with circadian disruption “probable carcinogen”

2007 - Agency for Research on Cancer, WHO

(Straif et al., 2007)
Breast Cancer

Meta-analysis 13 studies
(Megdal et al. 2005)

Night work combined estimate 1.48 (CI 1.4 – 1.6)

(additional reference Bonde et al., 2012)
Spontaneous Abortion, Preterm Birth, Reduced Fertility in Women

Shift work associated with modest increase

(Frazier & Grainger 2003)
Menstrual Cycle Symptoms

• ↑ visits for complaints
• Cycle shorter, longer, or irregular

(Shechter et al., 2008)
May Exacerbate

Heart disease  Hypertension medication
Sleep disorder  Diabetes M. with insulin
Epilepsy  Asthma medication
Psychiatric Meds circadian changes
Alcohol drug abuse
GI disorders

(Sood 2003)
About 20% seem unable to adjust to shift work

(Harrington, 2001)
Risks Linked to Long Work Hours

Fewer Studies but recently number is growing
Fatigue
Poor Mood
Poor Recovery from Work

(Hayashi et al. 1996; Iwasaki et al. 1998; Proctor et al. 1996; Sasaki et al. 1999; van der Hulst et al. 2006)
Musculoskeletal Disorders

8 studies with control for physical demands report MSD

(Caruso & Waters, 2008)
Disrupt Circadian Rhythms
Disturb Sleep
Disturb Family & Social Life

Family
Employer
Community
Impacts to Families

• Delay marriage, childbearing (Jacobs, 2004)

• Divorce: night work - men ↑ 6 fold; women ↑ 3 fold (Presser, 2000)

• ↑ risk for obesity in children (Phipps et al. 2006)

• ↑ risk for work/family conflict (Carlson & Perrewé 1999; Greenhaus et al. 1987)
Conclusion

Be aware of possible broad negative impacts
Demanding Schedules

Night, evening, rotating shifts
Long shifts
Long hours per week

Combining demanding patterns ↑ risks for example: 12-hour night shifts
Combining demanding schedules with other hazards?

Chemicals, infectious agents, stress, etc.
Healthcare Social Assistance

Sector with 2\textsuperscript{nd} highest rate of nonfatal occupational injury & illness

(www.bls.gov/news.release/archives/osh_10252012.pdf Table 1)
Strategies to Reduce Risks
Nurses & their Managers share in the responsibility for reducing risks.
Shift Work, Long Work Hours

- Disrupt Circadian Rhythms
- Disturb Sleep
- Disturb Family & Social Life

- Worker
- Family
- Employer
- Community
Make sleep a priority
Science-based, 10-year national objectives for improving the health of all Americans

www.healthypeople.gov/2020/default.aspx
Healthy People 2020
Sleep Health Objectives

1. ↑ Proportion of adults who sleep 7 or more hours each day

2. ↑ Proportion of persons with symptoms of obstructive sleep apnea who seek medical evaluation

3. ↓ Rate of vehicular crashes due to drowsy driving

Other Organizational Efforts

• Page, Institute of Medicine. (2004). “Keeping patients safe: Transforming the work environment of nurses”

• The Joint Commission Alert (2011) “Health care worker fatigue & patient safety”

• The Joint Commission (2012) “Improving Patient & Worker Safety”
Hours of Service Regulations for Transportation & Nuclear Plants
Fatigue Risk Management Systems

1. management policy
2. risk management
3. reporting system for employees
4. incident investigation
5. training
6. sleep disorder management
7. corrective actions, continuous improvement

(Lerman, Flower, Gerson & Hursh 2012)
Strategies for Nursing Managers

- Improve schedules
- Workload
- Environment
- Supervisor coworker support
- Healthcare & counseling
- Workplace culture, policies
Improving Work Schedules

• Plan regular rest – at minimum, 10 hours off between shifts
• Consider workload when determining shift lengths
• Plan 1 or 2 full days off after five 8-hour shifts or three 12-hour shifts
• See book chapter for more suggestions
Overtime vs. Additional Staff
Frequency of Rest Breaks on Risk for Errors in 60-Hour Work Weeks

(adopted from Folkard & Lombardi, 2006)
Strategies for Nursing Managers

- Improve schedules
- Workload
- Environment
- Supervisor coworker support
- Healthcare & counseling
- Workplace culture, policies
Strategies for Nurses

- Behaviors to maximize sleep
- Behaviors to increase alertness
  - Family and social management
  - Recognize health problems & get treatment
Strategies for Nurses

Good sleep practices – improve sleep
Good Sleep Environment - Improves Sleep

- Very dark
- Quiet
- Cool temperature
- Comfortable mattress & pillows
Preparing yourself for sleep - improves sleep
Sleep Tips

Sleep disorders

Getting help

(National Heart, Lung, and Blood Institute, 2011)
Correct Pain & Other Causes of Poor Sleep
Sleep Disorders – Diagnose & Treat
See healthcare provider if spend enough time in bed but -

- consistently take > 30 min. to fall asleep
- consistently awaken more than a few times or for long periods of time each night
- take frequent naps each day
- often feel sleepy during the day

(National Heart, Lung, and Blood Institute, 2011)
Sleep & Age

• Teens & young adults:
  – better able to sleep at different times
  – tend to need to sleep longer
  – poor sleep → ↑ declines in performance

• Insomnia problems increase with age

• Nurses may have more difficulties with shift work as they age

(Czeisler, 2009; Duffy 2003; National Sleep Foundation, 2007)
Address Other Sources of Sleepiness

• Other illnesses

• Medications - sleepiness side effect - some antidepressants, antihistamines, sleep meds
* Caution *

**Use of Substances**

- Use behavioral strategies fully
- Stimulants & sleep meds can have side effects & can become addictive
- Do not completely remedy effects of sleep deprivation
- Effects of long-term use are not fully known

(Caldwell & Caldwell 2005)
Sleep experts recommend planned naps before & during night shifts.

(Morgenthaler et al. 2007)
15 – 20 minute nap can help!

(Driskell & Mullen, 2005)
Caffeine

- Takes about 30 minutes to take effect
- Notice how caffeine affects your body
- Heavy use every day may reduce effectiveness
- Use strategically
Combine Benefits of Short Nap & Caffeine

(http://drowsydriving.org/)
Strategies for Nurses

- Behaviors to maximize sleep
- Behaviors to increase alertness
- Family & social management
- Recognize health problems & get treatment
New NIOSH Resources

Will be released soon
NIOSH online training for nurses & managers

Will be available on the NIOSH internet
Content

• Short video with testimonials
• 11 evidence-based modules
• Interactive quizzes
• Self-help tools
• Resources for more information
WORK SCHEDULES: SHIFT WORK AND LONG WORK HOURS

According to 2004 data from the Bureau of Labor Statistics, almost 15 million Americans work full time on evening shift, night shift, rotating shifts, or other employer arranged irregular schedules. The International Labor Office in 2003 reports that working hours in the United States exceed Japan and most of western Europe. Both shift work and long work hours have been associated with health and safety risks. This page provides links to NIOSH publications and other resources that address demanding work schedules.

NIOSHHTC-2 Search

NIOSHHTC-2 is a searchable bibliographic database of occupational safety and health publications, documents, grant reports, and journal articles supported in whole or in part by NIOSH.

NIOSHHTC-2 search results on work schedules

NIOSH Publications and Guidance

On this Page
• NIOSHHTC-2 Search
• NIOSH Publications and Guidance
• Conferences
• Past NIOSH-Sponsored Events
• Some Strategies Suggested for Coping with Shift Work

http://www.cdc.gov/niosh/topics/workschedules/
Review Major Points

• Inadequate sleep – common in nurses
• Shift work, long hours → many health & safety risks, ↓ productivity, ↑ errors
• Sleep & fatigue physiology → strategies
• Nurses, managers, employers share in responsibility of reducing these risks
Sleep is a need for life & health – not a luxury!

Make sleep a priority when organizing the schedules & work
Thank You
For Your Interest!

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