Shiftwork Sleep Disorder: The Role of the Nurse
Understanding SWSD for You and Your Patients

Welcome
Cathy Rick, RN PhD (h), NEA-BC, FAAN, FACHE
Chief Nursing Officer (10A1)
Department of Veterans Affairs
Outline

• Circadian Rhythm Sleep Disorders
  – Phase delay syndrome (teenager)
  – Phase advance syndrome (elders)

• Shift Work Sleep Disorder
  – Prevalence
  – Symptoms
  – Risk factors
  – Occupations at risk
  – Effects of type of shift schedule
  – Job satisfaction
  – Individual differences
Circadian Preference - Chronotype

- Morningness – Lark
  - Phase advance syndrome (elderly)
- Eveningness – Owl
  - Phase delay syndrome (teenager)
- Desynchronosis: chronotype out of phase with lifestyle or environment
  - Jet lag
  - Night shift

Light, the Pineal Gland, and Melatonin
Circadian Rhythm Sleep Disorders

- Restless Legs Syndrome (RLS) – evening symptoms in relation to circadian rhythms for dopamine and iron metabolism
- REM sleep disorders and REM paralysis
- Phase Advance Syndrome (early acrophase peak)
  - Short sleeper, elders, <24 hr rhythm
  - Earlier bed time and rise time
- Phase Delay Syndrome (later acrophase peak)
  - Teenagers, >24 hr rhythm
  - Later bed time and rise time

Shiftwork Sleep Disorder

- Shift work – work that occurs between 7 pm and 6 am¹
- Shift-work tolerance²
  - Ability to adapt (short term) to shift work without adverse consequences
  - No problems with fatigue, sleepiness, or digestion
  - Not the same as adjustment (biological response) to shift work
- Shift-work intolerance – shift work sleep disorder

Shift Work Sleep Disorder

- **SWSD – Definition:**
  
  Insomnia or excessive sleepiness, temporally associated with work period during habitual sleep phase. Shift work is an essential component.

- **Insomnia:** past month; severe 6+ (1–10 score) past 3 months
  - Difficulty falling asleep
  - Difficulty staying asleep
  - Nonrestorative sleep

- **Excessive Sleepiness:**
  - Epworth Sleepiness Scale (13+, rather than 10+)

Drake CL, Roehrs T, et al. *Sleep* 2004; 27(8), 1453-1462

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Shift Work Sleep Disorder

- **Prevalence**<sup>1</sup> (Detroit tri-county general population)
  - 0% day shift (n = 1,950)
  - 8% rotating (n = 337)
  - 14% night shift (n = 162)
  - 10% total Detroit tri-county sample (n = 2,449)

- **Prevalence in nurses on 8-hr shifts**<sup>2</sup>
  - 0% day shift (n = 316)
  - 0% evening shift (n = 194)
  - 4.3% rotating (n = 71)
  - 4.0% night shift (n = 178)
  - 4% total San Francisco Bay Area nurses sample (n = 760)

Shift Work Sleep Disorder/Intolerance -1

- Review article: 60 studies reviewed
- Risk factors:
  - Age
    - 13 studies – young age more tolerant
    - 7 studies – young age less tolerant
    - 6 studies – no association with age
  - Gender
    - 8 studies – women less tolerant than men
    - 4 studies – women more tolerant than men
    - 4 studies – no association with gender
  - Chronotype
    - 9 studies – morning types less tolerant
    - 3 studies – morning types more tolerant
    - 4 studies – no association with chronotype

Saksvik et al Sleep Med Rev, 2011; 15, 221-235
Shift Work Sleep Disorder/Intolerance -2

- Risk factors (cont.)
  - Genetics: variants in Period 3 gene
  - Internal desynchronization: <24 hr rhythm = less tolerant
  - Anxious personality (neuroticism) = less tolerant
  - Internal locus of control = more tolerant

- Occupations at risk
  - Health care industry (nurses)
  - Travel industry (train conductors, air traffic controllers, pilots and airline attendants)
  - Night security guards
  - Bakers
  - New parents

Saksvik et al, Sleep Med Rev, 2011; 15, 221-235

Astronauts are desynchronized, too...
Astronauts are desynchronized, too...
Shift Work Sleep Disorder

- Effects of type of shift schedule
  - Longer shift periods? 8-hr vs. 12-hr shifts?
  - Less off time between shifts?
  - Earlier start times?
    - OR and surgical units
    - Commuting distances

Summary Points

- Most younger adults can tolerate night shift better than most older adults.
- Shorter night shifts may be tolerated better than longer night shifts.
- A night-shift worker can cope with changes in sleep-wake patterns by sleeping during the day.
- Excessive sleepiness is a risk for auto accidents.
- A night-shift worker with SWSD/intolerance is more likely to have irritable bowel symptoms or other GI problems.
Overview

- Risky health habits of shift workers
- Diseases associated with shift work
Important Caveats

- Shift work may cause some health problems
- Shift work sleep disorder may cause some health problems
- Correlation does not imply causation
- 3rd variable problem, spurious correlation
  - Circadian misalignment vs. sleep loss vs. other

Breast Cancer

- Elevated risk of breast cancer
  - >20 years rotating night shift work: multivariate RR 1.79; 95% CI 1.06 to 3.01
  - At least 0.5yrs of night work: OR 1.5; 95% CI 1.3 to 1.7
  - Higher prevalence in flight attendants, but confound of radiation
  - 30+ years nursing nights OR 2.21; CI 1.10 to 4.45

Breast Cancer

Odds ratios for breast cancer associated with duration, frequency and type of night work among women of the OCEANS study

<table>
<thead>
<tr>
<th>Type of night work</th>
<th>Never worked at night</th>
<th>Ever worked at night</th>
<th>OR ( ^{3} )</th>
<th>95% CI ( ^{3} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late evening (^{1})</td>
<td>42 (3.4)</td>
<td>38 (2.9)</td>
<td>1.25</td>
<td>(0.79–1.98)</td>
</tr>
<tr>
<td>Early morning (^{2})</td>
<td>9 (0.7)</td>
<td>12 (0.9)</td>
<td>0.90</td>
<td>(0.36–2.21)</td>
</tr>
<tr>
<td>Overnight (^{3})</td>
<td>120 (8.7)</td>
<td>102 (7.7)</td>
<td>1.35</td>
<td>(1.01–1.80)</td>
</tr>
</tbody>
</table>

Total duration of night work periods (years)

< 4.5 | 66 (5.4) | 69 (5.2) | 1.12 | (0.78–1.60) |
≥ 4.5 | 98 (7.9) | 78 (5.9) | 1.40 | (1.01–1.92) |

- Even higher risk if > 4 years of night work prior to 1\(^{st}\) pregnancy: OR 1.95 [1.13–3.35]\(^{1}\)
  - 1,232 cases, 1,317 population controls
- Men: rotating shifts, higher rate of prostate CA\(^{2}\)


Risks For Cardiovascular Disease

- Mediation of socioeconomic, health behaviors, job-related factors
- Women: only significant for triglycerides, MUCH higher.

Thomas & Power, Eur J Epidemiol, 2010

* \( P < 0.05 \)
Menstrual Cycle

- Longer duration of shift work = higher risk of irregular menstrual cycle

Association of Rotating Shift Work and Other Characteristics With Irregular Menstrual Pattern$^a$ (n = 6930) Among 71,077 Participants of the Nurses’ Health Study II (1993)

<table>
<thead>
<tr>
<th>Rotating shift work (months)</th>
<th>Age-adjusted RR (95% CI)</th>
<th>Full Model RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0$^b$</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1–9</td>
<td>1.20 (1.11–1.30)</td>
<td>1.13 (1.05–1.22)</td>
</tr>
<tr>
<td>10–19</td>
<td>1.24 (1.12–1.39)</td>
<td>1.18 (1.06–1.31)</td>
</tr>
<tr>
<td>20+</td>
<td>1.34 (1.24–1.45)</td>
<td>1.23 (1.14–1.33)</td>
</tr>
</tbody>
</table>

Lawsen et al., Epidemiology, 2011
**Childbirth Problems**

- Small for gestational age (<5\textsuperscript{th} percentile)\textsuperscript{1}
  - Shift work, work-related hazard exposure, insufficient sleep duration, ETOH exposure, less walking
- Lower birth weight (LBW), preterm, or small for gestational age (SGA)\textsuperscript{2}
  - Statistical effects of trends in:
    - <2500g (3.2\%): >40hrs/wk, more active job
    - <3000g (15.4\%): >40hrs/wk, more active job, SW (trend)
    - Preterm (4.1\%): >40hrs/wk, temp job
    - SGA (6.5\%): more active job
    - Shift work may add to cumulative risk
- RR of: preterm 1.16, LBW 1.27, SGA 1.12\textsuperscript{3}


**Mental Health Problems**

- Female nurses in Taiwan, rotating shift vs. day shift worker comparisons\textsuperscript{1}
- Mental health complaints
  - OR 1.91; 95\% CI 1.39–2.63
- Sleep complaints
  - OR 2.26; 95\% CI 1.57–3.28
- Both symptoms improved if at least 2 days off, after night shift schedule
- Higher rates of anxiety and depression symptoms in shift working Norwegian ICU nurses vs. population\textsuperscript{2}

Gastrointestinal Disorders

- GI complaints are very common in shift work
- Variety of theories
  - Upper/lower GI symptoms higher in evening vs. day\(^1\)
  - More GI symptoms, irregular meal timing, and GI medications in rotating vs. day shift nurses\(^2\)
  - Irritable bowel syndrome (OR 2.14) and abdominal pain (OR 2.8) higher in rotating vs. day shift nurses
  - IBS-D higher in night vs. day\(^3\)
- Mixed results for gastric ulcers\(^4\)


Obesity

- Nurses and midwives changing from day to shift, or shift to day\(^1\):
  - Shift to day: 3.02 kg/m\(^2\) decrease in BMI
  - Day to shift: 0.56 kg/m\(^2\) increase in BMI
- Nurses and midwives\(^2\):
  - Shift workers 15% more likely to be overweight (BMI >25 and <30) or obese (BMI >30)
  - Suggest need for longitudinal research

Weaker Response to Bariatric Surgery

- Roux-en-Y procedure
- Retrospective chart review
- Relatively small sample of shift workers
- % excess body weight lost, shift workers vs. non-shift workers (all \( P < 0.01 \))
  - 3 months: 29.9\% vs. 43.8\%
  - 6 months: 46.4\% vs. 61.3\%
  - 12 months: 56.5\% vs. 76.8\%

Ketchum & Morton, Obesity Surgery, 2007

Type-2 Diabetes

- Nurses’ Health Study I (n=69,269) and II (n=107,915)
- No DM, CAD, or CA at baseline
- Followed at 2-4 year intervals, 18-20 year of f/u
- Vs. women without shift work Hx hazard ratios of
  - 1-2yrs of shiftwork: 1.05 (1.00-1.11)
  - 3-9yrs: 1.20 (1.14-1.26)
  - 10-19 years: 1.40 (1.30-1.51)
  - 20+ years: 1.58 (1.43-1.74)
  - Only partial mediation by BMI

Metabolic Syndrome

- Various risk factors for other diseases:
  - Central obesity
  - Insulin resistance
  - Hypertension
  - Low LDL and/or high triglyceride levels

- 877 day vs. 474 rotating shift workers\(^1\)
  - BMI: 27.1 vs. 26.3 kg/m\(^2\)
  - Fasting insulin: 65.5 vs. 55.9 pmol/L
  - Diastolic BP: 78 vs. 76 mmHg
  - Triglycerides: 1.71 vs. 1.5 mmol/L
  - Metabolic syndrome OR 1.51; 95% CI 1.01–2.25

- Other examples, such as higher resistin levels in shift working men\(^2\)


Cerebrovascular Disease

- Nurses’ Health Study (n = 80,108)
- Stroke is 3\(^{rd}\) leading cause of death in women
- 4 percent increase in risk per 5 years of rotating shift work
- Data adjusted for obvious contributors to CVA
- May be “threshold effect” at 15+ years of shift work

Brown et al., Am J Epidemiol, 2009
Comorbid Sleep Problems

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Type of shift work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day (n=884)</td>
</tr>
<tr>
<td>Snoring</td>
<td>88.3</td>
</tr>
<tr>
<td>Witnessed apneas</td>
<td>46.8</td>
</tr>
<tr>
<td>Sleep maintenance difficulties</td>
<td>15.0</td>
</tr>
<tr>
<td>Sleep onset difficulties</td>
<td>3.3</td>
</tr>
<tr>
<td>Dozing when driving</td>
<td>28.3</td>
</tr>
<tr>
<td>Excessive daytime sleepiness</td>
<td>48.3</td>
</tr>
<tr>
<td>Excessive caffeine intake</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Walia et al., Sleep Breath, 2011

Restless Legs Syndrome

- More prevalent in rotating shift workers (2 types of schedules) vs. non-rotating day shift workers
  - 14.7% and 15.2% vs. 8% (day workers; P<0.05)
  - RLS was not more severe in shift workers
- RLS associated with (all P<0.001):
  - Slightly older age (35.2 vs. 32.7)
  - Longer years of working (11.8 vs. 8.9)
  - More antihistamine use (16.3% vs. 4.3%)

**Summary**

- Working rotating or night shifts increases risk for:
  - Cardio- and cerebrovascular disease
  - Several types of cancer
  - Obesity and obesity-related disease (OSA, DM)
  - GI, reproductive, metabolic, and other diseases
- Increase in bad health behaviors and decrease in good health behaviors

**Possible Confounds**

- Not always well controlled in studies
  - Smoking status
  - Alcohol use
  - Abuse of medications or illicit drugs
  - Exercise
  - Diet
  - Stress
Other Confounding Variables

- Duration of shift work (years)
- Duration of shift itself (8hr, 12hr, other)
- Gender
- Age
- Selection bias for shift work
- Survival effect
- Job-specific risks (e.g., chemical exposure)
- Inadequate or missing control group

Sample Countermeasures

- Improve diet and increase exercise
  - Increase HDL, lower LDL
  - Decrease triglycerides
  - Lower risk for OSA, DM, metabolic syndrome
  - Improve blood pressure
- Address sleep complaints
  - Sleep restriction clearly linked to health risk
- Consider avoiding nights or rotating shifts if already at increased risk for certain diseases
In This Segment We Will Describe

- Alertness and the cognitive process under conditions of reduced sleep
- Sleep loss–related patient-care errors
- Sleep loss–related nurse accidents and injuries
- Sleep loss–related public safety events: traffic accidents, injuries
**Sleep Deprivation**

- Neurocognitive impairment and sleepiness are often unrecognized by the affected person
- Sleep deprivation causes episodes of involuntary microsleep

**Four Areas of Neurocognitive Change**

- Performance deficits
- Impaired information processing
- Cognitive flexibility
- Impaired mood
Performance Deficits

• Performance is unstable when intense concentration is needed
  – Omission: fail to respond to stimulus
  – Commission: respond when stimulus is not present
• False reassurance because it doesn’t happen every time you are sleep deprived
• Accuracy is preserved at the expense of speed
• Increased effort is needed to remain “on task”—performance deteriorates with increased time on task
• Response time slows

IOM, Sleep disorders and sleep deprivation, an unmet public health problem, 2006; Durmer and Dinges, 2007

Memory and Information Processing

• Short-term recall and working memory decline
  – Remembering a drug dose from chart to med room
  – Looking up a phone number and walking to phone to dial
  – Remembering next task when interrupted
• Reduced learning of new information
  – Patient handovers
  – In-service on new equipment

IOM, Sleep disorders and sleep deprivation, an unmet public health problem, 2006; Durmer and Dinges, 2007
Cognitive Flexibility

- Divergent thinking deteriorates
  - No “thinking out of the box”
  - Perseverate on ineffective solutions
  - Cannot recognize better alternatives even if clearly available
- Risk assessment is faulty, risk-taking behavior increases
  - Less able to learn from negative consequences of behavior
- Loss of situational awareness

Impaired Mood

- Irritability, anxiety, depression
- Loss of vigor
- Inappropriate behavior
  - Giggling
- Communication skills decrease
  - Misinterpret others
  - Word-finding problems
- Avoid communicating when in difficult situations
Sleep Loss–Related Patient-Care Errors

A Case That Shook Medicine

By Barbara H. Lerner
Special to The Washington Post
Tuesday, November 28, 2005

May 4, 2010

Dear Program Directors, Members of the Faculty, Designated Institutional Officials, Residents and Fellows of the United States,

It has been about five months since I last shared an update on the progress of the task force charged with drafting standards relating to professional responsibility, transitions in care, supervision and resident duty hours for the profession. I am pleased to relate that the work of the group is nearly complete, and that their recommendations will soon begin the traverse the path that all program requirement revisions must follow on their way to approval by the ACGME Board of Directors.

The ACGME Task Force: A Uniquely Qualified Team

Photo: Libby Zion, http://libbyzion.com/libby_zionary.html
Role of the Nurse: Integrating SWSD Interventions for You and Your Patient

### Table 1: Association of Errors or Near Errors With Nurses' Scheduled Work Duration and Overtime, 2002

<table>
<thead>
<tr>
<th>Scheduled Work Duration (hours)</th>
<th>Number of shifts with one or more errors (N=3,258)</th>
<th>Number of shifts with one or more near errors (N=3,258)</th>
<th>OR (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 6.0</td>
<td>377</td>
<td>15</td>
<td>1.00</td>
</tr>
<tr>
<td>6.0 to 8.0</td>
<td>2,074</td>
<td>18</td>
<td>1.34 (0.43)</td>
</tr>
<tr>
<td>8.0 to 12.5</td>
<td>346</td>
<td>3</td>
<td>0.53 (0.34)</td>
</tr>
<tr>
<td>12.5 to 16.0</td>
<td>380</td>
<td>8</td>
<td>1.00</td>
</tr>
<tr>
<td>16.0 to 20.0</td>
<td>370</td>
<td>14</td>
<td>1.22 (0.00)</td>
</tr>
<tr>
<td>20.0 to 23.5</td>
<td>1,260</td>
<td>10</td>
<td>1.00</td>
</tr>
<tr>
<td>23.5 to 27.5</td>
<td>70</td>
<td>5</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>3,258</td>
<td>104</td>
<td>1.22 (0.00)</td>
</tr>
</tbody>
</table>

### Table 2: Association Between Work Hours, Errors, and Near Errors

<table>
<thead>
<tr>
<th>Work Duration, hours*</th>
<th>Shifts with at least 1 error, No. (%)</th>
<th>Odds ratio (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6</td>
<td>564 (39)</td>
<td>1.00 (p = 0.07)</td>
</tr>
<tr>
<td>4.6 to 6.0</td>
<td>1,112 (81)</td>
<td>1.42 (p = 0.00)</td>
</tr>
<tr>
<td>6.0 to 8.0</td>
<td>491 (36)</td>
<td>1.42 (p = 0.00)</td>
</tr>
<tr>
<td>8.0 to 12.5</td>
<td>318 (46)</td>
<td>1.44 (p = 0.00)</td>
</tr>
<tr>
<td>12.5 to 16.0</td>
<td>306 (43)</td>
<td>1.44 (p = 0.00)</td>
</tr>
<tr>
<td>16.0 to 20.0</td>
<td>266 (39)</td>
<td>1.46 (p = 0.00)</td>
</tr>
<tr>
<td>20.0 to 23.5</td>
<td>208 (28)</td>
<td>1.46 (p = 0.00)</td>
</tr>
<tr>
<td>23.5 to 27.5</td>
<td>208 (28)</td>
<td>1.46 (p = 0.00)</td>
</tr>
</tbody>
</table>

*The duration of work shifts could not be classified because of missing data.

### Findings similar to Rogers, extended work days increased the risk for patient-care errors and near errors

**Effects of Critical Care Nurses’ Work Hours on Vigilance and Patients’ Safety**

Linda D. Scott, PhD, RN, Ann E. Rogers, PhD, RN, Wei-Ting Hwang, PhD, and Yaweri Zhang, MS, MD

By Ann E. Rogers, Wei-Ting Hwang, Linda D. Scott, Linda K. Aiken, and David F. Dilts

HealthAffairs

At the Intersection of Health, Health Care and Policy

By Ann E. Rogers, Wei-Ting Hwang, Linda D. Scott, Linda K. Aiken, and David F. Dilts

The Working Hours of Hospital Staff Nurses and Patient Safety

Health Affairs, Vol. 23, No. 4 (2004), 212-212

doi: 10.1277/hafft.23.4.202
Sleep Loss–Related Nurse Accidents, Injuries

Cumulative 15-month incidence of injuries ranged from 14%–21% by body part, and risk increased substantially when nurses worked extended hours per day.
Role of the Nurse: Integrating SWSD Interventions for You and Your Patient

Agile Adverse Odds Ratios (ORs) for Needlestick Injuries in the Past Year and Botanical Risk (BR) for Needlestick Injury Among Nurses Who Had Worked 24 Year at Nurses. According to Work Schedule at Boston, 2012-2014

<table>
<thead>
<tr>
<th>Work schedule variables</th>
<th>Needlestick injury in the past year ( \times 100 % )</th>
<th>Needlestick injury past year ( \times 100 % )</th>
<th>OR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shifts per week</td>
<td>4-5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per month</td>
<td>4-5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per day</td>
<td>4-5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per night</td>
<td>4-5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per week</td>
<td>6-9</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per month</td>
<td>6-9</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Shifts per day</td>
<td>6-9</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per night</td>
<td>6-9</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per week</td>
<td>1-3</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per month</td>
<td>1-3</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per day</td>
<td>1-3</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per night</td>
<td>1-3</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per week</td>
<td>&gt; 4</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shifts per month</td>
<td>&gt; 4</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
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<td>1.00</td>
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<td>&gt; 4</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Original Article

Work Schedule, Needle Use, and Needlestick Injuries Among Registered Nurses

Allen M. Haberfeld, MD, RPI, PAAN; Kim Li, MS, RN; Janice Gelber-Brown, PhD, RN; Susan Loprisone, PhD, RN

Role of the Nurse: Integrating SWSD Interventions for You and Your Patient

Sleep, Sleepiness, Fatigue, and Performance of 12-Hour-Shift Nurses

Jeanette Gelber-Brown, Valarie E. Rogers, Alison M. Teich, Robert L. Kane, R. Barker Basner, and Susan M. Schiff
Sleep Loss–Related Public Safety Events

**SLEEP AND DRIVING**

The Relationship between Nurse Work Schedules, Sleep Duration, and Drowsy Driving

Linda D. Scott, PhD, RN, Wee-Ting Huang, PhD; Anne E. Rogers, PhD, RN, FAAN; Tami Nye, MSN, RN; Grace C. Dean, PhD, RN; David F. Rogers, PhD

**Shifts with drowsy driving**

(2,919 shifts)

- < 8.5
- 8.5–<12.5
- ≥ 12.5

**Shifts with MVC or near miss**

(282 shifts)

- < 8.5
- 8.5–<12.5
- ≥ 12.5

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Shiftwork Sleep Disorder: The Role of the Nurse

29
Role of the Nurse: Integrating SWSD Interventions for You and Your Patient

Michael Decker PhD, RN, RRT, D.ABSM
Diplomate, American Board of Sleep Medicine
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Unique Vulnerability and Role of Nurse

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Rotating Shifts Impact Nursing

- Fatigue and recovery problems attributable to shift work are well recognized and independent of partnership or family status.\(^1\)
- Optimal standards for patient care may be difficult to achieve for nurses, who may suffer from sleep deprivation and health problems associated with rotational night work and disrupted physiological rhythms.\(^2,3\)
- Night-shift workers are reportedly most susceptible to SWD, with an estimated 32.1% of this group experiencing symptoms that meet the minimum diagnostic criteria for SWD compared with 26.1% of rotating-shift workers.\(^4\)


Self-awareness and Self-assessment of Sleepiness

“Sleep loss is at least as potent as ethanol in its performance-impairing and amnestic effects and is significantly more potent in its sedative effects.”\(^1\)

- **Myth**
  “I can tell how tired I am and I know when I’m not functioning up to par.”
- **Facts**
  Studies show that sleepy people underestimate their level of sleepiness and overestimate their alertness. The sleepier you are, the less accurate your perception of degree of impairment. You can fall asleep briefly (“microsleeps”) without knowing it.

How is Sleepiness Measured?

- Questionnaires and scales (subjective)
- Behavioral and performance (objective)
- Physiological (objective)

Subjective Rating Scales

- Consist of “subjective measures” of sleepy behavior assessed by single item questions and/or scales consisting of multiple items
  - Epworth Sleepiness Scale\(^1\)
  - Stanford Sleepiness Scale\(^2\)
  - Karolinska Sleepiness Scale\(^3\)
  - Pittsburgh Sleep Quality Index Questionnaire\(^4\)
  - Athens Insomnia Scale\(^5\)

- The sensitivity and specificity of such tests are influenced by:
  - Terms, such as fatigue, tiredness and sleepiness may contribute to misclassification
  - Clinical experiences show that patients who have lived with severe sleepiness for many years may underreport their sleepiness due to habituation

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Epworth Sleepiness Scale (ESS)

0 = Would never doze
1 = Slight chance of dozing
2 = Moderate chance of dozing
3 = High chance of dozing

Use this scale to choose the most appropriate number for each situation:

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of dozing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and Reading</td>
<td></td>
</tr>
<tr>
<td>Watching TV</td>
<td></td>
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<tr>
<td>Sitting inactive in a public place (e.g., theatre)</td>
<td></td>
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<tr>
<td>As a passenger in car for an hour without break</td>
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<tr>
<td>Lying down to rest in the afternoon</td>
<td></td>
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<tr>
<td>Sitting and talking to someone</td>
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<tr>
<td>Sitting quietly after lunch without alcohol</td>
<td></td>
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<tr>
<td>In a car, while stopping for a few minutes in traffic</td>
<td></td>
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</tbody>
</table>

A score of greater than 10 is interpreted as daytime sleepiness

* the ESS is not validated in night- or rotating-shift workers. Nonetheless, it is useful "screen" for excessive sleepiness.

Behavioral and Performance - Psychomotor Vigilance Test (Assessing reaction time)

- Requires responses to a small, bright-red-light stimulus (LED-digital counter) by pressing a response button as soon as the stimulus appears
- Designed to be sensitive to sleep deprivation (experimental, occupational, and clinical) induced in many different ways (i.e., through sleep fragmentation, acute prolonged waking, chronic partial sleep restriction, etc.)

Physiological -
Multiple Sleep Latency Testing

- Objective assessments reduce potential error associated with subjective assessments of sleepiness or alertness
- Most common: multiple sleep latency test (MSLT)
  - a well-validated test of the physiologic tendency to fall asleep during usual waking hours
  - performed under very controlled conditions
  - five 20-minute nap opportunities are given at two-hour intervals, beginning 2 hours after morning awakening
  - an all night in-laboratory sleep study must precede the MSLT to “rule-out” conditions that could impact
  - **Patient is asked to fall asleep!**
  - Parameters measured are:
    - average number of minutes to sleep onset
    - appearance of REM sleep during the nap


Summary of Subjective / Objective Assessments of Sleepiness

- A person cannot necessarily gauge how sleepy he/she may be
- A person’s performance may be impaired by sleepiness without being aware of it
- Hospital-based nursing practice can implement subjective questionnaire assessments
- Behavioral and performance measures (such as psychomotor vigilance testing) may be better suited for primary care settings
- MSLT with its prerequisite sleep study are reserved for specialty diagnostic sleep laboratories
Non-Pharmacological Management Strategies of Sleepiness

- Improve sleep hygiene
  - darkened room, sound attenuation, cool temperature,
  - allow for extra sleep time for “recovery sleep” after 1st couple of nights to counter overall reduction in total sleep time
- Consider light therapy
  - bright light therapy to help resynchronize circadian rhythms
- Exercise
  - develop “practical” exercise regime (fast walking) and maintain daily schedule
- If possible, do not work several back-to-back night shifts
  - cumulative sleep loss, with corollary performance decrements and increased propensity for accidents occur following multiple concurrent night-shifts
- AVOID OTC stimulant drinks
  - rebound sleepiness
  - high sugar content


Pharmacologic Management Strategies-1

Goal #1: Facilitate sleep onset and maintenance during time of day that circadian drive is promoting wake

- **Melatonin agonists**
  - Ramelteon (Rozerem) is a melatonin receptor agonist
    - stimulates those receptors responsive to melatonin, a hormone secreted by the pineal gland of all animals and humans. Release of melatonin, which stimulates melatonin receptors, is associated with an increase of sleep propensity.
- **Non-benzodiazepines**
  - Zolpidem (Ambien, Ambien CR, Stilnox, and Sublinox)
    - short-acting (15 minute onset with 2-3 hour duration that potentiates gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter, by binding to GABA$_A$ receptors
    - does not adequately maintaining sleep, unless used in the CR formulation
    - may be associated with morning “hangover” effect
  - Eszopiclone (Lunesta)
    - mechanism of action is via the benzodiazepine receptor-GABA complex, similar to zolpidem

Pharmacologic Management Strategies -2

Goal #2: Facilitate maintenance of wakefulness.

- **Non-prescription - Wake promoting**
  - Caffeine is often used as the initial treatment for excessive sleepiness associated with reduced sleep.
  - It achieves its wake-promoting effects by antagonizing adenosinergic neurons located in the hypothalamus and projecting into cells in the cortex, basal forebrain, and reticular activating system.¹
  - Through its inhibition of adenosine receptors, caffeine prevents sleep onset and maintenance.¹

- **Prescription - Wake promoting**
  - Armodafinil (Nuvigil)²
    - used to improve wakefulness in adults who experience excessive sleepiness due to shift work disorder (SWD), obstructive sleep apnea, or narcolepsy
    - mechanism of action remains unclear
    - may be related to increased release of monoamines


Summary of Dr. Lee’s Key Points

- **SWSD – Definition**
  - Insomnia or excessive sleepiness, temporally associated with work period during habitual sleep phase. Shiftwork is an essential component.
  - Shorter shifts and less frequent night shift is tolerated better than longer more frequent night shifts.
  - A night shift worker can cope with changes in sleep-wake patterns by sleeping during the day.
Summary of Dr. Geiger-Brown’s Key Points

- Consequences of shiftwork sleep disorder
  - Performance is unstable when intense concentration is needed
  - Short term recall and working memory decline
  - Reduced learning of new information
  - Divergent thinking deteriorates
  - Risk assessment is faulty, risk taking behavior increases
  - Loss of situational awareness
  - Irritability, anxiety, depression
  - Loss of vigor
  - Inappropriate behavior
  - Communication skills decrease

Summary of Dr. Wyatt’s Key Points

- Working rotating or night shifts increases risk for:
  - Cardio- and cerebrovascular disease
  - Several types of cancer
  - Obesity and obesity-related disease (OSA, DM)
  - GI, reproductive, metabolic, and other disease

Sample Countermeasures

- Improve diet and increase exercise
  - Increase HDL, lower LDL
  - Decrease triglycerides
  - Lower risk for OSA, DM, metabolic syndrome
  - Improve BP

- Address sleep complaints
  - Sleep restriction clearly linked to health risk

- Consider avoiding nights or rotating shifts if already at increased risk for certain diseases
Role of the Nurse: Integrating SWSD Interventions for You and Your Patient

Summary of Dr. Decker’s Key Points

- Rotating shifts impact Nursing
  - Optimal patient care may be difficult to achieve for nurses who may suffer from sleep deprivation and health problems associated with rotational night work.
  - Night-shift workers are reportedly most susceptible to SWSD, with an estimated 32.1% of this group experiencing symptoms that meet the minimum diagnostic criteria.
  - Sleep loss is at least as potent as ethanol in its performance-impairing and amnestic effects and is significantly more potent in its sedative effects.
  - A person cannot necessarily gauge how sleepy he/she may be.
  - A person’s performance may be impaired by sleepiness without being aware of it.
  - Both pharmacologic and nonpharmacologic interventions exist.

See a Board Certified Sleep Physician if you believe that you may have a sleep-related disorder.