Working Against the Clock: Practical Strategies for Diagnosis and Management of Shift Work Disorder (SWD)

March 20, 2014
Houston, Texas
Session 3: Working Against the Clock: Practical Strategies for Diagnosis and Management of Shift Work Disorder (SWD)

Learning Objectives

1. Describe the pathophysiologic basis of circadian rhythm misalignment and its relationship to sleep/wakefulness and overall health
2. Establish the differential diagnosis of shift work disorder (SWD) based on symptomatology, patient history, and findings obtained from a thorough sleep history and other assessment tools
3. Formulate evidence based initial and ongoing treatment plans for SWD that incorporate nonpharmacologic and pharmacologic modalities

Faculty

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Collegeville Family Practice
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Dr Paul Doghramji cofounded Brookside Family Practice & Pediatrics Pottstown, Pennsylvania. He has also been attending physician in family practice, chair of the utilization management committee, and physician advisor at Pottstown Memorial Medical Center; senior staff member at Collegeville Family Practice, assistant medical director for health services at the Hill School in Pottstown, and preceptor in the physician assistant program at Arcadia University, Glenside, Pennsylvania and nurse practitioner program at LaSalle University, Philadelphia, PA. Board certified by the American Board of Family Practice and the American Board of Preventive Medicine; a fellow of the American Academy of Family Physicians, Dr Doghramji holds membership in the American Academy of Family Physicians and Pennsylvania Academy of Family Physicians. He has received the physician's recognition award from the American Academy of Family Physicians in every qualifying year since completing his residency in 1985. Dr Doghramji's work on sleep medicine has been published in Postgraduate Medicine, Journal of Clinical Psychiatry, INSOM Magazine, and International Journal of Clinical Practice, as well as on such Web sites as Medscape and Pri-Med. He coauthored a textbook, "Clinical Management of Insomnia," released January 2007. Dr Doghramji lectures nationally on topics relating to sleep medicine.

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Senior Bioscientific Staff
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Dr Christopher Drake is a licensed clinical psychologist, board certified in sleep medicine and a fellow of the American Academy of Sleep Medicine. Dr Drake's research interests are focused on human sleep research with an emphasis on the factors that predispose individuals to sleep disorders broadly and insomnia and circadian rhythm disorders specifically. He serves on the editorial board of the journals Sleep and Behavioral Sleep Medicine; he is currently the chairman of the National Sleep Foundation.

Faculty Financial Disclosure Statements
The presenting faculty reported the following:

Dr Doghramji has received honoraria from Teva, Takeda, and Purdue. He also serves on advisory boards for Merck and Astra Zeneca.

Dr Drake has received honoraria from Teva. He has received research grants from Merck and equipment for research use from Phillips and The Sunbox Company.
**Education Partner Financial Disclosure Statement**
The content collaborators at Ardgillan Group LLC have reported the following:

Karen Roy MSc. CCMEP at Ardgillan Group LLC, has no financial relationship to disclose.

**Suggested Reading List**


Working Against the Clock: Practical Strategies for Diagnosis and Management of Shift Work Disorder (SWD)

March 20th Houston

Drug List

<table>
<thead>
<tr>
<th>Generic</th>
<th>Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armodafinil</td>
<td>NUVIGIL Tablets (C-IV)</td>
</tr>
<tr>
<td>Modafinil</td>
<td>PROVIGIL Tablets (C-IV)</td>
</tr>
</tbody>
</table>

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1. Describe pathophysiologic basis of circadian rhythm misalignment and its relationship to sleep/wakefulness and overall health.
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IN YOUR PRACTICE

What is Shift Work Disorder?

Diagnostic Criteria

ICSD-3 Criteria
Criteria A-D must be met
A. There is a report of insomnia and/or excessive sleepiness, accompanied by a reduction of total sleep time, which is associated with a recurring work schedule that overlaps the usual time for sleep.
B. The symptoms have been present and associated with the shiftwork schedule for at least three months.
C. Sleep log and actigraphy monitoring [whenever possible and preferably with concurrent light exposure measurement] for at least 14 days (work and free days) demonstrate a disturbed sleep and wake pattern.
D. The sleep and/or wake disturbance are not better explained by another current sleep disorder, medical or neurological disorder, mental disorder, medication use, or substance use disorder.


Alternative Work Shift Types

<table>
<thead>
<tr>
<th>Shift Type</th>
<th>Regular Start Time</th>
<th>% workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night Shift Workers</td>
<td>6pm – 4am</td>
<td>4.25%</td>
</tr>
<tr>
<td>Early Morning Shift Workers</td>
<td>4am – 7am</td>
<td>12.4%</td>
</tr>
<tr>
<td>Evening/Afternoon Shift Workers</td>
<td>2pm – 6pm</td>
<td>4.3%</td>
</tr>
<tr>
<td>Rotating Shift Workers</td>
<td>Variable</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

Who Works Shifts?

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective Services</td>
<td>50.4%</td>
</tr>
<tr>
<td>Food Preparation/Serving</td>
<td>49.4%</td>
</tr>
<tr>
<td>Transportation</td>
<td>29.0%</td>
</tr>
<tr>
<td>Healthcare Support</td>
<td>27.9%</td>
</tr>
<tr>
<td>Personal Care/Service</td>
<td>27.6%</td>
</tr>
<tr>
<td>Healthcare Practitioners/Technicians</td>
<td>24.0%</td>
</tr>
<tr>
<td>Production</td>
<td>24.0%</td>
</tr>
<tr>
<td>Sales</td>
<td>23.3%</td>
</tr>
</tbody>
</table>

Prevalence of Shift Work Disorder

- Prevalence among rotating and night shift workers estimated to be 10%-38%
- Early morning or split-shift workers also at risk, prevalence less well known
- Estimated prevalence of 2%-5% of the general population

McMenamin T et al. Monthly Labor Rev. 2007;130:9-11

IN YOUR PRACTICE

Christina Talks About Tiredness

- Tired
- Struggle
- Problems Concentrating
- Errors
- Lack of Energy
- Zoned Out

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Patient Presentation May be Non-specific

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Differential Diagnosis of Sleep Disorders

Causes of Sleepiness

- Reduced sleep
- Restriction
- Sleep fragmentation e.g. obstructive sleep apnea
- CNS disorders e.g. narcolepsy.
- Circadian rhythm misalignment.
- CNS medications.

**IN YOUR PRACTICE**

SWD May Be Assessed And Managed In Primary Care Practices

- Assessment of SWD
  - Determine circadian misalignment.
  - Assess sleep disturbance:
    - Difficulty falling asleep, staying asleep or having nonrestorative sleep.
    - Degree of alertness or sleepiness.
    - Assess falling asleep during inappropriate times/circumstances.
    - Important job-related factors e.g. commute, type of shift.
  - Determine impact on social and domestic responsibilities.

**IN YOUR PRACTICE**

Take a Thorough Sleep History

- On average, how much sleep per night are you getting?
- Do you have uninterrupted sleep?
- Have you been told that you snore loudly (louder than talking or loud enough to be heard through closed doors) or do anything else unusual in your sleep?
- Do you have problems falling asleep?
- What time do you go to bed and when do you get up?
- Is your sleep pattern regular?
- Do you have problems waking up?
- Are you taking any CNS medications?
- Are you having problems with alertness while driving?

**IN YOUR PRACTICE**

Assessing Sleepiness

**Drake C et al.** In Kryger MH, Roth T, Dement WC, editors. Principles and Practice of Sleep Medicine. 5th ed 2011
**Epworth Sleepiness Scale (ESS)**

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>CHANCE OF DOZING (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Watching television</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Sitting in a public place – for example, a theater or meeting</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>As a passenger in a car for an hour without a break</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Lying down to rest in the afternoon</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Sitting quietly after lunch</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>In a car, while stopped in traffic</td>
<td>0 1 2 3</td>
</tr>
</tbody>
</table>

ESS total score ≥ 10 indicates excessive sleepiness.


**Single Question Sleepiness Assessment**

“Please measure your sleepiness on a typical day” where 0 is none and 10 is highest.

Score of 7 is indicative of excessive sleepiness.


**Insomnia Severity Index**

<table>
<thead>
<tr>
<th>Insomnia Problem</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Difficulty falling asleep</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Difficulty staying asleep</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Problems waking up too early</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. How satisfied/dissatisfied are you with your current sleep pattern?</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. How noticeable is your current sleep problem in terms of impacting the quality of your life?</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. How worried/terrified are you about your current sleep problem?</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. To what extent does your current sleep problem interfere with your daily functioning (e.g., daytime fatigue, mood, ability to function at work/life chores, concentration, memory, read etc.)?</td>
<td>0 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add scores for all seven items for total score:_____

0-7=no clinically significant insomnia
8-14=subthreshold insomnia
15-21=moderate insomnia
22-28=severe insomnia


**IN YOUR PRACTICE**

**Sleep/Wake Cycle**

Christina Shares Her Schedule

- Monday-Friday schedule
- Awake at 3am
- Work shift 4am – 12 noon
- Afternoon nap opportunity often missed
- Evening with family
- Bed time 9pm rarely possible
- Disturbed 11pm by husband

**IN YOUR PRACTICE**

**Diagnostic Algorithm for Shift Work Disorder**
ALGORITHM FOR DIAGNOSIS OF SHIFT WORK DISORDER

Is the patient a shift worker?
Yes
No

Shift Work Disorder ruled out

Does the patient complain of insomnia or excessive sleepiness?
Yes
No

ICSD-3 criteria for diagnosis of Shift Work Disorder requires presence of excessive sleepiness and/or insomnia.

Is the complaint temporally associated with shift work schedule?
Yes
No

When did the patient first notice problems with insomnia or excessive sleepiness?

Have the symptoms and associated shift work schedule lasted at least one month?
Yes
No

ICSD-3 criteria for diagnosis of Shift Work Disorder require symptoms associated with the schedule for at least three months.

When did the patient first notice problems with insomnia or excessive sleepiness?

Has the complaint been associated with shift work schedule's impact on everyday activities?

No
Yes

IN YOUR PRACTICE
Comorbidities of Circadian Misalignment

Take full sleep and medical history to explore possible other causes of sleep disturbance.

Is the sleep disturbance better explained by another current sleep disorder, medical or neurological disorder, mental disorder, medication use or substance use disorder?
Yes
No

Consider a differential diagnosis or whether SWD is comorbid with other disorders.

Consider referral to sleep specialist if another sleep disorder is suspected.

Diagnosis: Shift Work Disorder

Remember the most common occupations for shift work schedules include:
• Protective services
• Food preparation/serving
• Transportation
• Healthcare/healthcare support.

Christina’s Information

<table>
<thead>
<tr>
<th>Last Appointment</th>
<th>Today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>175lb</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>128/82</td>
</tr>
<tr>
<td>Height</td>
<td>5'6&quot;</td>
</tr>
</tbody>
</table>

BMI: 30

<table>
<thead>
<tr>
<th>Normal Ranges</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>&lt;149mg/dL</td>
</tr>
<tr>
<td>Glucose</td>
<td>&lt;100mg/dL</td>
</tr>
<tr>
<td>Cholesterol, Total</td>
<td>&lt;200mg/dL</td>
</tr>
<tr>
<td>HDL Cholesterol</td>
<td>&gt;35mg/dL</td>
</tr>
<tr>
<td>LDL Cholesterol</td>
<td>&lt;180mg/dL</td>
</tr>
<tr>
<td>AST</td>
<td>&lt;31 U/L (Female)</td>
</tr>
<tr>
<td>ALT</td>
<td>&lt;20 U/L (Female)</td>
</tr>
</tbody>
</table>

Morbidities Associated With Circadian Misalignment
- Insulin Resistance
- Malabsorption
- Diarrhea
- Electrolyte Imbalance
- Cancer
- Cardiovascular Disease
- Inflammation
- Obesity

Increased Risk for Cancer Among Shift Workers
In 2007, International Agency for Research on Cancer determined that “Shift work that involves circadian disruption is probably carcinogenic to humans.”

<table>
<thead>
<tr>
<th>Type of Cancer</th>
<th>Odd Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night Shift &gt; 0.5yr</td>
<td>1.5</td>
<td>1.3-1.7</td>
</tr>
<tr>
<td>Night Shift &gt; 6yrs</td>
<td>1.7</td>
<td>1.3-1.7</td>
</tr>
<tr>
<td>Night Shift &gt;30yrs</td>
<td>2.12</td>
<td>1.14-4.31</td>
</tr>
<tr>
<td>Rotating Shift Work &gt;20yrs</td>
<td>1.79</td>
<td>1.04-1.78</td>
</tr>
<tr>
<td>Prostate Cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotating Shift Workers (mixed occupations)</td>
<td>3.0</td>
<td>1.2-7.7</td>
</tr>
</tbody>
</table>

IN YOUR PRACTICE

Significantly More Missed Family and Social Activities

IN YOUR PRACTICE

Treatment Goals for Shift Work Disorder
Recommendations for Management of Shift Work Disorder

I. Regular Physicals.
   • Attention to psychological, gastrointestinal, cardiovascular and potential cancer risks

II. Removal from Shift Work if possible.
   • May not be feasible for many patients

III. Determine Patient Specific Therapeutic Approach.

IV. Address work, social and domestic factors.


Practice Parameters (AASM) 2007

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Recommendation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Sleep Schedules</td>
<td>Standard</td>
</tr>
<tr>
<td>Timed Light Exposure</td>
<td>Guideline</td>
</tr>
<tr>
<td>Timed Melatonin Administration</td>
<td>Guideline</td>
</tr>
<tr>
<td>Hypnotics</td>
<td>Guideline</td>
</tr>
<tr>
<td>Stimulants/Caffeine</td>
<td>Option</td>
</tr>
<tr>
<td>Alerting Agents</td>
<td>Guideline</td>
</tr>
</tbody>
</table>

Addressing Circadian Misalignment and Sleep Deprivation

- Sleep hygiene education
- Hypnotic medication
- Melatonin 3 mg at bedtime
- Bright light during work
- Melatonin
- Avoid morning bright light

Increase sleep duration
Increase alertness
Circadian Alignment
↑ Sleep duration
↑ Alertness

Circadian Interventions

Align circadian rhythm of alertness with the shift work and sleepiness with sleep schedule

- Avoid bright light after work shift in preparation for sleep opportunity.
- Have a dark, quiet bedroom.
- Get bright light exposure during the shift.
- Split sleep opportunities may avoid starting shift with sleep debt.

Goals for Use of Medications in Shift Work Disorder

- Enhance wakefulness during work shift:
  • Improve alertness
  • Facilitate normal levels of attention and energy throughout the wake-period
- Facilitate good sleep when desired:
  • Ensure adequate sleep duration
  • Improve sleep quality
- Minimize side effects that impair functioning or normal sleep patterns.

Management of Shift Work Disorder: Focus on Insomnia

- Hypnotics may improve daytime sleep, but do not improve subsequent nighttime alertness.
- Short-acting hypnotics of little help to most night shift workers, as sleep maintenance and not sleep onset problems are more common.
- Potential carryover effects (eg, sedation) during work hours should be considered.
Armodafinil was generally well tolerated:
- Headache was the most frequently reported adverse event
- The majority of adverse events were considered mild or moderate in severity
- Label warning: serious rash.

Exogenous Melatonin Improves Sleep During the Biological Day but not the Biological Night

<table>
<thead>
<tr>
<th>Sleep Efficiency (%)</th>
<th>PLA</th>
<th>0.3mg</th>
<th>5.0mg</th>
<th>PLA</th>
<th>0.3mg</th>
<th>5.0mg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[OUT OF PHASE]</td>
<td>75</td>
<td>80</td>
<td>85</td>
<td>80</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>[IN PHASE]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* * * * *

Management of Shift Work Disorder: Work, Social, and Domestic Factors

Countermeasure | General Concepts
---|---
Family & Social Support | - Family rules and planning calendar
- Informing others about sleep/wake schedule
Commuting | - Car pooling or public transportation
- Naps before driving, use of radio, A/C, varied route
Sleep at Home | - Routine sleep schedule, especially on days off
- Noise & light reduction during sleep periods
Health & Wellness | - Exercise; on-duty naps; adequate light and breaks
Shift Worker Participation | - Communication between employer goals & employee needs
Working Conditions | - Staffing levels; workload; job rotation; rest breaks
Ergonomic Design | - Consecutive number, direction, & sequence of shifts
- Start, end, and duration of shifts
Health Care | - Medical surveillance of sleep/wake; staff education re: SWD
Personal Health & Behavior | - Diet; active living; coping strategies
Education | - Manager awareness and social support
- "Shift Work Awareness" programs

Armodafinil Improves MSLT in Patients with SWD

Potential for Circadian Regulation

Melatonin/Agonists
- Possess circadian phase-dependent hypnotic properties.
- Attenuate the wake-promoting drive from the circadian system.
- Allow consolidation of sleep occurring out of phase with endogenous melatonin secretion.
- Have little effect when taken at times when endogenous levels are high or rising.
- May reduce sleep latency times.
- Investigational: No FDA approvals for SWD.
Ongoing Management of Shift Work Disorder

- Regular reviews.
- Increased monitoring for comorbidities/health consequences.
- Consultation with sleep specialists for more complex patients or if comorbid sleep disorders are suspected.

Summary

- Circadian misalignment is associated with multiple health morbidities.
- A thorough sleep history must include assessment of sleep timing in addition to quality and quantity of sleep.
- Personalized management plans are required to address symptoms, circadian misalignment and social, work or domestic factors.
- Shift Work Disorder may be assessed and managed within primary care practices, in most cases.
- Regular follow up with patients is advised.

Question & Answer