Commercial Drivers, OSA, and Employer-Mandated Screening

Maureen Smith, R PSG T, RN, APN-BC
Nurse Practitioner
Rush University Sleep Disorders Center
No financial relationships to disclose.
Objectives

• Identify the higher rates of prevalence of Obstructive Sleep Apnea (OSA) in commercial drivers versus the general population and the higher potential for motor vehicle crashes.

• Be aware of the Federal Motor Carrier Safety Administration (FMCSA) guidelines for screening of OSA in commercial drivers as of May 2014.

• Recognize the important role the sleep technologist play in public safety to ensure high quality polysomnogram monitoring for accurate diagnosis and subsequent treatment of OSA.
What is OSA?

“An apnea is defined as complete or near cessation of airflow for a minimum of 10 sec with or without associated oxygen destaturation and sleep fragmentation.”

Nocturnal symptoms of OSA

- Snoring
- Choking or witnessed apneas
- Insomnia
- Restless sleep
- Nocturia
- Sweating throughout night
- Acid reflux
Waking symptoms of OSA

- Excessive sleepiness or fatigue
- AM headache
- Sore throat or dry mouth
- Poor work performance
- Cognitive dysfunction
- Personality or mood change
Long Term Outcomes of untreated OSA

- Cardiovascular
- Inflammatory
- Metabolic
- Cognitive
- Quality of Life
Clinical and functional outcomes of untreated OSA

- Hypertension and Coronary artery disease
- Stroke
- Insulin resistance
- Depression and/or poor social functioning
- Decreased work productivity
- Memory impairment/Concentration difficulty
- Increased risk of motor vehicle accidents

Risk Factors for OSA

- Increasing age (> 42 yrs)
- Male
- Genetics
- Obesity
- Sedative meds/substances
- Craniofacial abnormalities
- Abnormality of the airway
  - e.g. tonsil enlargement
- Hypothyroidism
Who is at risk for sleep apnea?

- Wisconsin Cohort Study
- Middle age work force – all state employees
  - AHI > 5 9% women and 24% men
  - OSA 2% women and 4% men

Special case: the Commercial Motor Vehicle (CMV) operator

- Prevalence of OSA in CMV drivers is 12-28%
- Untreated OSA increases risk of crash 2-7x
- In US, large trucks and buses kill 5300 and cause 104,000 additional injuries annually
- 30% of above due to fatigue/sleepiness

*National Summary of Large Truck and Passenger Carrier Crashes*. US DOT; 2010
The Sleepy Driver

Do you have a sleep disorder?
Sleep disorders, such as sleep apnea and insomnia are more common than most people realize. See your doctor if you spend 7-9 hours in bed but:
- You consistently take more than 30 minutes to fall asleep.
- You consistently awaken several times during sleep or for long periods.
- You take frequent naps.
- You often feel sleepy, especially at inappropriate times.

Having a sleep disorder doesn’t have to mean going out of service. Simple changes may lessen symptoms. Learn more at, http://www.nhlbi.nih.gov/health/public/sleep/healthy_sleep.pdf

OTHER RESOURCES
- http://www.cdc.gov/sleep
- http://www.sleepfoundation.org/
- http://drowsydriving.org/
- http://www.nhlbi.nih.gov/health/resources/sleep/

Mention of any company or product does not constitute endorsement by the National Institute for Occupational Safety and Health (NIOSH). In addition, citations to websites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these websites. All Web addresses referenced in this document were accessible as of the publication date.

To obtain information about other occupational safety and health topics, contact NIOSH at:
Telephone: 1-800-CDC-INFO (1-800-232-4636)
TTY: 1-888-232-0348 • E-mail: cdcinfo@cdc.gov
or visit the NIOSH website at http://www.cdc.gov/niosh

For a monthly update on news at NIOSH, subscribe to NIOSH eNews by visiting http://www.cdc.gov/niosh/eNews.

August 2014

FOR MORE INFORMATION
Truck drivers and trucking companies wanting more information and strategies on how to sleep better and to reduce the risks associated with fatigue, visit:
http://www.cdc.gov/niosh/topics/workschedules/
http://www.cdc.gov/niosh/nora/sectors/truck

SAFER • HEALTHIER • PEOPLE™

DHHS (NIOSH) Publication No. 2014–150
The Sleepy Driver

THE IMPORTANCE OF SLEEP FOR TRUCK DRIVERS

FOR YOUR HEALTH
Good sleep is as important as proper nutrition and exercise. Your body is busy during sleep, repairing wear and tear and getting you in shape for a new day. Without enough sleep, you might experience:

- Slower reactions, a cloudy mind, or a bad mood
- Weakening of body defenses, increasing your risk for infections, high blood pressure, and diabetes
- Increased appetite, over eating, and obesity

WHERE YOU SLEEP MATTERS
A good sleep environment improves sleep quality. Your sleep environment may depend on your schedule, but you can improve your sleep environment on the road or at home.

- Keep safety in mind. Park with a balance of quiet and safety in mind.
- Block out all light. Close all curtains and truck shades, or use an eye mask.
- Block out noise. Use ear plugs or a "white noise" machine like a fan to block out noises. Silence phones and assign an audible ringtone to important contacts to minimize distractions.
- Keep your cab or bedroom temperature cool. People's temperature preferences vary, so keep your room temperature comfortable for you.
- Get comfortable. You spend one third of your life in bed, so use a comfortable mattress and pillow. Consider upgrading or replacing the mattress in your sleeper if it is old or uncomfortable.

FINE TUNE YOUR ENVIRONMENT

PREPARE FOR BETTER SLEEP
Try to get 7–9 hours of sleep each day; most people need this amount. Be aware of your body's natural feelings of sleepiness. When you are driving, try to plan your stops and sleep breaks to match your natural sleep times. Sleeping at about the same times every day helps improve sleep. Getting sufficient and regular sleep actually will help you fall asleep faster and sleep better in the future. Better sleep will lead to better health and increased alertness. Remember, any exercise during the day that does not take away from sleep time improves sleep.

Avoid before bedtime:
- Heavy or spicy meals (2–3 hours before bed)
- Liquids (to avoid getting up to use the bathroom), especially alcohol, which causes sleep disturbances
- Caffeine (according to your own sensitivity)—this stimulant can help you stay awake while driving, but remember it can affect your body for five hours or more so plan your intake so that it does not prevent you from getting good sleep
- Nicotine and other stimulants
- Exposure to light from television and electronics (tablets, computers, etc.)—studies show that light from these devices can disturb your sleep

Do before bedtime:
- Explain to family, friends, and dispatchers the importance of your sleep, when you will be sleeping, and ask them not to disturb you when you are sleeping to minimize disruptions.
- Driving a truck is a stressful, demanding job. Follow a relaxing routine within an hour or more before bedtime. This will signal to your brain that it is time to sleep. Brushing your teeth, washing your face, and getting undressed for bed will help you relax and fall asleep.
The Sleepy Driver

悦北一器

Overcoming the Dangers of DROWSY DRIVING
National Transportation Safety Board Forum
October 21, 2014
www.ntsb.gov/drowsydriving

Agenda
Opening Remarks: Member Mark R. Rosekind, PhD (8:30 AM–8:40 AM)

PANEL 1: INTRODUCTION AND SCOPE OF THE PROBLEM
(8:40 AM–9:40 AM)
This session will review definitions of drowsy driving, the varying etiologies of fatigue/drowsiness, and fatigue’s known effects on performance. It will also present recent research on the prevalence and impact of drowsy driving on traffic crashes and fatalities.
Panelists:
David Dinges, PhD, University of Pennsylvania
Brian Taft, AAA Foundation

PANEL 2: WORKPLACE ISSUES (9:45 AM–11:00 AM)
This session will look at how workplace policies and practices can affect the safety of employees who commute or those who drive as part of their work assignment.
Panelists:
Stephanie Pratt, PhD, National Institute for Occupational Safety and Health
David Flower, MD, FRCGP, FFOM, FACP, BMJ International
John Violanti, PhD, University at Buffalo, SUNY
MORNING BREAK (11:00 AM–11:15 AM)

PANEL 3: CONCERNS FOR NOVICE DRIVERS
(11:15 AM–12:15 PM)
This session will address risks associated with young drivers, a high-risk group for drowsy driving crashes. Topics will include educating youth about sleep needs, educating novice drivers, graduated licensing with nighttime restrictions, community-based programs, and drowsy driver awareness messages.
Panelists:
Mary Carskadon, PhD, Bradley Hospital
Nathaniel F. Watson, MD, MSc, University of Washington
LUNCH (12:15 PM–1:15 PM)

PANEL 4: HEALTH ISSUES (1:15 PM–2:30 PM)
This session will address health-related risk factors associated with drowsy driving and countermeasures that could mitigate risk due to those factors. The primary focus of the session will be sleep disorders and use of medications associated with sleepiness.
Panelists:
Maurice Ohayon, MD, DSc, PhD, Stanford University
Indira Gurubhagavatula, MD, MPH, University of Pennsylvania
Ronald Farkas, MD, PhD, Food and Drug Administration

PANEL 5: IN-VEHICLE AND ROADWAY FACTORS
(2:35 PM–3:35 PM)
This session will provide an overview of in-vehicle technologies—currently available or under development—designed to mitigate drowsy driving and drowsy driving-related crashes. It will also consider the efficacy and user acceptance of in-vehicle systems, as well as roadway factors.
Panelists:
Frank Sgambati, Bosch
Chris Monti, PhD, National Highway Traffic Safety Administration
Peter Savolainen, PhD, PE, Iowa State University
AFTERNOON BREAK (3:35 PM–3:45 PM)

PANEL 6: CONSIDERATION OF COUNTERMEASURES AND FUTURE DIRECTIONS (3:45 PM–4:55 PM)
The final session will review various countermeasures that could lead to a reduction in drowsy driving crashes. Leaders from the fatigue and traffic safety community will discuss the needed next steps to reduce the incidence of noncommercial drowsy driving crashes.
Panelists:
Charles A. Czeisler, PhD, MD, FRCGP, Harvard Medical School
Jacob Nelson, MPH, MPP, AAA National Office
Allan I. Pack, M.B.Ch.B., PhD, University of Pennsylvania
Stephen J. Popkin, PhD, Volpe, The National Transportation Systems Center

Closing Remarks, Member Mark R. Rosekind, PhD (4:55 PM–5:00 PM)
What are we trying to avoid?
Duty to Report: Medical Conditions

• In 1949, mandatory reporting for epilepsy for passenger cars or private vehicles
• Laws have evolved and vary by state
• Any medical condition that may result in loss of consciousness or impaired functioning:
  • Diabetes, CVD, OSA, Arthritic/Muscular Disease, Mental Disorders, Hearing/Vision, ETOH/Drug use

State Laws for Reporting Med Conditions for Private Drivers

• 3 categories:
  • Mandatory reporting - required to report any illness with potential for fines or criminal penalties for HCP for not reporting (6 states)
  • Permissive reporting - language allowing reporting of patients to DMV or protection from legal action for breach of confidentiality (25 states)
  • None - no law regarding reporting (20 states)*

*includes District of Columbia

Duty to report for CMV operators

• In 1957, Surgeon General distinction: passenger car vs. commercial vehicle driver

• CDL criteria became more restrictive
History of CMV reporting for OSA

• In 1991, Conf on Resp/Pulm Disorders: ask drivers if snore or daytime sleepiness

• In 1998, *Federal Register* added questions regarding dx of sleep disorders and nighttime breathing
FMCSA* Guidelines

• As of 2006, FMCSA guidelines for CMV drivers:
  49 CFR 39.41 (b)(5)

• Expert Panel Guidelines 2008:

• Updated Review 2011:

*Federal Motor Carrier Safety Administration
OSA and CMV Safety: Evidence

• #1: Are individuals with OSA at increased risk for MV crashes when compared to normals?
  • Yes, CMV drivers with OSA do pose increased risk
  • Precise estimate of magnitude of increased risk undetermined

#2: What disease-related factors are associated with increased MV crash risk in those w/ OSA?

- Four factors associated with crash risk in general driver population:
  - 1. degree of subjective sleepiness as measured by ESS
  - 2. severity of sleep disordered breathing (AHI or RDI)
  - 3. severity of blood oxygen desaturation levels
  - 4. high BMI
# OSA and Safety Risk: Evidence

- **#3:** Are CMV drivers with OSA unaware of factors associated with increased crash risk?
  - Drivers with OSA may know their numbers: AHI, Sat O2 nadir, BMI
  - Those with OSA may not be aware of extent of daytime sleepiness
• #4: Are there screening tests that enable examiners to identify those with increased risk of MV crash from OSA?
  • No psychometric test that identifies disease severity
  • No one algorithm is best screening tool for OSA, none predictive of disease severity (2011)
  • Polysomnography (PSG) aka sleep study is only test
    » Sleep Lab (technologist attended) is gold standard
    » Portable monitoring study may be alternative method*

*less expensive, not as accurate, 2011
OSA and Safety Risk: Evidence

• #5: Which treatments reduce crash risk in those with OSA?
  • 1. Continuous Positive Airway Pressure (CPAP)
  • 2. Dental Appliances
  • 3. Surgery
  • 4. Medications with CPAP use (Theophylline, Modafinil)
  • 5. Behavioral modification (weight loss)
CDL- Class A License

CDL-A DRIVERS
$2,500 Sign-On Bonus!

BETTER HOME TIME
2-3 days a week

BETTER MILES
2,500 miles a week

BETTER PAY
$66,000 avg salary

text DRIVE to
51893 for info
855-231-3535 | www.aimntls.com/35
Definition of a CMV

In US, need a Commercial Driver’s License (CDL):
-vehicles with gross weight > 26,001 lbs
Definition of a CMV

- A vehicle that transports quantities of hazardous materials that require DOT placard
Definition of a CMV

A vehicle designed to carry >16 passengers
FMCSA guidelines for CMV operators

• Refer for PSG if any of the following:
  • BMI $\geq 33$ kg/m²
  • Berlin Questionnaire (2 categories positive)
  • Clinical Evaluation suggestive of OSA
# APPENDIX C: The Berlin Questionnaire

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Weight (kg)</th>
<th>Age</th>
<th>Male / Female</th>
</tr>
</thead>
</table>

Please choose the correct response to each question.

## CATEGORY 1

1. Do you snore?
   - □ a. Yes
   - □ b. No
   - □ c. Don’t know

   *If you snore:*

2. Your snoring is:
   - □ a. Slightly louder than breathing
   - □ b. As loud as talking
   - □ c. Louder than talking
   - □ d. Very loud – can be heard in adjacent rooms

3. How often do you snore?
   - □ a. Nearly every day
   - □ b. 3-4 times a week
   - □ c. 1-2 times a week
   - □ d. 1-2 times a month
   - □ e. Never or nearly never

4. Has your snoring ever bothered other people?
   - □ a. Yes
   - □ b. No
   - □ c. Don’t Know

5. Has anyone noticed that you quit breathing during your sleep?
   - □ a. Nearly every day
   - □ b. 3-4 times a week
   - □ c. 1-2 times a week
   - □ d. 1-2 times a month
   - □ e. Never or nearly never

## CATEGORY 2

6. How often do you feel tired or fatigued after your sleep?
   - □ a. Nearly every day
   - □ b. 3-4 times a week
   - □ c. 1-2 times a week
   - □ d. 1-2 times a month
   - □ e. Never or nearly never

7. During your waking time, do you feel tired, fatigued or not up to par?
   - □ a. Nearly every day
   - □ b. 3-4 times a week
   - □ c. 1-2 times a week
   - □ d. 1-2 times a month
   - □ e. Never or nearly never

8. Have you ever nodded off or fallen asleep while driving a vehicle?
   - □ a. Yes
   - □ b. No

   *If yes:*

9. How often does this occur?
   - □ a. Nearly every day
   - □ b. 3-4 times a week
   - □ c. 1-2 times a week
   - □ d. 1-2 times a month
   - □ e. Never or nearly never

## CATEGORY 3

10. Do you have high blood pressure?
    - □ Yes
    - □ No
    - □ Don’t know
ESS scores usually do not differ significantly between normal men and women, nor do they change much with age. About 10–20 percent of the general population have ESS scores > 10 (i.e. 11+).
Clinical evaluation: PMH

• Hypertension (treated or untreated)*

• Type 2 diabetes (treated or untreated)*

• Hypothyroidism (untreated)

*Metabolic syndrome

Clinical evaluation: subjective

- Sleep history of OSA, loud snoring, witnessed apneas, excessive daytime sleepiness*

- Hx of near-MV crash related to sleep disturbance
e.g. run-off road, falling asleep at traffic light

- Family history of OSA

Clinical evaluation: objective

- Small jaw
- Small airway (M3 or 4)
  - Mallampati score
- Large neck size (> 17 inches males, >15.5 females)
Victor, L. (1999). Am Fam Physician,
FMCSA exam guidelines for OSA screening: PPV

- 1443 referred to single Occ Health Clinic
- 190 (13%) positive on ME for further PSG
- 134 underwent PSG; 127 (94.8%) + OSA
- FMCSA screening criteria had positive predictive value for OSA
- None detected if based only on responses to CDME form regarding sleep behavior

Dear medical provider:

During a Department of Transportation (DOT) medical certification examination, the above driver was:

☐ Temporarily disqualified
☐ Given a Limited Certification expiring on: __________________________

The following condition(s) and/or concerns were identified:

__________________________________________________________

__________________________________________________________

We request that you evaluate and treat the driver for the above condition(s). Upon completion of treatment, please complete the bottom section of this form and provide any additional documentation requested, as follows:

[Signature]

A summary of DOT regulations and guidelines are attached for your reference. This driver’s ability to operate a commercial motor vehicle in interstate commerce depends on your timely response to this request before the referenced expiration date.

Treating provider’s statement

As the treating provider of the above commercial driver, I am familiar with the driver’s condition(s) and treatment. I have read the relevant DOT regulation(s) and guidelines; I understand that the driver is in compliance and that:

☐ The identified condition(s) and/or treatment should not cause sudden impairment or interfere with the driver’s ability to safely operate a commercial motor vehicle.

☐ The following condition(s) and/or treatment have the potential to suddenly impair or interfere with the safe operation of a commercial vehicle:

__________________________________________________________

Provider name: __________________________
Specialty: __________________________

[Signature]
Measurements by Physician:

Body Mass Index (BMI) _____ kg/m²
Neck circumference _____ inches
Hypertension: Absent _____ or Present _____ Controlled _____

____ New _____ Requires only 1 drug
____ Uncontrolled
____ Requires ≥ 2 meds for control

Conclusion: ___ No significant OSA Risk  ___ 3 month card  ___ No card

____________________________  _________________
Physician A  Physician B
After initial screening exam: plan

- FMCSA recommends to disqualify drivers who:
  - Report excessive sleepiness when driving
  - Have had a MV crash from falling asleep
  - Have prior dx of OSA, not treated

- Positive screening exam for OSA
  - Refer for PSG
  - If BMI > 33 (high likelihood of OSA), recommend 1 month driving certification awaiting PSG
PSG testing should include

• Drivers should be tested on their usual chronic medication regime
• At least 5 hours of data measurement with minimally:
  • Sleep/Wake time
  • Nasal pressure
  • Oxygen saturation
OSA: Diagnosis - Polysomnogram

- **8 hour overnight study**
  - EEG - 6 leads
  - EOG (EYE) - 2 leads
  - EKG - 2 leads
  - Leg movement - 2 leads
  - Respiratory flow - nasal/ oral sensor
  - $O_2$ saturation - finger pulse oximetry
  - Abdomen and thoracic strain gauges
OSA: Respiratory Events

- Apneas
- Hypopneas
- Respiratory event related arousals
Clinical Definition of OSA

- At least 5 obstructive events per hour of sleep associated with daytime sleepiness, loud snoring, witnessed breathing interruptions or awakenings due to gasping or choking
- 15 or more obstructive respiratory events per hour in the absence of sleep related symptoms

Classification of Severity

- **Mild**
  - AHI 5 – 15 per hour
  - Typically have passive daytime sleepiness

- **Moderate**
  - AHI between 15 – 30 per hour
  - Typically aware of their daytime sleepiness
  - May have increased MVAs or accidents

- **Severe**
  - AHI > 30 per hour and/or oxygen saturation below 90% for more than 20 percent of the total sleep time
  - Disabling daytime symptoms and signs of cardiopulmonary failure, nocturnal angina and polycythemia
### Sleep Study (PSG) Report

#### Sleep Stage

<table>
<thead>
<tr>
<th>Sleep Stage</th>
<th>Latency (mins.)</th>
<th>Minutes</th>
<th>% of TST</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1:</td>
<td>0.0</td>
<td>74.0</td>
<td>33.9%</td>
</tr>
<tr>
<td>N2:</td>
<td>10.0</td>
<td>98.5</td>
<td>45.2%</td>
</tr>
<tr>
<td>N3:</td>
<td>252.0</td>
<td>37.0</td>
<td>17.0%</td>
</tr>
<tr>
<td>R:</td>
<td>281.0</td>
<td>8.5</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

Stage Latency = 0.0 denotes start of sleep.

#### RESPIRATORY EVENTS

<table>
<thead>
<tr>
<th>Count:</th>
<th>Central Apneas</th>
<th>Obs. Apneas</th>
<th>Mxd. Apneas</th>
<th>Hypopneas</th>
<th>Total Apneas</th>
<th>Apnea+ Hypopnea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index (events / hr.):</td>
<td>0.3</td>
<td>2.5</td>
<td>0.0</td>
<td>23.9</td>
<td>2.8</td>
<td>26.7</td>
</tr>
<tr>
<td>Mean Duration (sec.):</td>
<td>12.6</td>
<td>29.2</td>
<td>N/A</td>
<td>16.4</td>
<td>27.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Longest Event (sec.):</td>
<td>12.6</td>
<td>38.2</td>
<td>N/A</td>
<td>40.0</td>
<td>38.2</td>
<td>40.0</td>
</tr>
<tr>
<td>REM Count:</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>10</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>NREM Count:</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>77</td>
<td>7</td>
<td>84</td>
</tr>
<tr>
<td>REM Index:</td>
<td>0.0</td>
<td>21.2</td>
<td>0.0</td>
<td>70.6</td>
<td>21.2</td>
<td>91.8</td>
</tr>
<tr>
<td>NREM Index:</td>
<td>0.3</td>
<td>1.7</td>
<td>0.0</td>
<td>22.1</td>
<td>2.0</td>
<td>24.1</td>
</tr>
</tbody>
</table>

*Note: Does not contain Cheyne Stokes Breathing, Hypoventilation, or Periodic Breathing.*

#### RESPIRATORY EVENTS (Supine, Prone, Left, Right)

<table>
<thead>
<tr>
<th>Duration (hrs:min:sec):</th>
<th>Supine Count</th>
<th>Supine Index</th>
<th>Prone Count</th>
<th>Prone Index</th>
<th>Left Count</th>
<th>Left Index</th>
<th>Right Count</th>
<th>Right Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstructive Apneas:</td>
<td>9</td>
<td>5.4</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Central Apneas:</td>
<td>1</td>
<td>0.6</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mixed Apneas:</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Hypopneas:</td>
<td>78</td>
<td>47.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>9</td>
<td>4.6</td>
</tr>
<tr>
<td>RERAs:</td>
<td>0</td>
<td>0.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total*:</td>
<td>88</td>
<td>53.1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>9</td>
<td>4.6</td>
</tr>
</tbody>
</table>

*Note: Does not contain Cheyne Stokes Breathing, Hypoventilation, or Periodic Breathing.*

#### OXYGEN SATURATION

<table>
<thead>
<tr>
<th>Wake</th>
<th>NREM</th>
<th>REM</th>
<th>TST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. SpO2%:</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Mean SpO2%:</td>
<td>98.4</td>
<td>98.4</td>
<td>98.2</td>
</tr>
<tr>
<td>Min. SpO2%:</td>
<td>90.0</td>
<td>86.0</td>
<td>90.0</td>
</tr>
<tr>
<td>SpO2% &lt;= 89% (min.)</td>
<td>0.0</td>
<td>0.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Does CPAP work?

- Reduces car accidents

- Reduces blood pressure

- Reduces healthcare utilization

- Reduces nocturnal GERD
Specific treatment guidelines: CMV operator

- **CMV drivers with AHI ≥ 20**: 
  - CPAP as first line therapy
  - **Surgical options:**
    - Bariatric
    - Oropharyngel
    - Facial bone surgery
    - Tracheostomy
  - Dental Device/Oral Appliance-**NOT** recommended
    - Variable efficacy
    - Not able to monitor compliance

*Discuss benefits of CPAP for those AHI < 20*
Plan of Care: Education

- Findings of study; severity of disease
- Pathophysiology of OSA
- Associated disorders
- Risk factor modification (weight loss, smoking cessation)
- Treatment options & what to expect from treatment
- Patient’s role in treatment (concerns & goals)
- Consequences of untreated disease
- Drowsy driving/sleepiness counseling
- Patient assessment & feedback regarding evaluation
- Loss of CDL without treatment

Plan of care: CPAP

• All CMV operators should have a CPAP machine able to download compliance data*:
  • Time on CPAP therapy (nightly duration of use)
  • CPAP pressure
  • Estimated AHI

• For Fitness for Duty, at all clinic visits:
  • must show average usage of at least 4 hrs, 70% of time
  • AHI ≤ 5 but
  • must be AHI ≤ 10 without subjective sleepiness

*FMCSA guidelines
Plan of care: 1 month follow-up

• Must show compliance:
  • Min acceptable: CPAP use > 4 hrs, 70% of time
    • Min timeframe for subjective improvement
  • Provisional 3 month medical certification
  • Schedule a 3 month follow-up appointment
    • CPAP compliance check
## Compliance Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Range</td>
<td>3/11/2012 - 3/25/2012 (15 days)</td>
</tr>
<tr>
<td>Days with Device Usage</td>
<td>15 days</td>
</tr>
<tr>
<td>Days without Device Usage</td>
<td>0 days</td>
</tr>
<tr>
<td>Percent Days with Device Usage</td>
<td>100.0%</td>
</tr>
<tr>
<td>Cumulative Usage</td>
<td>4 days 9 hrs. 21 mins. 10 secs.</td>
</tr>
<tr>
<td>Maximum Usage (1 Day)</td>
<td>9 hrs. 3 mins. 56 secs.</td>
</tr>
<tr>
<td>Average Usage (All Days)</td>
<td>7 hrs. 1 mins. 24 secs.</td>
</tr>
<tr>
<td>Average Usage (Days Used)</td>
<td>7 hrs. 1 mins. 24 secs.</td>
</tr>
<tr>
<td>Minimum Usage (1 Day)</td>
<td>5 hrs. 52 mins. 24 secs.</td>
</tr>
<tr>
<td>Percent of Days with Usage &gt;= 4 Hours</td>
<td>100.0%</td>
</tr>
<tr>
<td>Percent of Days with Usage &lt; 4 Hours</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total Blower Time</td>
<td>4 days 9 hrs. 21 mins. 10 secs.</td>
</tr>
</tbody>
</table>

## Sleep Therapy Statistics

- Average Time in Large Leak Per Day: 48 secs.
- Average AHI: 2.4
- CPAP Pressure: 9.0 cmH2O
CPAP use: Poor Compliance

Summary of Compliance - All Data

<table>
<thead>
<tr>
<th>Compliance Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Range</td>
<td>1/1/2012 - 3/20/2012 (80 days)</td>
</tr>
<tr>
<td>Days with Device Usage</td>
<td>23 days</td>
</tr>
<tr>
<td>Days without Device Usage</td>
<td>57 days</td>
</tr>
<tr>
<td>Percent Days with Device Usage</td>
<td>28.7 %</td>
</tr>
<tr>
<td>Cumulative Usage</td>
<td>132 hrs. 25 mins.</td>
</tr>
<tr>
<td>Maximum Usage (1 Day)</td>
<td>8 hrs. 13 mins.</td>
</tr>
<tr>
<td>Average Usage (All Days)</td>
<td>1 hrs. 39 mins.</td>
</tr>
<tr>
<td>Average Usage (Days Used)</td>
<td>5 hrs. 45 mins.</td>
</tr>
<tr>
<td>Minimum Usage (1 Day)</td>
<td>1 hrs. 27 mins.</td>
</tr>
<tr>
<td>Percent of Days with Usage &gt;= 4 hours</td>
<td>22.5 %</td>
</tr>
<tr>
<td>Percent of Days with Usage &lt; 4 hours</td>
<td>77.5 %</td>
</tr>
<tr>
<td>Total Blower Hours (During Reported Period)</td>
<td>132 hrs. 25 mins.</td>
</tr>
</tbody>
</table>

Average Humidifier Setting: 3.3, Last Setting: 3
Average Flex Setting: 2.0, Last Setting: 2
CPAP with C-Flex
CPAP Noncompliance

• Adherence rates for CPAP vary from 40% to 80%

• Adherence rates for antihypertensive medications ranged from 34% to 78% at 1 year
At 3 month follow-up

- At 3 month follow-up appointment:
  - If continued CPAP compliant, consider 1 year medical certification

- Some Sleep Centers require further testing:
  - Repeat CPAP PSG on therapeutic pressure with next day Maintenance of Wakefulness Testing (MWT)
What is the MWT?

- Measures ability to stay awake under conditions that promote sleep
- Daytime test with EEG monitoring
- Patients are asked to sit upright chair, remain awake in a quiet, darkened room
- Four tests of 40 minute duration q 2hrs

MWT - valid for risk of MV crash?

- Staying awake is different behaviorally than tendency to fall asleep

- Improved test results with CPAP use
MWT: alertness with CPAP use

- MWT allows you to better state a driver’s case
  - May limit legal liability
  - Objective data of time spent on CPAP to stay awake
  - Objective data of daytime alertness
  - Predictive value of crash risk with MWT poor
    - Prior sleep, circadian variability, shift work, mood, compliance with medical treatments (CPAP)

Maintenance of Wakefulness Test
Benefit of repeat CPAP PSG + MWT

- Data: CPAP compliant for 2-4 wks prior to PSG
- CPAP PSG titration at optimal pressure
- Objective treatment of sleep apnea
- Total sleep time on CPAP
- Documented MWT results WNL

  “Mr. X. can perform regular work duties requiring alertness on the condition he obtain 8-9 hours of total sleep time with a regular sleep-wake schedule and continues to successfully use his CPAP machine in order to optimize his daytime alertness.”
Follow-up management

- CMV operators with OSA must be certified annually

- Retesting (PSG) not required if demonstrated objective compliant CPAP use and controlled OSA on CPAP machine data download report

- Matched by subjective report of driver
Why important for Sleep Techs?

• High quality PSG monitoring and data analysis ensures appropriate diagnosis and effective therapy (PAP titration or AutoPAP)
• Recognize that CMV operators are unique patients who may challenge PSG validity
• FMCSA current guidelines for PSG testing for OSA effective as of 5/21/2014-you play an instrumental role in a public safety issue!

US Dept of Transportation, FMCSA, National Registry of Certified Medical Examiners; http://nrcme.fmcsa.dot.gov/about_faqs.aspx
Questions?