



The National Healthy Sleep Project involves a partnership between the American Academy of Sleep Medicine (AASM), the Center for Disease Control (CDC) and Sleep Research Society (SRS). The long-term goal of the project is to promote improved sleep health in the U.S. The project will increase public awareness of the importance of healthy sleep. It also will promote the treatment and prevention of sleep disorders.

## **Obstructive Sleep Apnea in Commercial Drivers**

Erin O'Shea, DO and Anthony Izzo, DO

The two central components of healthy sleep are sufficient quantity and quality. On average, adults require about 7.5 hours of good quality sleep per night. Obstructive sleep apnea (OSA) is a prevalent, yet under-diagnosed condition in the general population characterized by repeated upper airway collapse that leads to oxygen desaturation and arousals from sleep, which in turn disrupts quality of sleep. In addition to increasing risk for cardiovascular disease, hypertension, stroke and atrial fibrillation, OSA has short term consequences that range from mild to severe. Untreated OSA can lead to chronic sleep insufficiency, and the most prominent symptoms include excessive daytime sleepiness (EDS) and unrefreshing sleep.

The estimated prevalence of OSA in the US general population is 4%. Risk factors include obesity, male sex, increasing age, increased neck circumference (greater than 16 inches in women and 17 inches in men) and certain craniofacial features – retrognathia,

macroglossia and highly arched palate. In the population of commercial drivers, the prevalence is estimated to be much higher at 15 to 30%, largely due to the increased number of males in the profession as well as increased prevalence of obesity and sedentary lifestyle in drivers.

One of the most prominent symptoms of OSA is excessive daytime sleepiness. This is measured subjectively using the Epworth Sleepiness Scale (ESS), which asks patients to rate their likelihood of falling asleep in eight difference scenarios from 0-3. A study from Australia showed that adults without evidence of a chronic sleep disorder had a mean ESS of  $4.6 \pm 2.8$ .<sup>1</sup> The normal range (defined by 2.5 and 97.5 percentiles) is 0 to 10. A higher score is correlates with a higher level of subjective daytime sleepiness.

In the setting of occupational health, EDS is arguably the most important consequence of OSA as it leads to drowsy driving or even falling asleep behind the wheel (sleep

attacks). The effects of EDS are comparable to those of alcohol consumption<sup>1</sup>, leading to psychomotor deficits, concentration, judgement and memory impairment, and slowed reaction times. This is especially concerning for commercial and professional drivers as these impairments lead to an increased risk of motor vehicle accidents. An estimated 10 to 30% of all crashes and 21 to 31% of fatal crashes have found drowsy driving and/or falling asleep behind the wheel as the root cause.<sup>(3, 4, 5)</sup> Since OSA can lead to EDS, which in turn can lead to drowsy driving, it is not surprising that drivers with OSA had more than a two times greater risk of crashing than drivers without OSA (RR = 2.43, 95% CI:1.21-4.89).<sup>6</sup> Indeed, Hakkanen and Summala found that 22% of long haul truck drivers in Finland admitted to dozing while driving at least 2 times in the past 3 months of their study.<sup>7</sup> Commercial vehicle crashes are 7 times more likely to be fatal compared to non-commercial vehicle crashes.<sup>8</sup>

Currently in the US, the only mandated screening of the 14 million commercial driver's license holders for any sleep related disorder is to complete a federal medical examination questionnaire, which includes only one sleep-related question: "Do you have sleep disorders, pauses in breathing while asleep, daytime sleepiness, loud snoring?" In 2009, a study by Parks et al revealed that among drivers at high risk for OSA, 85% answered "no" to this question.<sup>9</sup>

Self-reporting of sleep related problems may be biased due to drivers' fear of perceived financial and/or occupational consequences of such problems, such as losing their job or having to incur the additional costs of diagnosis and treatment.

In 2006, the Joint Task Force of representatives from the American College of Chest Physicians (ACCP), the American College of Occupational and Environmental Medicine and the National Sleep Foundation, published guidelines for identifying OSA in commercial drivers.<sup>10</sup> The summary of the recommendations is as follows:

Drivers meeting one or more of the six criteria are considered to have OSA or probable OSA:

1. Any of the following symptoms: snoring, EDS, witnessed apneas
2. History of MVA likely related to sleep disturbance (run off road, at-fault, rear-end collision)
3. Previous OSA diagnosis; prior PSG with AHI>5; reported CPAP prescription and/or use
4. ESS > 10
5. Sleeping in examination or waiting room
6. Two or more of the following:
  - a. BMI  $\geq$  35kg/m<sup>2</sup>
  - b. Neck circumference > 17 inches in men, 16 in women
  - c. Hypertension (new, uncontrolled or requiring 2 or more medications for control)

Diagnosis of OSA is by polysomnography (PSG) or home sleep test (HST) demonstrating sleep disordered breathing with an apnea-hypopnea index (AHI) of greater than 5.

The mainstay of OSA treatment is CPAP (continuous positive airway pressure). With this modality effectiveness of and compliance with treatment can be objectively monitored. Other treatment modalities include surgical

options, oral appliances, lifestyle modification (weight loss, alcohol restriction) and positional sleeping, which cannot be objectively monitored. Once diagnosed, commercial driver's license holders are often required to demonstrate compliance with OSA treatment, which most often includes CPAP therapy.

There is evidence that treatment of OSA with CPAP decreases the risk of vehicle crashes in the general population in those subjects who are compliant with treatment. Tregear et al conducted a meta-analysis of 9 observational studies investigative the risk of crashing in drivers diagnosed with OSA before and after treatment with CPAP and found a risk reduction after treatment (risk ratio = 0.278, 95% CI 0.22 to 0.35;  $P < 0.001$ ).<sup>11</sup>

In conclusion, untreated obstructive sleep apnea, which is very common in the US commercial driver population, leads to increased risk of both fatal and non-fatal motor vehicle crashes. There is currently no federally mandated effective screening, but effective screening tools do exist. If diagnosed with obstructive sleep apnea, literature demonstrates that effective treatment with CPAP therapy can decrease the risk for vehicle crashes and associated morbidity, mortality and cost.

## References

1. Johns MW, Hocking B. Daytime sleepiness and sleep habits of Australian workers. *Sleep* 1997; 844-949

2. Dawson A, Reid K. Fatigue, alcohol and performance impairment. *Nature* 1997; 388:235.
3. AAA Foundation for Traffic Safety. A report on the determination and evaluation of the role of fatigue in heavy truck accidents. Washington DC: AAA Foundation for Traffic Safety, October 1995.
4. Radun I, Summala H (2004) Sleep-related fatal vehicle accidents: characteristics of decisions made by multidisciplinary investigation teams. *Sleep* 27, 224-7.
5. Philip P (2005) Sleepiness of occupational drivers. *Industrial Health* 43, 30-3.
6. Tregear S, Reston J, Schoelles K, Phillips B (2009) Obstructive sleep apnea and risk of motor vehicle crash: systematic review and meta-analysis. *J Clin Sleep Med* 5, 573-81.
7. Hakkanen H, Summala H (2000) Sleepiness at work among commercial truck drivers. *Sleep*, 23, 1-9.
8. NHTSA. Traffic Safety Facts: 2007 Data. DOT report number DOT HA 810 98.
9. Parks P, Durand G, Tsismenakis AJ, Vela-Bueno A, Kales S (2009) Screening for obstructive sleep apnea during commercial driver medical examinations. *J Occup Environ Med* 51, 275-82.
10. Hartenbaum N, Collop N, Rosen IM, Phillips B, George CF, Rowley JA, Freedman N, Weaver TE, Gurubhagavatula I, Strohl K, Leaman HM, Moffitt GL; American College of Chest Physicians; American College of Occupational and Environmental Medicine; National Sleep Foundation

- (2006) Sleep apnea and commercial motor vehicle operators: statement from the joint task force of the American College of Chest Physicians, the American College of Occupational and Environmental Medicine, and the National Sleep Foundation. *Chest* 130, 902–5.
11. Tregear S, Reston J, Schoelles K, Phillips B. Obstructive sleep apnea and risk of motor vehicle crash: systematic review and meta-analysis. *J Clin Sleep Med* 2009;5:573–81
  12. Kales S, Straubel M (2014) Obstructive sleep apnea in North American commercial drivers. *Industrial Health* 2014, 52, 13-24.
  13. Pizza F, Contardi S, Mondini A, Trentin L, Cirignotta F (2009) Daytime sleepiness and driving performance in patients with obstructive sleep apnea: comparison of the MSLT, the MWT, and a simulated driving task. *Sleep*, 32, 382-391