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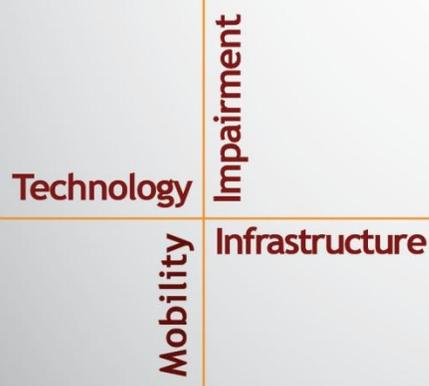
National Surface Transportation
Safety Center for Excellence

Case Study on the Impact of Treating Sleep Apnea in Commercial Motor Vehicle Drivers

Sleep Apnea Programs from Two Leading
U.S. Carriers and Focus Group Findings

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EXECUTIVE SUMMARY

Overview

Two leading U.S. carriers, Schneider National, Inc. (SNI) and J.B. Hunt Transport, Inc. (JBH), partnered with commercial sleep apnea providers, Precision Pulmonary Diagnostics (PPD) and SleepSafe Drivers, Inc. (SSD), who later partnered with FusionHealth, respectively, to implement obstructive sleep apnea (OSA) programs that screen, diagnose, treat and manage their OSA-positive commercial motor vehicle (CMV) drivers. The current project, *Case Study on the Impact of Treating Sleep Apnea in Commercial Motor Vehicle Drivers*, included focus groups and phone interviews with drivers and staff involved in each OSA program to assess drivers' and staff perceptions and opinions of their respective OSA programs.

Procedures

Virginia Tech Transportation Institute (VTTI) research personnel conducted the driver focus groups at fleet terminal locations. A total of 15 drivers participated in the focus groups. After discussing all components in the OSA program, including screening, education, testing, treatment, and compliance, SNI and JBH drivers were asked to list the benefits and drawbacks they experienced while participating in the OSA program. SNI, JBH, PPD, and FusionHealth staff were interviewed over the phone and/or face-to-face at a central location. A total of 17 staff participated in the phone interviews and/or focus groups. These staff participants were asked to list procedures that assisted in the implementation of the OSA program for SNI and JBH drivers as well as any challenges they faced.

Program Outcomes

The following summary discusses key program outcomes highlighted by SNI and JBH drivers and SNI, JBH, PPD, and FusionHealth staff involved in their respective OSA programs. Overall, the majority of drivers expressed satisfaction with participating in their carrier's OSA program. Drivers reported benefits of the programs, including: their quality of sleep was better, they had more energy and felt better rested, they were experiencing improved health, and they were less worried that they would fall asleep while driving. Drawbacks of the programs reported by drivers included discomfort while sleeping with the positive airway pressure (PAP) device and mask discomfort, and complaints about the PAP device (including using it at home and cleaning and maintaining it). Drivers also complained about being "tied to" the PAP device, having to use the device during their personal time, and that treatment is a life-long adjustment.

Overall, OSA program personnel believed their OSA programs were successful and were eager to continue refining and improving the programs. OSA program personnel cited several supports that aided in implementing and maintaining the OSA programs, including having a supportive team of carrier and OSA provider staff that prioritized roadway safety and driver health. Another significant support noted by staff was having an effective compliance monitoring protocol in place accompanied by consistent follow-up with drivers. Staff also reported challenges they faced while implementing and maintaining the OSA programs, including gaining driver acceptance of the program and significant time delays between screening and testing drivers for OSA due to the high volume of drivers at risk for OSA. Staff also noted logistical challenges

inherent to the trucking industry and the mobile workforce of drivers, as well as collecting and organizing PAP compliance data due to the volume of data received.

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LIST OF ABBREVIATIONS AND SYMBOLS

AHI	Apnea-Hypopnea Index
APAP	Automatic positive airway pressure
BMI	Body mass index
CDL	Commercial driver's license
CMV	Commercial motor vehicle
CPAP	Continuous positive airway pressure
DBL	Driver Business Leader
DOT	Department of Transportation
EKG	Electrocardiogram
EMR	Electronic medical records
ESS	Epworth Sleepiness Scale
FDA	U.S. Food and Drug Administration
FMCSA	Federal Motor Carrier Safety Administration
FOSQ	Functional Outcomes of Sleep Questionnaire
HIPAA	Health Insurance Portability and Accountability Act
JBH	J.B. Hunt Transport, Inc.
NTSB	National Transportation Safety Board
OSA	Obstructive sleep apnea
PAP	Positive airway pressure
PPD	Precision Pulmonary Diagnostics
PSG	Polysomnogram/Polysomnography
SSD	SleepSafe™ Drivers, Inc.
SSSQ	Somni-Sage® Screening Questionnaire
SNI	Schneider National, Inc.
VPAP	Bi-level PAP
VTTI	Virginia Tech Transportation Institute

CHAPTER 1. INTRODUCTION

Obstructive sleep apnea (OSA), the most common sleep disorder, is caused by repetitive collapse of the upper airway during sleep. These interruptions in breathing deprive the body of oxygen and induce numerous stressful arousals throughout the night, thus resulting in fragmented and insufficient restorative sleep. Young and colleagues estimated that between 2% and 4% of the U.S. population have mild OSA.^[1] This estimate is likely to be higher given the strong relationship between obesity and OSA and the increased prevalence of obesity since the Young study, which included data collected in the Wisconsin Sleep Cohort Study, initiated in 1988.^[1]

When considering commercial motor vehicle (CMV) drivers as a population, there are few published reports of their status for body mass index (BMI). A study of 4,286 randomly sampled commercial driver's license (CDL) holders in the Philadelphia area revealed that approximately half were obese, with a BMI of 30 kg/m² or more, and another 38% were overweight with a BMI of 25 to 29.9 kg/m².^[2] A more recent study by Wiegand et al.^[3] found the prevalence of obesity among CMV drivers to be higher (53.4% of the sample). Given the distributed operations in long-haul trucking, limited access to healthy food options, and the sedentary lifestyle, it is not surprising that the prevalence of obesity among CMV drivers far outpaces the U.S. adult population. Furthermore, given the higher rates of obesity in CMV drivers, approximately one in four CMV drivers in the United States are estimated to possess mild or higher levels of OSA, with moderate and severe OSA found in 5.8% and 4.7% of this population, respectively.^[4, 5]

Individuals with OSA are at a greater risk for developing diabetes, hypertension, coronary artery disease, myocardial infarction, congestive heart failure, and stroke.^[6] After following 1,522 people over the course of 13 years, Young et al.^[7] found that individuals with severe sleep-disordered breathing were three times more likely to die during the study than those without breathing problems during sleep. Beyond health-related complications, OSA can be especially dangerous in CMV drivers since a major symptom of OSA is excessive daytime sleepiness. Excessive daytime sleepiness may negatively influence behavior, and can result in poor judgment and impairments in concentration, memory, and cognitive function.^[8] These decrements may explain why passenger car drivers with mild, moderate, and severe OSA were 2.6, 1.9, and 2.0 times more likely, respectively, to be involved in a vehicle crash than were controls.^[9] CMV drivers with OSA are likely to be at greater risk for involvement in a vehicle crash given their significant road exposure. In fact, Pack et al. found that CMV drivers with severe OSA were 4.6 times more likely to be involved in a severe crash during a 7-year period than were CMV drivers without OSA.^[4]

OSA Screening and Testing

Because of these safety concerns, the Federal Motor Carrier Safety Administration (FMCSA) Medical Review Board^[10], the National Transportation Safety Board (NTSB)^[11], and a Joint Task Force comprising the American College of Occupational and Environmental Medicine, the American College of Chest Physicians, and the National Sleep Foundation^[12] have strongly supported the implementation of federal mandates to screen and test all CMV drivers with Class-A and Class-B CDLs for OSA. FMCSA currently has a regulation that states that a CMV driver is physically qualified to drive if that driver has no established medical history or clinical diagnosis of a respiratory dysfunction likely to interfere with his/her ability to control and safely

drive a CMV (49 CFR 391.41[b] subpart 5); however, there are no current regulations on mandatory screening and testing of CMV drivers. Thus, drivers may be unwilling to voluntarily consult their physician about OSA as it may disqualify them from driving if they are diagnosed with OSA and do not seek treatment (the current FMCSA regulation does not disqualify drivers who are treating their OSA with positive airway pressure [PAP]).

OSA Treatment

OSA treatment methods, including weight reduction and upper airway surgery, have proven successful in maintaining an open upper airway during sleep by preventing the posterior backward movement of tongue and soft palate from narrowing the airway.^[13] However, the most prescribed and cost-effective first-line treatment for OSA is nasal continuous positive airway pressure (CPAP).^[14] CPAP establishes a pneumatic splint in the nasopharyngeal airway to prevent upper airway collapse during sleep.^[15] Studies have consistently shown that CPAP therapy reduces overall airway resistance, thereby decreasing OSA severity, improving sleep quality and reducing daytime sleepiness and fatigue.^[16]

However, automatic PAP (APAP), which adjusts to changes in airway pressures during inspiratory/expiratory effort, has also been shown as an effective treatment for OSA.^[17-19] In 2008, the American Academy of Sleep Medicine stated that APAP is an appropriate choice of therapy for moderate to severe sleep apnea in those without significant co-morbidities.^[20] APAP has also been shown to result in an overall reduction in delivery pressure and potentially improves adherence to therapy.^[21, 22] Although fixed CPAP requires in-laboratory polysomnography, APAP can be “self-titrated” outside of the sleep laboratory.

OSA Case Study

The high costs associated with screening and testing drivers for OSA, as well as treatment via PAP, may dissuade carriers from investing in an OSA program with their drivers without data showing a positive return-on-investment (in terms of reduced health costs, lower crash rates, and improved driver retention). Additionally, many carriers are unlikely to possess the resources or knowledge necessary to implement an effective OSA program with their drivers. Fortunately, two leading U.S. carriers, Schneider National, Inc. (SNI) and J.B. Hunt Transport, Inc. (JBH) have partnered with commercial sleep apnea providers, Precision Pulmonary Diagnostics (PPD) and SleepSafe™ Drivers, Inc. (SSD) and their partner FusionHealth, respectively, to implement OSA programs to screen, diagnose, treat, and manage their OSA-positive CMV drivers. SNI initiated a pilot OSA program in 2003 with PPD and has since expanded it to mandatory fleet-wide screening, testing, and treatment. JBH initiated a voluntary pilot program in 2008 with SSD, who later included FusionHealth in the trial program. JBH has since expanded the sleep program nationally with SSD.

The current “Case Study” provides an overview of these two OSA programs; outlines each carrier’s screening, testing, and compliance protocol; and compares and contrasts the two carriers’ approaches. Focus group research was also conducted with drivers and staff involved in each OSA program to assess drivers’ and staff perceptions and opinions of their respective OSA programs. A set of best practices will be developed which will provide recommendations and guidance for implementing and maintaining a successful OSA program for the trucking industry. However, the business case (i.e., return-on-investment) for implementing an OSA program has

not been completed and is not included in the current report. The research team believed that carriers deliberating on implementing an OSA program with their drivers, or in the early stages of implementing an OSA program, would benefit from an overview of two successfully implemented OSA programs in CMV operations. The current report will be updated to include the business case for implementing an OSA program when data collection and analyses have been completed.

CHAPTER 2: METHODS

To provide an overview of each carrier's OSA program, the Virginia Tech Transportation Institute (VTTI) team worked with executives and staff at SNI, JBH, PPD, and FusionHealth to accurately detail and describe their OSA program protocols. Each program is described in terms of OSA screening, testing, treatment, compliance monitoring, and follow-up.

Focus groups were conducted with drivers and staff involved in each OSA program to assess their perceptions and opinions of their carrier's OSA program. Four focus group meetings (one each with drivers and staff participating in SNI or JBH's OSA programs), each lasting approximately 120 minutes, were conducted. Between 5 and 10 participants were recruited in each focus group. Phone interviews, each lasting approximately 90 minutes, were also conducted with staff participants that were unable to attend the focus group meetings. There was no exclusion criteria based on sex, health, status, or ethnicity; however, all participants were required to be eligible for employment in the United States, possess a valid Class-A CDL (if a driver), and be currently involved in their carrier's OSA program. Upon arrival to the focus group meeting, all participants consented to participate and completed a brief survey which collected demographic information and inquired about the participant's experience with the respective carrier's OSA program. The driver and staff interview guides were structured similarly; however, each was geared for the population of interest. Each focus group and phone meeting consisted of six parts:

- I) **OSA Program Participation:** Drivers were asked about their likes and dislikes about participating in the OSA Program. Staff participants were asked about their position at the company and their roles and responsibilities within the OSA program.
- II) **Screening, Testing, and Education:** Participants were asked to review and discuss the steps in this process, how they would revise this process, and about their opinions regarding each step and suggestions for improvement.
- III) **Recommended Treatments:** Drivers were asked to list each treatment recommended to them in their OSA program. Drivers were also asked to discuss their experiences with each treatment and describe the education and training they received. Staff participants were asked to list each OSA treatment recommended to drivers, to discuss their experiences with each treatment, and to describe what (if any) education and training they provide drivers.
- IV) **Treatment Compliance:** Drivers were asked to sort each treatment into categories to rate ease of compliance and discuss barriers and supports regarding PAP compliance. Staff participants were asked to sort each treatment into categories to rate the ease of compliance monitoring and to discuss barriers and supports in compliance monitoring.
- V) **Program Outcomes:** Drivers were asked to list and discuss benefits and drawbacks in participating in the OSA program. Staff participants were asked to discuss supports and challenges in implementing an OSA program for carriers.
- VI) **Closing Thoughts:** Participants were asked to express any important issues and ideas that were not brought up during the meeting.

All focus group meetings were audio-recorded for later transcription and analysis. Participant responses were analyzed via content analysis (adapted from a framework analysis methodology).^[23]

CHAPTER 3: OSA PROGRAM PROTOCOLS

Precision Pulmonary Diagnostics Protocol

PPD, founded in 2005, is committed to diagnosing and treating OSA in commercial drivers/operators to improve driver health and safety and provide a significant return-on-investment for employers. Several leaders in the trucking industry have chosen PPD as their sleep apnea provider, including SNI, H.O. Wolding, and Swift Transportation. PPD's integrated, patented program includes web-based screening tools, diagnosis, treatment, and monitoring of OSA in commercial drivers. Since 2006, PPD has served as SNI's sleep apnea provider to screen all of their CMV drivers for OSA, test those at high risk for the disorder, and treat and monitor those drivers diagnosed with OSA.

Screening

Sleep-related questionnaires and objective sleep tests are the most common and cost-effective methods to use for screening for OSA. Sleep questionnaires, including the Epworth Sleepiness Scale (ESS), the Functional Outcomes of Sleep Questionnaire (FOSQ), and the Berlin Questionnaire, are all validated OSA screening tools in general adult populations where there is no pre-existing resistance to diagnosis.^[24-26] Unfortunately, as a group, truck drivers are different in this regard.^[27, 28] Sleep tests, including the Multiple Sleep Latency Test and the Maintenance of Wakefulness Test, evaluate daytime sleepiness and fatigue; however, these laboratory-based tests have limited utility in some populations, including the case of shift workers.^[29-31]

PPD has developed a proprietary web-based screening tool, the Somni-Sage® Screening Questionnaire (SSSQ), to identify drivers at risk for OSA (see Appendix A for the SSSQ). This self-report questionnaire includes items that can divulge information regarding OSA symptoms and coexisting conditions predictive for OSA. The questionnaire takes about 5 to 10 minutes to complete and includes approximately 30 subjective and objective items, including demographic and medical questions. As drivers may try to conceal OSA symptoms for fear it may jeopardize employment and/or require them to receive OSA treatment in order to drive, the SSSQ was designed to classify individuals based on the likelihood of OSA while minimizing drivers' ability to "trick" the system by providing false answers. The questionnaires are scored and ranked to determine the likelihood a driver may have OSA (with Class 4 representing the lowest probability and Class 1 the highest probability). The results are then posted to a secure website that can be accessed by SNI for review and scheduling of laboratory polysomnograms (PSG), with preference given to Class 1 drivers.

PPD uses the SSSQ to screen all existing SNI drivers during spring and winter training and new hires during their entrance paperwork. PPD and SNI are currently working toward fleet-wide screening, as well as re-screening drivers, as they continue to refine and expand the OSA program. In addition to the SSSQ, SNI drivers may also be referred to undergo an overnight laboratory PSG through several other modes, including: (i) a DOT certifying physician may refer a driver for a PSG based on information from the certification exam, (ii) an SNI safety manager or occupational health nurse who believes a driver may have a high likelihood of OSA (based on conversations with the driver, such as frequent sleepiness, etc.) can refer a driver, and (iii) self-report from the driver or a report from another driver (i.e., a team driver). These additional

modes of screening identify SNI drivers that likely have OSA who may have “slipped through the cracks” (i.e., have not taken the SSSQ or concealed responses on the SSSQ).

Scheduling and Outreach

Once an SNI driver has been identified as “Class 1” via his/her responses on the SSSQ, or has been referred for PSG testing by one of the methods described above, PPD works with SNI to schedule the driver for an overnight laboratory PSG at one of PPD’s multiple partnering sleep laboratories around the country that is most convenient for the driver in question. SNI drivers are scheduled for a PSG based on their Class categorization, such as those with severe co-morbidities, and the date they completed the SSSQ (with those ranked in Class 1 given priority). Approximately 50 to 60 SNI drivers are scheduled to undergo a laboratory PSG each month. Prior to the driver being tested, PPD begins OSA outreach by educating the driver on OSA symptoms, adverse consequences, and treatment, as well as what they can expect in the overnight laboratory PSG test.

Laboratory Polysomnography

All Class 1 SNI drivers complete a full-night Type 1 PSG to properly diagnose OSA (see Figure 1 for a typical Type 1 PSG). This overnight sleep study provides a comprehensive recording of multiple physiologic parameters related to sleep and health and is considered the gold standard for OSA diagnosis and several other sleep disorders.^[32] The driver arrives at the sleep laboratory in the early evening for an introduction to the sleep laboratory environment, which includes a private room, similar to a hotel room, where the driver will sleep that night. A sleep technician will attach multiple wires and electrodes to the driver so that several channels of data can be recorded when the driver falls asleep. Recorded data include brain activity, heart rate and rhythm, airflow, oxygen saturation, chin and eye movement, and chest, abdominal and leg movement. Wires for each channel of recorded data lead from the driver into a recording device placed near the driver, often on a nightstand. This recording device transmits all data to a computer system for recording, storing, and displaying the data. A video camera in the driver’s sleeping chamber is also recording the driver throughout the night. A sleep technician is monitoring all data and video in real time as the driver sleeps. The next morning, the driver will wake up or be awakened by a sleep technologist and all sensors and wires will be disconnected.



Figure 1. Patient Undergoing a Laboratory PSG

To ensure the PSG does not interfere with drivers' work schedules, sleep tests are scored and interpreted by the participating sleep physician the morning following the SNI driver's laboratory PSG (i.e., prior to the driver leaving the sleep clinic). The sleep test is scored by interpreting the following information: (i) sleep onset latency, or the onset of sleep from the time the lights were turned off, (ii) sleep efficiency, or time asleep divided by time in bed, (iii) sleep stages, (iv) apneas and hypopneas (complete and partial, respectively), which are cessations of airflow for at least 10 seconds followed by an arousal and/or 3% oxygen desaturation, (v) arousals, which are sudden shifts in brain wave activity which interrupt sleep, (vi) cardiac rhythm abnormalities, (vii) leg movements and body positions during sleep, and (viii) oxygen saturation during sleep. The sleep test is interpreted in conjunction with additional collected information, including medical history, medications taken, and any other relevant sleep and health information. The sleep test is scored using the Apnea-Hypopnea Index (AHI), which assesses the severity of OSA based on the number of apneas and hypopneas per hour. AHI is used to classify severity of OSA, including: (i) an AHI of 5 to 15 events/hour indicates mild OSA, (ii) an AHI greater than 15 to 30 events/hour indicates moderate OSA, and (iii) an AHI greater than 30 events/hour indicates severe OSA. The interpreted results from the sleep tests are then sent to PPD's Chief Medical Officer, Dr. Mark Berger, for review and to upload into the Somni-Sage® administrator Health Insurance Portability and Accountability Act (HIPAA)-compliant data base. SNI drivers that test negative for OSA (i.e., $AHI \leq 5$ events/hour) are informed of their results and are free to leave the sleep lab. However, drivers that test positive for OSA (i.e., $AHI \geq 5$ events/hour) are informed of their results and are immediately administered treatment for their OSA.

Training and Treatment

The most prescribed and cost-effective first-line treatment for OSA is nasal PAP.^[14] This device establishes a pneumatic splint for the nasopharyngeal airway by delivering a stream of pressurized air via a hose connected to a face mask, thereby preventing upper airway collapse during sleep to reduce or prevent apneas and hypopneas.^[15] See Figure 2 for a PAP device. Studies have consistently shown that, when used properly and consistently, PAP therapy reduces overall airway resistance; thus, decreasing OSA severity.^[16] The most commonly prescribed PAP therapy is CPAP, which delivers a fixed air pressure, prescribed by the physician, to splint the airway open continuously. APAP is becoming increasingly popular, as these machines adjust the delivery pressure throughout the sleep period based on changing optimal pressure requirements due to sleep stage and body position. APAP treatment may be better tolerated by patients, thus improving compliance – as compared to CPAP – due to the fluctuating delivery of air pressure and the overall reduction in delivery pressure.^[21, 22] Bi-level PAP (VPAP) delivers a high pressure on inhale and a lower pressure on exhale, to make exhaling against the PAP delivery pressure easier for the patient. Bi-level may be indicated for a patient with more complex apnea or for those requiring additional ventilatory support.



Figure 2. PAP Device (left) and Person Sleeping with PAP Device (right)

Immediately after being diagnosed with OSA, SNI drivers receive treatment, which typically includes APAP treatment; however, CPAP and Bi-level may be prescribed as well. APAP is the preferred OSA treatment option for this population because it does not require individual titration and requires less time in the sleep clinic. For example, a titration study is necessary to determine the required fixed pressure needed to alleviate apnea when prescribing CPAP treatment. Titration often requires an additional overnight stay at the sleep laboratory following the diagnostic PSG. This additional night in the sleep laboratory is considered a drawback for drivers as it takes them off the road for an additional night, costing the driver and SNI extra money. Another option is a split-night PSG, where a PSG is conducted during the first part of the night and the second part of the night is used for titration; however, a drawback to a split-night study is the reduced time for sleep analysis, OSA diagnosis, and CPAP titration. Therefore, APAP is preferred in cases where titration may not be needed. By measuring the resistance in the driver's breathing, the APAP device automatically adjusts the amount of pressure delivered to the driver to the minimum required to maintain an unobstructed airway. Therefore, the driver receives the precise pressure required at a given moment and avoids the compromise of continuous fixed pressure. Special cases, including central sleep apnea and very severe apnea, may be recommended for titration studies and different types of treatment devices may be suggested (such as CPAP or VPAP).

SNI drivers are instructed on how to care for and maintain the PAP equipment as well as the components of the device and how to order replacement masks and other components. SNI drivers are fitted with a mask and are given the necessary PAP device and accessories, including a humidifier, hoses, filters, water reservoirs, etc., which are on-site and ready for distribution at the PPD partnering sleep laboratories. The drivers are also provided educational and training information to facilitate immediate treatment and limit extended out-of-service time. Drivers are also informed of SNI's OSA treatment compliance policy and procedures. SNI drivers are currently expected to use their PAP device for a minimum of 4 hours each night. This is currently the accepted clinical threshold for adequate PAP compliance.^[33] Drivers who do not meet this usage criteria are prohibited from driving for at least two weeks until adequate compliance can be demonstrated. Long-term driving suspension and termination may be indicated for chronically non-compliant drivers.

Once a driver is diagnosed with OSA, SNI is notified and the company sends these drivers a letter of support from SNI that discusses the expectations of the driver. These include the driver taking responsibility for managing and treating their OSA. Once SNI has been notified of the driver's OSA diagnosis, the driver works with his Driver Business Leader (DBL) to be routed to the nearest SNI operating center where a power inverter will be installed in his/her truck cab. The power inverter enables in-cab use of the PAP device and humidifier while on the road. It also enables PPD to access daily wireless downloads of treatment usage and efficacy from the PAP machine. The PAP device cannot function in the truck without the power inverter; therefore, the timeliness of the power inverter install is crucial so that the driver may begin treatment and return to driving. Upon leaving the operating center, the SNI driver is equipped with all the necessary equipment and accessories to begin using his/her prescribed PAP treatment.

Compliance Monitoring

Several positive outcomes are associated with PAP treatment for OSA, including improved attitude and daytime functioning, reduced fatigue, and reduced blood pressure and cardiovascular complications; despite these positive outcomes, treatment compliance continues to be inadequate. Studies indicate that a significant proportion of adult patients, as many as 83%, may not meet the criteria for compliance due to removing the device early in the night or skipping PAP use completely.^[34] However, many of the technical and behavioral issues that contribute to poor PAP compliance, including poor mask fit, incorrect PAP delivery pressure, and general problems adjusting to treatment, can be addressed soon after treatment is initiated. The earlier these problems are identified and addressed, the sooner patients can begin establishing positive patterns of compliance which will help them with long-term adherence.

PPD uses the ResTraxx® web-based compliance monitoring device to monitor each driver's PAP usage and compliance (Figure 3). The ResTraxx® device has a wireless transmitter which links to the PAP treatment device to automatically upload usage information to a secure server that is monitored by PPD personnel. OSA patients usually establish patterns of compliance within the first week following treatment initiation; thus, daily PAP usage and efficacy uploads are scheduled during the SNI driver's first 30 to 90 days with the PAP device. SNI drivers are carefully monitored during this early period to allow timely identification of problems and effective troubleshooting with the driver. Common complaints and problems following PAP initiation include mask discomfort and irritation, mask leaks, delivery pressure discomfort, claustrophobia, movement restrictions while sleeping, and morning congestion and dry mouth. Once a driver demonstrates a treatment compliance routine that meets the minimum usage requirements of 4 hours/night for 70% of the nights, the ResTraxx® wireless transmitter is no longer required. This usually occurs within the first month to allow drivers time to adjust to treatment and become comfortable with their PAP machines. Once the ResTraxx® is removed, SNI drivers are instructed to mail data cards from the PAP device to PPD every 90 days to assess ongoing PAP usage and compliance monitoring.



Figure 3. Restraxx® Compliance Monitoring Device

SNI has an OSA treatment compliance policy that outlines expectations and responsibilities for drivers regarding their PAP treatment, as well as consequences for non-compliant drivers. Consequences for these drivers may include verbal warnings, temporary driving restrictions, and termination. SNI drivers that do not attain the minimal threshold for adequate PAP usage (4 hours/night for 70% of the nights) are flagged as non-compliant and PPD alerts the driver's DBL. The DBL then contacts the driver to speak with him/her about their non-compliance. At this point, both PPD personnel and SNI personnel work together with the driver to address the problem(s). Initially, technical issues are examined; this may include poor mask fit or leaks, pressure discomfort, and humidification problems. If non-compliance persists after technical issues are addressed, the driver is suspended from driving for two weeks. During this time PPD and SNI personnel continue working with the driver in question to coach and support his/her use of PAP. SNI also uses "driver champions" which are SNI drivers that have been PAP-compliant and have a positive attitude regarding PAP treatment (non-compliant drivers may be more responsive to these driver champions rather than to PPD and SNI personnel). The SNI driver must demonstrate satisfactory compliance during these two weeks before they are permitted to be in service again. If the driver continues to be non-compliant with PAP treatment, SNI may terminate the driver.

Long-Term Treatment

PPD monitors SNI drivers' quarterly compliance histories via the PAP data cards as long as they are driving for SNI. PPD also provides long-term care by supplying SNI drivers with PAP replacement supplies every 6 months. This includes a new mask, filter, water reservoir, and replacement hoses and tubing. PPD also provides ongoing support for SNI drivers via a toll-free number, including OSA and PAP support/questions, supplies, etc. If an SNI driver needs a new PAP and/or PAP supplies, PPD works with the driver's DBL to ensure that this equipment reaches the driver as soon as possible. Given the distributed operations of SNI, equipment will be sent to the nearest SNI operations center for pick-up or directly to the driver's home (whichever is most convenient and timely for the driver).

FusionHealth and SleepSafe™ Drivers, Inc. Protocol

FusionHealth has implemented a specialized medical program focused on restoring health and improving quality of life for people with sleep-related disorders. The FusionHealth company is based in Atlanta, Georgia and is focused on delivering sleep disorder management services to employers in risk-adverse industries, including trucking, aviation, public transportation, rail, and other occupations highly influenced by fatigue-related risk. SSD works to promote and deliver full sleep disordered breathing management services to a broad range of employers, although it specializes in industries with risk-sensitive job categories such as trucking, aviation, rail, maritime, and energy, where excessive daytime sleepiness caused by OSA can create significant safety challenges. FusionHealth and SSD partnered on a contract to run a clinical trial focused on testing and treating JBH drivers suffering with sleep apnea. The clinical trial is voluntary and will document cost savings associated with reduced medical expenses and accidents; however, the primary goal of the trial is to improve the health and safety of the JBH drivers. Together with the JBH Special Projects Manager, Debra Thomas, and the JBH Senior Vice President of Corporate Safety & Security, Greer Woodruff, the SSD President and Founder, Dana Voien, and the Chief Medical Officer and co-Founder of FusionHealth, Dr. Jeffrey Durmer, developed a protocol to detect and treat OSA in JBH drivers quickly and cost-effectively. The protocol delivers a low-cost, high-quality program designed to screen, test, and treat OSA in the workplace while minimizing drivers' downtime.

Recruitment and Screening

As the FusionHealth protocol is a clinical trial, JBH drivers must meet certain inclusion and exclusion criteria to participate in the JBH voluntary sleep apnea program. JBH drivers are eligible to participate in the clinical trial if they meet the following criteria: voluntary JBH drivers under the age of 75 years must have been with JBH for at least one year, participate in the JBH insurance option, and have access to the JBH terminal site where the clinical trial is being conducted. While most JBH drivers are self-selected, some drivers are also screened to participate using available health records, anthropometric data, and symptoms of sleep-disordered breathing (e.g., snoring, witnessed apneas, and excessive daytime sleepiness). Voluntary participants may also be identified by the JBH managers and/or medical professionals who certify drivers for their DOT certification. Please note that JBH drivers may be referred to the OSA program; however, their participation, or lack thereof, is completely voluntary.

Education and Evaluation

JBH drivers that have been recruited and are eligible to participate in the study are scheduled to meet FusionHealth personnel at the participating JBH terminal. JBH drivers meet with FusionHealth personnel for an educational session where the health and safety complications of OSA are explained and drivers' questions regarding OSA are answered. Interested drivers consent to participate in the JBH clinical trial and complete detailed health and sleep questionnaires to identify and quantify their likelihood for sleep and medical disorders, including OSA and other sleep breathing disorders. JBH drivers also undergo a physical exam and are questioned about general medical information to assess pre-existing conditions. FusionHealth examiners assess each driver's resting heart rate and blood pressure, height and weight, and neck circumference, as well as Mallampati score and peripheral edema, both of which can be useful

and non-invasive markers of OSA. A Mallampati score is determined by a physical examination of the oral cavity, specifically the uvula and the soft palate. A high Mallampati score is associated with a higher incidence of OSA.^[35] Peripheral edema, or fluid accumulation and swelling of tissues in the limbs, is commonly caused by hypertension due to inadequate circulation of blood throughout the body.^[36] Hypertension is strongly associated with OSA; therefore, peripheral edema may be a marker for untreated OSA.^[37]

After the JBH driver completes the battery of questionnaires (including the ESS and the Berlin Questionnaire) and general health screens, he/she is fitted with an Embletta® device (i.e., a portable sleep testing device will be worn by the driver that night to determine the presence and severity of sleep-disordered breathing; Figure 4). The Embletta® is approved by the U.S. Food and Drug Administration (FDA) to measure nasal pressure, blood oxygenation via pulse-oximetry, lung volume via respiratory inductance plethysmography, snoring, and electrical activity of the heart via electrocardiogram (EKG). FusionHealth personnel instruct drivers on the proper set-up and use of the Embletta®. In some situations, the Embletta® is placed on the driver for immediate use that night; however, in other situations, the device is taken off and the driver is expected to replace the device him/herself that evening prior to going to bed that night. As the clinical trial is voluntary, there is no need to verify that the driver wore the Embletta®, as opposed to sabotaging the test by placing the device on another individual. It should be noted that FusionHealth staff did verify all drivers' identities by checking their driver's license prior to setting them up on the Embletta®.

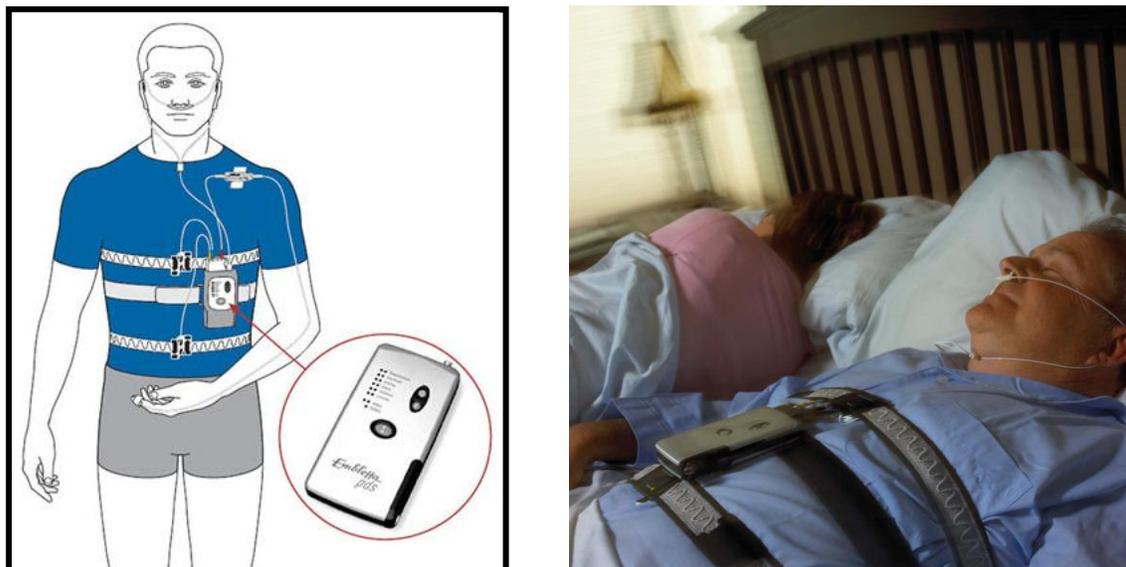


Figure 4. Embletta® Recording System

Once the JBH drivers have been instructed on the proper use of the Embletta® and all of their questions have been answered, drivers go to their sleeping chamber for the night (this may be the truck cab, bunk house, hotel, or home). The Embletta® is on and recording data throughout the night while they are sleeping. The next morning, the driver removes the Embletta® as instructed and returns the device to FusionHealth personnel waiting to meet them at the JBH terminal. Upon receiving the Embletta® from the JBH driver, the sleep technician inspects the device and downloads the data to a remote secure server via a wireless Internet connection. Once on the

secure server, the FusionHealth technical team interprets and scores the data from the Embletta® (see Appendix B for an example of Embletta® scored apnea data). The final review of these data is performed by a board-certified sleep physician at FusionHealth and the principal investigator for the JBH clinical trial, Dr. Jeffrey Durmer. More specifically, Dr. Durmer reviews the overnight sleep test data, sleep and medical history, and physical examination data prior to making a formal diagnosis. While these data are being reviewed, the on-site FusionHealth team begins driver education regarding OSA treatment. This includes training the driver on how to use the PAP device and fitting the driver with the appropriate PAP mask. The turnaround time from when the sleep test data are downloaded to the secure server to when the driver receives a formal OSA diagnosis from the board-certified sleep physician at FusionHealth is 30 to 60 minutes.

Once a formal medical decision has been made by the FusionHealth sleep physician, a letter describing the results and a copy of the test report are generated and sent to the driver's DOT certifying physician. If the driver was diagnosed with moderate or severe OSA, according to the criteria in the clinical trial ($AHI \geq 15$ events/hour), the DOT certifying physician is notified that the driver will receive immediate treatment with PAP and a 90-day provisional certification is requested. In some situations, the request for a provisional certification may require an iterative process between FusionHealth and the DOT certifying physician (most notably that FusionHealth will be closely monitoring the JBH driver during his/her 3-month provisional certificate phase). If a driver was negative for OSA based on the clinical trial criteria ($AHI < 15$ events/hour), it was documented and the DOT physician was notified. In some instances, a driver may score low on the overnight sleep testing device (i.e., ($AHI < 15$ events/hour) and found negative for OSA according to the criteria of the clinical trial; however, evidence from the test data may suggest another type of sleep-disordered breathing. In these cases, FusionHealth will contact the JBH driver for follow-up, including a consultation with a sleep medicine physician and/or a laboratory PSG test.

Other sleep disorders and/or sleep conditions suspected during these evaluations, including restless leg syndrome, hypersomnias, parasomnias, insomnias, and central sleep apnea may be identified by the FusionHealth program. If the driver is participating in the JBH program, FusionHealth personnel will follow up with a more thorough evaluation, which often includes a laboratory PSG to diagnose the specific sleep disorder. If the driver does not qualify to participate in the JBH program (i.e., $AHI < 15$ events/hour), then FusionHealth will recommend that the driver follow up with a sleep physician, either at FusionHealth or the driver's choice, to undergo a clinical evaluation to diagnose the suspected sleep disorder. The drivers with sleep disorders other than OSA will not be included in the clinical trial. Upon completing the evaluation phase, all voluntary JBH drivers completed screening and testing for the following sleep disorders: OSA and sleep-disordered breathing, restless leg syndrome, hypersomnia, insomnia, and parasomnias; however, only those JBH drivers that tested positive for OSA, according to the criteria of the clinical trial ($AHI \geq 15$ events/hour), were included in the clinical trial.

Treatment

Upon receiving a positive OSA diagnosis, JBH drivers immediately begin treatment using an APAP device. As described above, APAP effectively treats most patients with OSA; however, unlike other PAP devices, APAP does not require an overnight in-laboratory titration study. The

APAP device may not be appropriate for some drivers, such as drivers with more complex apneas. In these cases, CPAP or VPAP may be recommended following a laboratory PSG and titration study; however, APAP is the recommended device and is appropriate for the majority of JBH drivers. The drivers receive the PAP unit and all necessary equipment and accessories upon their formal OSA diagnosis. This includes two masks, tubing, filters, water reservoir, humidifier, compliance log book, pamphlets, and reading materials about OSA and PAP therapy, along with the contact information for FusionHealth. FusionHealth provides extensive training, fitting, and technical instruction to JBH drivers on the use and care of their PAP device. Attached to the PAP is a ResTraxx™ reporting device that wirelessly transmits daily usage and compliance data to the FusionHealth compliance team. The PAP device also records compliance and efficacy data, which is monitored by FusionHealth personnel to ensure JBH drivers are using the PAP for the required amount of time and the machines are effectively controlling the driver's OSA. Note that when the JBH driver is undergoing the education and training with the FusionHealth team, the JBH mechanical shop is alerted and instructed to install a power inverter in the driver's truck cab. As indicated above, the power inverter is critical for in-cab PAP use as well as wireless compliance monitoring.

Compliance

As part of their compliance coaching program, FusionHealth uses the commercially available ResTraxx™ web-based compliance program to monitor each driver's PAP usage and compliance. The ResTraxx™ device has a wireless transmitter which links to the PAP treatment device to automatically upload usage information to a secure server that is monitored by the FusionHealth compliance team. The ResTraxx™ reporting device enables the FusionHealth compliance team to receive daily PAP compliance and efficacy data during the first month of PAP usage or until the driver is compliant with therapy. Daily transmission of these data are crucial during the initial stages of PAP usage as the driver is becoming accustomed to the device and new sleep habits are being developed. The FusionHealth team coaches the drivers to become 100-percent compliant with a minimum acceptable compliance of 4 hours use/night for 70% of the nights. Compliance coaches do this by stressing the specific health and safety implications of continued PAP use for each individual driver during the initial education and training sessions as well as with one-on-one coaching for all drivers in the program. If a driver demonstrates poor compliance or deviates from the minimal threshold for compliance (4 hours/night for 70% of the nights), FusionHealth coaches immediately contact the JBH driver to resolve the issue. FusionHealth personnel work with the driver to resolve behavioral barriers to adherence, medical problems that may limit therapy, and/or mechanical issues with the PAP device or accessories, including mask leaks, pressure deviations, or faulty inverters. If a solution cannot be identified within 24 to 48 hours, FusionHealth personnel contact the JBH coordinator who then decides how to handle the issue with the driver. Non-compliant drivers are typically restricted from driving for a week until they can demonstrate adequate compliance.

JBH drivers are removed from daily ResTraxx™ wireless monitoring once they have demonstrated 30 days of successful PAP treatment. After successfully demonstrating PAP compliance, JBH drivers are monitored monthly via data cards. Any deviation from adequate PAP compliance prompts FusionHealth personnel to immediately contact the driver to resolve the issue. JBH and the DOT certifying physician may be contacted as indicated.

Once successful PAP compliance has been attained in the initial 3 months, the FusionHealth sleep physician writes a letter to the DOT certifying physician indicating the driver's acceptable compliance with treatment and his/her eligibility for a 12-month certification exam. JBH drivers are required to continually demonstrate their PAP compliance by mailing their PAP data cards to FusionHealth every 3 months. Again, any deviation from adequate compliance requires immediate contact with the JBH driver by FusionHealth personnel to resolve these issues. JBH and the DOT certifying physician may be contacted as necessary.

Medical Management

The FusionHealth team continues to monitor drivers' quarterly compliance histories via the PAP data cards and phone interview. The FusionHealth team also assures long-term support by providing JBH drivers with a toll-free telephone line for support, questions, device and supply requests, etc. JBH drivers are provided replacement PAP therapy supplies every 6 months using an automated supply replenishment program. Supplies may be shipped to the driver's home, JBH trucking terminal, or a pick-up may be arranged at the FusionHealth office (whichever is most convenient and timely for the driver). JBH drivers that are compliant with their PAP treatment are eligible for yearly DOT recertification letters (rather than 2-year certificates). Intervention with medications is sometimes required for PAP adherence, and/or the treatment of other sleep medicine conditions to help maintain compliance. FusionHealth sleep medicine physicians provide drivers with these treatments and coordinate any recertification activities with DOT certifying physicians. The FusionHealth medical team provides documentation and a full electronic medical records (EMR) system for drivers, JBH, and DOT certifying physicians. All medical management information regarding the drivers' care, including other sleep disorders under management, ongoing treatments, and specific compliance parameters, are maintained in the HIPAA-compliant FusionHealth EMR.

CHAPTER 4: FOCUS GROUP FINDINGS

Four focus group meetings and three phone interviews were conducted with 32 participating drivers and staff (15 drivers and 17 staff). Participant demographics are reported together to protect carrier anonymity and are included in Table 1. Focus groups and phone interviews were between 60 and 150 minutes long and all discussions were audio-recorded and later transcribed and evaluated. Although the description of the JBH and SNI OSA programs above provides detailed information on their respective procedures for screening, testing, and maintaining compliance, the focus group results below can be used to refine the OSA programs. The following are the results of the content analysis with supporting driver and staff quotes.

Table 1. Focus group participant demographic information.

Group	Gender M:F	Age (yrs) n:Range*	Experience Driving CMV (yrs)	Length of Participation in OSA Program n:Range	Original OSA Diagnosis n:Status	Overall satisfaction/rating of OSA Program n:Status
Drivers	15:0	2:25-34 5:35-44 7:45-54 1:55-64	5:1-4 2:5-9 8:10-24	2:<6 mo 7:6 mo-1 yr 4:1-2 yrs 1:2-3 yrs 1:>4 yrs	2:Mild 5:Moderate 7:Severe 1:Do Not Know	10:Satisfied 4:Very satisfied 1: Dissatisfied
Staff	N/A	N/A	N/A	2:<6 mo 2:6 mo-1 yr 4:1-2 yrs 2:2-3 yrs 2:3-4 yrs 5:>4 yrs	N/A	7:Good 10:Very good

Theme 1: Screening and Evaluation

During the focus groups, participants were asked to review and discuss the steps involved in their OSA program's screening process. They were asked their opinions of the process, if and how they would revise the screening process, and their suggestions for improving the screening process for identifying drivers who may be at risk for OSA.

Driver Feedback and Supporting Quotes

A common opinion expressed by drivers was that the purpose of the screening questionnaires was not explained up front. Participants also thought that some questions were vague and the context of the questions was unclear. Participants reported they may have been better able to more accurately and honestly complete the questionnaires if told the purpose of the surveys.

- **Driver Quote:** *It was like they don't really tell you what this information is going to be used for. But at the same time it's a little underhanded...the way they went about doing it. Fill out something and then 6 months later somebody tells you you're going for a sleep*

apnea test. You're like, "for what?!" Just the way they went about it....could have been better.

- **Driver Quote:** *It was a stupid questionnaire anyway. I mean, half the questions you couldn't answer unless you had someone sleeping next to you. I don't know about you guys but I sleep in the bunk all by myself.*

Drivers did not appreciate having to proceed with their participation in the OSA program after they volunteered to complete the screening questionnaire. After they were screened as at risk for OSA, the program was no longer voluntary, which some drivers reported not realizing up front.

- **Driver Quote:** *I had to sign to take this questionnaire. Once I took it and I already signed and I tested that I was a good candidate, then I was required to do the physical examination and the medical evaluation for the sleep apnea. I couldn't back out.....I had to do it or walk out the door.*

Drivers suspected that the OSA screening questionnaire was not the only way they were being screened for OSA; however, they indicated they were given this impression from program staff (carrier and/or OSA provider).

- **Driver Quote:** *...about the questionnaires, they'll ask you things and you want to answer it truthfully but at the same time it's like, "why are they really asking me this?" The questions they ask you, just like, what's the underlying reason you're asking me this... know how many people would answer that....and that's dealin' with their livelihood.*

Several drivers noted significant time gaps between the time that they completed the screening questionnaire and when they were scheduled for the laboratory PSG testing. Drivers reported experiencing up to a 2-year gap.

- **Driver Quote:** *Well aside from between the screening questionnaire and sleep test there being a 2-year gap for me, that's it. Seriously, when I talked to the occupational health nurse, I asked the question: "How did you identify me for this?"and the lady said, "Well, you filled out a survey in 2006." This was August/September of 2008." If it was that bloody important, why'd you wait two years?" And she said, "Well we have a backlog."*

Several of the participants stated they had not spoken to nor seen a sleep physician as part of the screening process and they recommended that this be available to drivers after completing the screening questionnaire (in case they had questions).

- **Driver Quote:** *...and talk to a doctor after you fill it out in case they find you got some weird flags or something. Ask to talk to a doctor who specializes....cause I never talked to one.*

Some drivers felt the screening process was too fast-paced and wondered how thorough it could be given the limited time they were evaluated.

- **Driver Quote:** *I thought it was kind of quick and really fast-paced! And I kind of wondered how they could actually get an opinion with only meeting with you for 1.5-2 hrs. I was wishing that was more of a preliminary thing and then go to some sort of more of a lab. You know, if this is going to be a life-altering, life-changing, have to do this for the rest of my working life decision, I want to make sure you guys know what you're talking about and I'm accurately diagnosed, you know! And like I said, I was a little bit, all of a sudden....boom boom boom!*

Program Staff Feedback and Supporting Quotes

OSA program staff highlighted the importance of establishing good rapport with drivers upon first meeting them or approaching them about the OSA program.

- **Staff Quote:** *When we talk to [drivers] it's a good chance for us to establish that first rapport, this is who we are, this is what you should expect and try to let them know, you know, please ask questions. And it also gives them, the phone calls, gives us a heads up, this is what we're walking into with the different personalities. Which can be really important, sometimes it's good to go in there armored, knowing someone is already coming in angry. So we know we might want to give them some space or try to figure out how to diffuse that, what they're angry about.*

Carrier and OSA provider staff named several ways that drivers were screened to undergo OSA testing (e.g., questionnaire(s), DOT long form, medical records, referral by safety managers, occupational health staff, fellow drivers, and self-referral). Program staff expressed they felt this was a thorough and accurate approach to identify those drivers at risk for OSA.

- **Staff Quote:** *There are about three different ways that a guy or gal could be selected for screening...I believe we do catch quite a bit. And it has gotten much better over the years. In other words, when we first began we were a little, "gosh what is the best way to do this?" It was kind of hit and miss. We weren't able to get as many of the screenings processed as we wanted to and now we have gotten a lot more efficient at it. So it has grown over the years and become more efficient, I believe.*
- **Staff Quote:** *Well, COMPANY is one of those great companies that looks at every single DOT long form, to the tune of over 700/month that came into the company. So if we had some concerns, we are able to at any point in time cross-reference the [questionnaire] data with the driver's DOT long form information. Where there is a height, weight, blood pressure, not necessarily a neck size, but there are a couple..... fasting blood sugar, that help us identify. That's one way. The other way is COMPANY is blessed to have an Occupational Health Department, so probably the next deeper dive, although they don't touch as many drivers as the [questionnaire] screening tool, they're not touching the entire fleet, but many drivers that are out for medical conditions, COMPANY has an excellent return to work process where there are a lot of medical records being reviewed, so the medical team at COMPANY is another referral source, as is the medial intake team on the front end when a COMPANY newbie is coming through, albeit an experienced or new hire, to COMPANY. There is a front end process whereby they check COMPANY's database to see if this driver was ever screened for sleep apnea, did he test positive? They've got a front end kind of block and tackle process as well.*

Staff noted that BMI was used as an initial screener to identify drivers that may be at risk for OSA who should be solicited to participate in the OSA program. Exhibiting signs or symptoms of OSA, self-referrals from drivers, or referrals from DOT certifying physicians or safety managers may be additional ways that drivers are identified and solicited to participate in the OSA program.

- **Staff Quote:** *She uses BMI to a big degree, she does a lot with BMI. BMI greater than 33 was one of her first cut-offs, so that was her first pass. But then after that it was symptoms too... And as the program's gone on and more people have known about it, there have actually been situations where either the DOT certifying physician will call me and say, "hey, I have a driver who happened to mention this and so we're recommending he have a study – does he qualify to be in the study?" So sometimes it's a self-report thing, some drivers have heard about it and are trying to figure out how they can get enrolled. So it's gone from just the Study Coordinator having to screen the records, to some of it is word of mouth amongst drivers who are safety team members, or the DOT physician.*

Program staff also indicated the sometimes long lag-time between screening and testing and believed this was a limitation in testing a large number of drivers within the logistical confines of the trucking industry. Program staff reported that the time lag between the OSA screening and the testing likely contributes to drivers' confusion regarding the OSA test. Staff noted that the program has improved since its inception and these time delays between screening and testing have been reduced and continue to improve.

- **Staff Quote:** *Most men don't want to talk to doctors so they'll put it [scheduling] off and they'll kind of ignore the message and another month goes by. So you end up at times with a very long lag time. That concerns me. That worries me because what if he falls asleep behind the wheel in the meantime.*

Program staff noted the program design works well in the current driver population. The screening tool is designed to “work in an environment where the drivers are fearful of providing [you with] honest answers.” One reason for this fear is that “their livelihood is attached to how they answer some of the questions.”

- **Staff Quote:** *What I like about the screening process is the fact that it was inherently designed to work in an environment where the drivers are fearful of providing you with honest answers. The screening tool was designed with that in mind, to be much more objective in helping select the high-risk candidates.*

Program staff recommends that all DOT examiners should be aware of the risks of OSA and know what to look for and how to identify those that should undergo OSA testing.

- **Staff Quote:** *I think that DOT examiners are out there looking at drivers for all the other reasons that a DOT would consider them a 'not go' but not all of them are out there looking and screening and being aware of the risks of sleep apnea.*

PPD program staff suggested that biometric measures be added to the screening protocol and used in conjunction with the self-report PPD SSSQ, including height, weight, and circumference (including neck) measurements. These biometric measures are included in the screening protocol with JBH drivers and FusionHealth reports that they work well for identifying drivers at risk for OSA.

- **Staff Quote:** *What I would love to see attached to it is some biometrics with it. So I put the driver on the scale, I take a tape measure around his/her neck to get a little bit finer data, if you will. That's what I like about it and that's where I see the possibility of some improvement.*
- **Staff Quote:** *Long term, we could be looking at multiple things, which I think would be an improvement. The data from their physical that could show additional co-morbidities which could be indicators of OSA, as well as BMI and neck circumference. And then having the questionnaire online that we could also use in conjunction with that to get a more holistic picture of those drivers we believe that need to be tested. And that's our long term view. So you're looking at all that data together at once.*

OSA provider staff express that the physical exam drivers undergo is a positive part of the screening process for OSA.

- **Staff Quote:** *Actually, I have another thought for the screening process that was a positive. It is a good tool, going back looking at it afterwards if there's a problem with compliance or there's a problem with the driver using different devices because the physical exam gives us a lot of data about the guys and their facial anomalies, number one, which is one particular guy, but other guys in the group, also looking if they're having problems with nasal congestion. If they have other anatomic issues, it's actually quite helpful.*
- **Staff Quote:** *Because [the physical exam] is something that, in all of the original discussions, we decided is an important thing to have because if someone has a physical obstruction that is seen, then we may not do the ambulatory test. So it's my understanding that they look at both the nasal and the throat airways and look for physical obstructions that might preclude us from using the ambulatory test.*

Theme 2: Education and Outreach

Carrier and OSA provider participants were asked to describe the OSA education they provided to drivers. Program staff were also asked to describe what worked and what could be improved in the OSA education process. Carrier staff reported providing little education to drivers, as they preferred it come from other sources, including the carrier's occupational health team or the OSA provider. Both OSA providers and the occupational health staff reported educating drivers on the sleep apnea program, OSA, health, treatment and device, and compliance education.

Driver Feedback and Supporting Quotes

Drivers receive information on their fleet's sleep apnea program in a variety of ways. Company newsletters, pamphlets, broadcasts, and portals let drivers know about the OSA program. Drivers

also learn specifics about the program while talking to program staff during PAP set-up; i.e., what is expected from them as a driver participant in a company-mandated OSA program.

- **Driver Quote:** *Yeah, she told me you had to have 2 full weeks of compliance and they can take you off, no matter how long it takes, if it takes 2 weeks or it takes 2 months. You gotta have 2 straight weeks of compliance and then you go to the [data] card.*

Many drivers reported receiving OSA education, including topics on what OSA is, associated health and medical conditions, myths and truths about sleep apnea, details on a driver's unique OSA condition, the risks and dangers of untreated OSA, and how OSA applies to the trucking industry. Drivers receive this information in a variety of ways, including reading materials, pamphlets, and public media (such as magazines and the Internet). Some drivers reported their families attending and participating in the educational session with them. Conversely, some drivers reported not receiving adequate information about OSA from the program staff.

- **Driver Quote:** *She told me where [OSA] comes from, as far as it stopping your breathing, what it can cause, spiking your blood pressure and it can cause a rise in..... I think she said if you already have high blood pressure it can cause your blood pressure to elevate even higher or if you don't have a problem with your blood pressure it could cause you to have problems. I think that's what she said.*
- **Driver Quote:** *They gave me pamphlets. The tech that helped me, he sat there with me and my wife and he explained it very well. Then I went on the Internet also, but there was still a lot of things that you didn't know, you just had to pretty much...some of it was still trial and error. I don't know what they could have done different. I think they don't want to give you everything up front and scare you off, but I don't know how they could change it. They don't want to give you everything and then the machine comes back and you know it's nothing. I guess it seemed adequate to me.*
- **Driver Quote:** *I couldn't even get anybody to give me a good explanation of what a hypopnea was versus an apnea event. I at least have Internet access in my truck and I got on my laptop and I did all my own research on sleep apnea causes, complications, what can happen if it goes untreated and all that stuff.*
- **Driver Quote:** *I think a video or something would have really been helpful. Go into detail as to what it is so you could understand really what it is instead of just reading a pamphlet, or having somebody just go over the basics, you know, you stop breathing at night and it causes... They told us what it caused but I think that may be helpful, just more detail, a video, something online to watch. Like a 'you've been diagnosed' video or something. It could explain it in more detail.*

Drivers reported being provided health information to manage their OSA, including instructions to lose weight with lifestyle improvements. Drivers unanimously agreed that making healthy dietary choices and exercising while on the road are extremely difficult. Drivers recalled company-sponsored health initiatives, such as the million pound weight-loss challenge, to try and encourage drivers to make healthy lifestyle changes. Drivers also mentioned they have access to physical therapy services and health screenings, but were hesitant to disclose any health-sensitive information to carrier staff as they were distrustful of how their health information could be used against them. Drivers recommended that health education and outreach could be improved upon

if they were given more reasonable advice for their over-the-road lifestyles. Drivers noted they were given common knowledge instructions, such as recommendations to eat fruits and vegetables and be more active, but would like to have received advice in consideration of their lifestyles, such as how to eat healthfully and economically over the road and how to fit in exercise over the road.

- **Driver Quote:** *Of course they tell you to lose weight. She gave me some more information that I had before. I've actually gained weight since I've been driving. They tell you to lose weight and I'm like, I'm on the road every day, very seldom do you have access to healthy food and I try to take fruits and stuff like that with me. I'm not gonna lie, it's real easy to run into a truck stop and grab a burger and a milkshake or a soda, French fries....*
- **Driver Quote:** *I wouldn't tell them anything; say everybody got caught with the screening. They didn't tell you what that was going to lead to. The same person that tries to reassure you, saying "it's just for this or it's just for that," those are the same people that screen you. They ask you if you got back pain, if you snore. Those are the same people that you talk to then! And 6 months later I'm sitting up there with all these wires. You really don't know who to trust, who not to trust, I mean I guess if you got a good relationship with your DBL, but I don't even trust him so much. I won't even get my blood pressure checked there [at the terminal]. I monitor my own blood pressure, that's a trust issue with the company.*
- **Driver Quote:** *When I talked to them, they gave me mostly common knowledge type stuff, like to eat fruits and vegetables. To me, it's hard. Some drivers have the big refrigerators in their trucks and I've bought like three of those things, they break and I got tired of buying them so I just keep a cooler with ice in it. I'm not eating the apples; I mean you can a little bit now because it's cool so you put it in the truck. But in the summer time you can't do that. Put a bunch of fruits in there, 2 days later they're rotten. It's kind of hard, I mean I guess you could do it if you really put forth the effort to do it but it's not too convenient to do it.*
- **Driver Quote:** *You are bombarded [with health information] from all sides, not just where you work but you hear that on the news. You hear that everywhere. Healthy living and healthy lifestyle. Unfortunately being an over-the-road trucker does not provide you the environment in which these things happen automatically. You have to make an effort to get that exercise.*

Drivers received information on their prescribed OSA treatment, PAP, and were educated on the PAP device and accessories, including use, care, and maintenance. Drivers reported the education they received regarding the PAP device and how to use it were adequate and simple to understand. Drivers also noted they were provided a phone number to call in case they had questions or problems. Some drivers reported they wished they were provided more education on other treatment options, in addition to PAP treatment, while others reported receiving information on alternative treatment options.

- **Driver Quote:** *The machine education was good. There's nothing to it, you push a button [to use the PAP machine].*

- **Driver Quote:** *I'd have like to known if there are any other treatment options, I mean they didn't really give us... there may not be but they didn't, you know, lose weight and the machines, that's it. I asked her if you can ever come off [PAP treatment] and she said, "yeah, but it's kind of rare." She said if it's all related to your weight and you lose the weight you can come off of the machine. She said people that are not overweight and have it; they need it the rest of their lives. She said she supposed it was possible.*
- **Driver Quote:** *They went over with me, he was explaining, I have severe [OSA], and they gave the options. And he was like, "surgery, CPAP machine, this, this and this." He explained with my severe case the surgery may not help, it might diminish it some but the amount of times that you're not breathing at night, I suggest a CPAP. Don't waste your time with surgery. So he pretty much went through all the options with fair detail.*

Drivers noted the driving community needs to be more educated regarding considerations for CMV drivers with OSA.

- **Driver Quote:** *I think if the sleep apnea stuff is going to be required by the government, something needs to be done to educate these communities, as far as people of habit, letting truckers idle. Because if we can't idle, we can't use the machine, if we can't use the machine we are not in compliance, so we're parked.*

Program Staff Feedback and Supporting Quotes

OSA provider staff note that group training and OSA education can be effective with drivers and gives them a sense of camaraderie; however, private medical discussions and consults should be performed one-on-one with drivers. Staff noted the effectiveness of casual and open-ended group question and answer sessions for initiating conversations about OSA among drivers and educators. Staff also stressed the importance of tailoring the OSA education for truck drivers and their lifestyles, and the challenges they face.

- **Staff Quote:** *If we have more than one driver we do everything as a group. The only thing that is done individually [is the physical exam]. So a driver is taken into one of the exam rooms which is more private and that's where he's one-on-one with the technician going over all of the exam procedures. Otherwise they sit in a room and fill out all their questionnaires, privately, but all the education stuff [is] together. It's interesting... it's almost like they're this little team because they went through all this stuff together.*
- **Staff Quote:** *It's evolved more into a question and answer thing. They show up and we try to develop a little before while we're waiting for everybody to convene and we encourage them to ask questions.*
- **Staff Quote:** *The discussion, it sounds like it's really tailored to the individual. He may be a high-functioning person that reads it and goes, "yeah, I get this, I've seen it, I've read about it!" And then somebody else who's not and you need to just tailor it. We talked more about how it relates to the truck driver industry. Drivers, I try to gear it when I'm talking to them about it. Because they tend to listen a little bit more, because it's more applicable to them. So we talk about it general and then specific to the truck drivers.*

Program staff reported using many different outlets to provide drivers with OSA information, including monthly newsletters which include quarterly OSA-relevant articles, company-wide broadcasts, employee portals, and driver testimonials. Drivers receive information on OSA during general driver orientation, as well as during education and training as part of the OSA program. Staff noted that for the drivers who have received this information, it is adequate; however, reaching more drivers and repeated exposure to materials could be improved upon.

- **Staff Quote:** *We do monthly newsletters and four times a year there is an article about sleep apnea in there. It can either be a driver testimony [which is] a driver that has gone through it and understands [the OSA program] and gives their point of view regarding it. Or it can be identifying the myths about sleep apnea that drivers understand if they are called in, why and what the concerns and the risks are to them. Or it could be educating them on the medical aspects of it. We also do, we call it [CARRIER] News Network, and it is at our large operating centers – there are televisions where we broadcast company messages. And we have used that venue a couple of times to tell a story. We have brought in drivers who were diagnosed and had them share their story on the [CARRIER] News Network. So those are a couple of pieces that we've done.*
- **Staff Quote:** *We have information out on our employee portal, like I said, to give them information about sleep apnea and tell them the program exists. And then in our orientation process, they do discuss some things about fatigue and sleep disorders and things. [We talk] to them about how to control fatigue and what our policy is with the drivers, saying that they're safe enough to drive and we can't, we won't make them drive if they don't feel like they're well enough rested, that kind of thing. But we do have information out on our employee portal that talks about sleep apnea in general and the dangers of sleep apnea and introduces them to our program.*
- **Staff Quote:** *For the drivers that have found it, it's summary enough where they will read it but it gives them enough detail to make them call if they think they have those symptoms, but when I said if they find it, there's lots of information out there for drivers and so it could be introduced either more often or in a more prevalent way, occasionally, that will make it available to drivers who haven't found it potentially.*

Health education and outreach is provided primarily by the OSA provider team and may be supplemented by the carrier's occupational health team. The OSA provider staff give drivers general health information to help them manage their OSA, including recommendations to lose weight. Carrier personnel reported that if drivers came to them with health concerns or questions, they usually direct them to the occupational health team or the OSA provider staff to ensure they are receiving accurate information. Some carrier staff also felt they needed more education about OSA to be better prepared for working with drivers with OSA; however, some staff felt the medical side of OSA should be handled primarily by medical professionals. OSA provider staff noted the importance of educating carrier staff on the OSA program and its importance for drivers.

- **Staff Quote:** *Well I think we need to be armed with some facts, a better understanding of what OSA actually is, what is happening to your body so when the driver comes to us we have some background... I don't feel like I have those facts to overcome an argument with a driver. We need to educate our front line leaders more.*

- **Staff Quote:** *I really hesitate arming us with things that could get into the medical area. So arming us with education and obviously it is a good thing we know about what issues sleep apnea can cause, I mean it can affect your blood pressure, your DOT physical, your lifestyle. You know at some point we have a gray area. You need to let the medical professionals answer that.*
- **Staff Quote:** *Fleet manager and safety manager education would be helpful in being supportive of the drivers when they need to get back to us. If the people at [CARRIER] that control the routes are a little more understanding of the importance of... some guys have great support from their managers and some guys do not and that also plays a role in their response to compliance.*
- **Staff Quote:** *Just that there's a lot of people involved, there's a lot of personality at [COMPANY] that may not be really understanding of the [OSA program] in itself, and also, you know, what it means to the drivers, and so we tend to run into some barriers in that way in which we need them to understand what this driver needs.*

Drivers are also given information on the laboratory PSG and portable monitoring device if they have been screened as high-risk for OSA and require testing. Many drivers are fearful and do not know what to expect with these testing options. OSA provider staff try to ease their fears by describing what to expect with each testing modality.

- **Staff Quote:** *Really to just prepare the drivers, what to expect at the lab. A lot of these drivers call in with a lot of anxiety, a lot of misinformation, and a lot of fear. So she's there to kind of calm everything down, put forth some information and get them to the [sleep] lab in a state where they're not out of control with their anxiety. A lot of [the information given] is driven by the driver. Some drivers are very curious and they want to know, "I've never heard about this" or "this is what I know." It really depends on each driver and what they want to know. So it's a little bit about, "you've been chosen to have a sleep study and this is what sleep apnea is." Then it's a little bit about what to expect at the lab, how you are going to sleep, what's going to happen there so that they have some information about the whole process.*

OSA treatment and PAP device information is provided by the OSA provider and is delivered to groups of drivers, rather than individually. Drivers learn how the PAP device works, how to maintain it, and about the accessories that accompany treatment; i.e., masks, humidifiers, hoses, etc. OSA providers may go over this information with drivers while their OSA tests are being scored, before they are ever diagnosed, to save the driver's time off the road. Drivers are given a phone number to contact the OSA provider support staff if they have questions or concerns. Staff did note that OSA treatment education could be improved by spending more time with drivers during this phase of the OSA program. They did note that this was a trade-off for getting drivers back on the road quickly, minimizing their time away from work. Repeated exposure to information on OSA treatment is another suggestion from OSA provider staff.

- **Staff Quote:** *And I'll use [OSA Provider] a lot, I'll call [them] and have them talk to the driver if there is a question or concern about what he is doing or not doing or how the mask fits, and so forth. So I'll use them more so then give them what little bit that I know about it. I'd rather them get the true information from the people that understand it.*

- **Staff Quote:** *Probably where things could be improved, as far as I'm concerned, I think that spending more time with the driver after, if the driver tests positive. Perhaps spending more time with the driver on the set up and education. It's a loaded answer because some of the drivers are in a hurry to leave the lab which ties the lab's hands as to how long they can spend with the driver. That would be my major issue – spending more time with the driver if they test positive.*
- **Staff Quote:** *The only thing that would be improved would be if they were found positive [for OSA] to spend a little bit more time on education with the driver regarding treatment.*
- **Staff Quote:** *There's a social psychosocial aspect. You were just diagnosed with sleep apnea; this is a life-changing event. You're getting a lot of information in a short period of time and I think I remember from my training days, people retain, on average, 10% of what they hear in those situations. As much and as often as you can get them information in bits and pieces and immediately following Day 1 where they are handed that PAP therapy. It's going to take repetitive teaching in order for it to really register.*

Compliance education is provided by the OSA providers and includes an explanation on the importance of complying with each carrier's policy regarding PAP usage. Drivers are informed of the safety implications of not complying with PAP adherence, including the risk of falling asleep behind the wheel, as well as job termination. Drivers are not permitted to drive if they are non-compliant with PAP treatment. Repetitive non-compliance may lead to job termination. OSA provider staff noted that drivers newly diagnosed with OSA have the most trouble with compliance and many of them do not want to use the PAP. Program staff noted that it often takes time for drivers to become accustomed to the PAP masks.

- **Staff Quote:** *There is a policy we developed before we put our first driver through our program, with the original sleep physician that we used. That policy tells them exactly what is required for usage and what will happen if they do not follow that compliance... and they're given that at the initial testing night, when they're given that information about the program.*
- **Staff Quote:** *We basically [tell the driver] this is where your compliance is, if it's below a certain amount then I am obligated, per the protocol and COMPANY's policy, and they get a copy of COMPANY's noncompliance policy for OSA, they have that in the folder of documents they get.*
- **Staff Quote:** *The vast majority of our drivers are compliant... we tend to have problems with the newly diagnosed. Sometimes they don't understand exactly what the requirements are. Sometimes they won't use it at home. They feel it is okay to go home to get rest and then not get any sleep and come back out and drive. So we kind of have to reinforce that with them.*

Carrier and OSA provider staff discussed the challenges in implementing a company-wide OSA program and are discussing process improvements such as continuously educating and re-educating the turnover of staff and maintaining communication between key players in the OSA program. OSA program personnel also noted the importance of educating the occupational medical community and physicians that perform DOT physicals on OSA, the signs and

symptoms, how to screen for it, and when testing is indicated for further evaluation. Screening drivers for OSA during DOT physicals is a significant step in the right direction, according to OSA provider personnel, because it can force drivers to be evaluated for OSA before they receive certification to operate a CMV.

- **Staff Quote:** *I think when you're dealing with a large organization versus a small organization, there's some inherent challenges when you're dealing with somebody that large, in terms of standard operating procedures across the board in their infrastructure. How do you get all the driver managers on the same page? How do you get all of the loss prevention leaders on the same page?*
- **Staff Quote:** *There is a slight disconnect between our occupational health department, which are the medical experts, and our front line leaders who are dealing directly with drivers. So I would say that is a watch out. That if other trucking companies were going to do it and you expect your front line leaders to be well-versed on it and calm drivers down and reassure them they probably need to be a little better educated. And we're working on that.*
- **Staff Quote:** *It's an educational component for the occupational medicine team. It's just like physician coordination. It's actually a big part of it, too, because without that, it's hard to get doctors to change what they do. Unless they talk to other doctors they won't listen to you otherwise.*

Program staff discussed the importance of driver support for newly diagnosed drivers with OSA. “Driver champions” who have had positive experiences with the OSA program and are willing to share their experiences with other drivers are effective. Staff also discussed other opportunities to encourage driver support, such as driver blogs, support groups, etc. One concern with these is that drivers may pass along tips that may be inappropriate (e.g., how to fake or bypass PAP compliance). One staff member suggested the use of a moderator to review inappropriate driver comments.

- **Staff Quote:** *And I think fortunately [CARRIER] does have some driver champions that are willing to talk to drivers. But I would agree, there could be better promotion of that... I thought [NAME] had a really excellent idea as we get into some sort of a blog opportunity for drivers as well as other means of communication. But you are so right; the whole support group philosophy thrives for a reason. The only caution I would have there sometimes, not that they can't support one another, but when it comes to the tips, what some drivers may be passing along as helpful tips may not actually be appropriate.*
- **Staff Quote:** *Some of the things we've talked about doing that I think would be beneficial for a program like this is developing something that is more like a peer group or support group for the drivers, where we have drivers that can have blogs and forums and talk about and through issues and help each other more. Or you can call and talk to a mentor kind of thing. I think that would be very beneficial and we've talked about setting up a whole different portal internally for those drivers. If they have sleep apnea they could get access to this portal with other information or that blog out there. I think that would be very beneficial to make it a more inclusive kind of thing, where maybe they don't feel so different about being treated for sleep apnea.*

- **Staff Quote:** *And most of the drivers, a lot of them have laptops now, or BlackBerries where they can participate in those blogs and forums online. And if they don't, then that's when they could call and talk to someone, hopefully. I think that would be important long term.*

Theme 3: Testing and Diagnosis

Drivers were asked their opinions of the OSA testing process and how the testing process could be improved. Carrier and OSA provider staff were asked how the OSA testing process could be improved and what works well.

Driver Feedback and Supporting Quotes

Drivers discussed their discomfort with the laboratory PSG. Drivers reported not being able to fall asleep because of the numerous wires attached to them during the night and having to sleep in an unfamiliar place. Drivers reported being disrupted during the night when clinical staff would enter their testing room to check wires or adjust monitors. Many drivers reported they did not sleep at all or slept very little during the PSG; thus, drivers did not understand how they could have received an OSA diagnosis after such a poor night's sleep. Drivers reported they would have liked the option to have a second PSG if they felt they were misdiagnosed. When asked if they would prefer to undergo a portable/home diagnostic test rather than the laboratory PSG, drivers responded that a portable/home diagnostic test would help them feel more comfortable but they thought the sleep test was too complicated to take at home. Some drivers recognized that the PSG was a more thorough test than the portable monitor, which they liked. The drivers reported that the clinical staff at the labs and the sleep technicians on-site at the terminals to set up the portable tests were nice and accommodating.

- **Driver Quote:** *I don't think it's fair. What I mean by that is, ask my mother, I've been a stomach sleeper since I was a baby so I lay on my stomach to sleep. You can't do that with those wires on you, on top of that you're in a strange place. I don't sleep well the first night anywhere, whether it was the field, the truck, or home, the first night I'm normally up late, two or three in the morning, then I'll finally burn out and go to bed because I'm not comfortable. The second night I'm fine, from then on I'm fine. I don't know how to improve the testing but I just didn't feel it was right. Then on top of that, talk about getting woke up, I was woke up three or four times. Ya know, this came disconnected, that came disconnected. They want to test you and find out whether you're breathing while you're sleeping... great, but you've got to sleep!*
- **Driver Quote:** *As far as comfort, the sleep lab isn't very comfortable because you're wired up from head to toe. But it is more thorough and there is someone there actually watching you and hearing you as you go through the night. And they can notice things, they check for restless leg syndrome and stuff like that.*

Some drivers that underwent the portable monitoring test for OSA reported not being satisfied with the procedures. Some lacked confidence in the test and preferred a more thorough exam; in some cases, they reported preferring a laboratory PSG over the portable testing. Some drivers lacked confidence in setting up the portable device and reported having to do so multiple times

before they were correct. Other drivers preferred the portable testing and were satisfied with it. A few drivers had undergone both testing procedures and recognized that there were positive and negative aspects with both the PSG and the portable monitoring.

- **Driver Quote:** *I guess for me, I wish there would have been a little bit different procedures. First of all, it was a little disorganized when I first got into the program and while I understand.... they just put this equipment on me one night and that's how I got tested. I wish that would have been more of a preliminary thing and once I got that preliminary testing I would have maybe gone into a lab and had a little bit more thorough examination of what my actual condition is and what my problem is.*
- **Driver Quote:** *You know, if this is going to be a life-altering, life-changing, have to do this for the rest of my working life decision, I want to make sure you guys know what you're talking about and I'm accurately diagnosed, you know!*
- **Driver Quote:** *I agree with you to a point. I think it did seem like, I'd sit there and fuss with that machine for an hour to make sure I had it connected correctly. It seems I lucked up and did! I guess they make it kind of streamlined so we don't have to miss as much work. I guess also the cost, also.*
- **Driver Quote:** *I have [had both the laboratory PSA and the portable test]. I don't like the lab either, for the same reason. You want to tear everything all to pieces, you don't really get the comfort level you need to get proper data to them.*
- **Driver Quote:** *Yeah, [the PSG] is more thorough but [the portable test] is quicker.*
- **Driver Quote:** *But then again I was happy with [the portable testing device] because it doesn't take you out of work for a couple of days.*

Drivers reported that the sleep technicians did go over their sleep test results with them the morning following their sleep assessments and some were satisfied with this process and the information they received while other drivers would have preferred receiving more information. Some drivers reported they never saw or spoke with a sleep physician and expressed they would have liked to speak to a physician about their PSG results.

- **Driver Quote:** *They go over the test results with you in pretty good detail.*
- **Driver Quote:** *On the testing, when I took it, for me, they just didn't give me enough information. They told me, "You were tested for sleep apnea." They didn't tell me there was anything wrong with my sinus or my airway was closing up, or nothing, they didn't tell me none of that.*
- **Driver Quote:** *One comment going back to the sleep study. I never saw a doctor. I was completely diagnosed over the Internet, or whatever it was. They sent my test results to a hospital and the diagnosis came back...I never saw any doctor attached to their name, which kind of ticked me off because, you know, you have sleep apnea, what does it mean? Can you give me an explanation? One of the technicians said, "well your case is pretty mild...you're right near the borderline." And I'm like, "OK, that's great," but I'd like to have heard that from a doctor.*

Some drivers felt the testing and diagnostic approach was “sneaky” because they suspected the OSA provider and/or clinical team was making a profit from diagnosing drivers with OSA, prescribing PAP treatment, and then charging the carrier for these services. Drivers thought there should be a separation of OSA testing and prescription. Some drivers reported that they did not realize that once they tested positive for OSA, they were required to participate in the OSA program or risk losing their job – they felt they should have been told this up front; however, other drivers said that they were informed of these procedures and knew what to expect if they were diagnosed with OSA.

- **Driver Quote:** *I have no doubts that I have [OSA] but it is kind of fishy, I mean it seems that way anyway. They're selling machines right there where they're diagnosing you. To me, there maybe should be some separation, but I guess that's just the way it is. It's kind of funny going through a study and right after you finish they give you the machine and tell you gotta make sure you do this, don't do this, use purified water and the machine cost X amount of money and stuff. I'm like, you know, this could be a nice little gimmick. You know \$1000 a machine or more and everybody that come in got sleep apnea, by coincidence. Could be a nice little gimmick! I guess if you had questions on their ethics, you could probably go get an independent type thing and see if you had it.... but, I'm not paying for it.*
- **Driver Quote:** *Once I took [the OSA test] and I was shown positive it was either you're going to participate in this or you're going to have to find another line of work.*

Program Staff Feedback and Supporting Quotes

A challenge for testing drivers can be the lengthy wait time for OSA testing after the driver has been indicated as high-risk for OSA via the screening questionnaire. OSA program personnel are working to limit this lag time, but the volume of drivers and the challenges with scheduling and routing drivers to sleep laboratories for testing presents a challenge. As the OSA program has expanded, so have the number of clinical testing sites around the country. This has helped with scheduling and routing drivers for their OSA test, but there are still challenges. Carrier staff indicated they wanted more driver updates regarding where the driver was along the clinical pathway (as the carrier staff is ultimately responsible for scheduling and routing their driver for testing).

- **Staff Quote:** *That is one of the things I think can be improved. And again it is probably just the sheer volume they have to go through, but sometimes we get the call, “hey this guy was identified and it's been a couple of months now so we really got to get him in.” So we have to go in hurry-up mode to find a place for them.*
- **Staff Quote:** *I actually have one on that because I had a driver that they say two years prior was borderline and they couldn't determine whether he actually slept or forced himself to stay awake but look asleep. And it took them 2 years to get back to me. So then it was panic time to get him in again. So following up on that I guess would be a little bit more, you know, if we could do better as far as the moderate drivers, the borderline drivers. Because again, it just, all of the sudden I had to go into mode of finding him a clinic within days, when I'm like “okay it's been 2 years, you know, you didn't mind it before.” I didn't get any feedback until it was “got to get it done.”*

Carrier staff reported that some drivers refused to undergo OSA testing or attempted to find alternative OSA treatments for fear that they would test positive for OSA.

- **Staff Quote:** *Sometimes when they are called for this screen they'll say "well, now wait I'd like to try something else. I'd like to try to lose weight or you know." It is almost like it is almost too late for that to happen by the time they have screened high risk. But they want to do something else to stop that, for even going for the test.*

Program staff reported that a logistical challenge is getting a driver to testing for OSA.

- **Staff Quote:** *Really it is fairly hands-off unless two things that can be time-intensive are getting a driver to [testing] once they have been identified. So you got to route them there and make sure there is truck parking.... Those are the two things that can be time-intensive.*

Carrier staff recognized the drivers' discomfort and dissatisfaction with the overnight PSG; however, they also recognize that Type 1 PSG is considered the gold standard for OSA testing. OSA provider staff also recognized the challenges in using portable monitoring in this population, including verifying driver identity and that the driver is asleep. Program staff reported that the testing and data review process with the drivers works well. The OSA provider clinical team explains the results of the sleep test to the driver, thereby limiting situations where a driver will try to argue his/her way out of a diagnosis by indicating he/she did not sleep during the test.

- **Staff Quote:** *And we do have drivers that after they do this test they will tell us "I was just awake all night." Now whether or not that actually was true, but they are too tired to drive the next day because they were awake all night because they are just so anxious about being observed and having things stuck on their body. No matter what we do to try and reassure them that this is just a good night's sleep in a nice warm bed and it will be fine in the morning. Some of them are just exhausted at the end of the night.*
- **Staff Quote:** *And I don't know how much you guys have gotten into this but the polysomnogram type one is considered the Cadillac of testing. That is why we went with it.... You can do testing, I am sure you guys are aware of this, out in a trailer at a truck stop. There are medical providers who are "doc in a box" if you will. Where they literally are going around to truck stops with their set up and doing the testing... We are considering whether or not to expand and use some different testing options but right now we don't believe the scientific evidence supports going to a lesser test if you will and that is mainly because of electroencephalogram monitoring and being sure that the driver is truly asleep. This is observed testing, we visually observe it. If you don't observe it there is a fear that a guy will stay awake all night or he'll put it on his teenage daughter who sleeps like a log or, you know, whatever. So there are a lot of different things.*

OSA provider staff recognized that while the portable monitor for OSA testing is convenient and cost-effective for the CMV driver population, it does have limitations, including capabilities to collect physiological data and chain of custody limitations. Staff demonstrate for the drivers how to put the device on and initiate recording and feel this is a fairly simple task that most drivers

pick up quickly; however, staff note that some participants do have trouble and require more training and assistance than others. For drivers that do not want the responsibility of setting up the portable device themselves, staff may set them up on-site and the driver leaves with it on and ready to record. Drivers are also given a phone number to call in case they have questions or problems setting up the portable monitoring device. Staff recognize that it would be possible for a driver to put the portable testing device on another person rather than wearing it himself, and this would be a concern for a mandatory, non-voluntary OSA program; however, for this voluntary OSA pilot program, staff were not concerned about drivers deceiving the system. Staff have identified portable monitoring devices that have chain-of-custody security checks in place, as well as additional channels for collection of physiological data, which they plan to move toward as they continue to revise and expand their OSA program. Staff also pointed out that while the portable monitoring device has software to automatically analyze and score a recorded sleep study, it is important and more accurate to have a trained technician review, analyze and score the study. OSA provider staff feel that the portable monitoring device is an accurate and cost-effective first-line testing protocol for the majority of drivers; however, if there are indications for further testing, drivers may follow up with a laboratory PSG for further evaluation.

- **Staff Quote:** *What works well is being able to test these drivers while they're out, over the road, instead of them having to take time... because the one thing they mentioned to me is they don't get very much time at home and they have families. So they don't have to spend a couple of nights in the lab when they have time with their families. So, doing it on the road is a big plus.*
- **Staff Quote:** *There are limitations on the recording device. Since we do not have the capacity to monitor brain waves, we are potentially losing diagnosis of mild or to moderate population of truck drivers that could still be having issues that are affecting alertness and higher functioning that they need to be driving big rigs. So getting a device in there that can monitor EEG, too, would be good in the ambulatory device.*
- **Staff Quote:** *I run through and score the data after an automatic analysis is run; the software has its own automatic analysis for respiratory events, but the human eye is better. So I go through and anywhere between a 5- and, I've gotten a 10-hour study before! And put all the events in, at that point I sent a notification to NAME that the study is ready for interpretation.*
- **Staff Quote:** *If the apneas were not being controlled by the APAP, the data from the machines could tell the physician that, they required the driver to have a lab, or they recommended they come in and have a lab because the apneas were not being controlled.*

Staff agreed that a significant challenge in diagnosing a driver with OSA was driver acceptance. CMV drivers represent a unique group where medical conditions, such as high blood pressure, cardiovascular disease, and OSA can disqualify a driver from his/her livelihood of driving a commercial truck. Drivers feel singled-out for their medical conditions. Having drivers understand the safety implications of being a professional driver with untreated OSA is critical in driver acceptance of their diagnosis. An OSA provider staff suggestion was to spend more time with the driver explaining their diagnosis if they are positive for OSA. Overall, staff reported being very satisfied with the partnering clinical labs and their work with the drivers. The clinical

labs make the drivers feel comfortable before the test, provide education, and respond to driver questions.

- **Staff Quote:** *You know and that falls in line with any medical condition that they have because you know you or I could have high blood pressure or sleep apnea and we are not going to lose our jobs over it. And we probably are not going to hurt anyone else either. You know for a driver it becomes a career-threatening illness for them.*
- **Staff Quote:** *I think most of them are somewhat resistant in the beginning. Some just have more resistance than others. They do feel it is going to affect their job. We feel that eventually it will be a requirement by DOT.*

Theme 4: Training and Treatment

Drivers diagnosed with OSA are prescribed PAP treatment. Company drivers are instructed on how to care for and maintain the PAP equipment. Drivers are fitted with a mask and are given the necessary PAP device and accessories for proper use. The drivers are also provided educational and training information to facilitate immediate treatment and limit extended out-of-service time. During the focus groups, drivers were asked to discuss the types of treatments recommended to them to improve or treat their OSA. Drivers were then asked to discuss their experience with each treatment. Program staff were asked to discuss the types of treatments recommended to their drivers to improve or treat their OSA.

Driver Feedback and Supporting Quotes

PAP treatment was prescribed to all drivers in the focus group, and most drivers reported being satisfied with their treatment.

- **Driver Quote:** *Overall I'm very satisfied with the PAP.*
- **Driver Quote:** *So I wish there would have been a little more thorough testing of what my actual situation was and then meeting me up with the proper equipment, given that this is a life-changing, forever thing; and I can't even continue to work as a truck driver if I'm not using this thing! So I want to make sure I have not only the proper diagnosis but the proper equipment before you send me out there. So there was a little bit of frustration because I had a mask initially using the full face one, it just didn't work for me at all. I was in misery, just terrible misery.*

Weight loss, along with PAP, was discussed with some drivers as an adjunct treatment to improve their OSA. Other drivers were not given additional treatment recommendations (other than PAP). Drivers stated they would have appreciated being informed about other treatment options or adjunct treatments that could be used in conjunction with PAP. Drivers wanted to know if there was a way to “get off” the PAP machines at some point.

- **Driver Quote:** *Well they pretty much say that diet, weight loss, exercise as an overall will help you...will help you with your sleep apnea.*
- **Driver Quote:** *Yeah, because I asked her, once I found out I had to use the PAP machine I wanted to know what I could do to stop this. And she was like, “for some people that's*

overweight, one of the things that causing them to have sleep apnea in the first place...” and by me being overweight, I was like, “OK, I’ll try the weight loss.” But like I said, it’s kind of hard to do it with the lifestyle of a truck driver. After I asked if weight loss would help, she said it could.

Drivers unanimously agreed that their profession presents many barriers to living healthy, including the challenges of a healthy diet and exercise habits. It is difficult for drivers to make healthy choices in the terminal cafeteria and truck stops. They cited having difficulty parking at restaurants and grocery stores where they might find healthier choices. Drivers also cited fatigue and exhaustion after long hours on the road as reasons for not exercising. Drivers discussed how their driving altered their sleep and eating schedules, resulting in weight gain since they began driving a truck. Drivers who reported the motivation to exercise often found it difficult to find an appropriate area to exercise. Some drivers reported behaviors to overcome these barriers to healthy eating and exercise, such as preparing food in their cab and walking around the trucking terminal.

- **Driver Quote:** *But we all can agree it’s just hard as a devil to lose some of this weight with what we do.*
- **Driver Quote:** *Funny, for example, walk out in the cafeteria, I guarantee you’re going to find something fried on the counter; you’re going to find starches or primary food groups... You go into a Pilot truck stop, other than coffee, there is not much you can eat and stay on a diet. And they try to give you two bags of M&M’s for \$2, because they have a deal on that each month! ... There’s a lot of problems out there, industry-wide, not just SNI. Industry-wide there is a big issue with weight and we all know it and we all live out here and this is just a headache for us.*
- **Driver Quote:** *I walk around here [trucking terminal], about a mile around the circumference. You can walk back up into the neighborhood up here. We’re all over the road. OK, we go everywhere! ... I never know where I’m going to be so you have to find a place to walk. Major cities, you can’t walk in major cities. It’s dangerous. You can’t walk around rest areas ‘cause there are other truck drivers driving in, let alone cars that aren’t going to notice you. You have to watch, make sure you don’t overexert yourself because you’re the only person there that’s going to get you back to medical attention if you need it. You gotta be cautious! There are a lot of things that go into exercise and an exercise plan and it’s just difficult to do over the road. And gyms are not a good option because they don’t like people like us that drive large vehicles, they don’t want us anywhere near them.*
- **Driver Quote:** *Now I walk out in the cab of my truck, I’ve got a cooler and I’ve got frozen vegetables, frozen spinach, frozen meals. I’ve got a birch stove; I can put everything together and have me a meal in about an hour going down the road. It’s a heck of a lot healthier than anything they serve in here.*

Some drivers reported success with losing weight and several of them attributed their success to the OSA program and being on PAP.

- **Driver Quote:** *I've actually lost, I was getting thick...my BMI was kinda like starting to go [up] and [the OSA provider staff] said, "you really need to write down, look at your diet, your exercise." And I took him at his advice... I've lost about 15 pounds and [my wife] has lost about 46. It has helped tremendously. The diet...getting into an everyday routine is what does it. Just getting used to everyday, you just knowing what to order, what not to eat. If you see a McDonald's you just run the other way.*

Drivers discussed their carrier's health and wellness initiatives which offer nutrition and exercise counseling; however, drivers reported this program was separate from the OSA program. Drivers suggested that the two programs be linked.

- **Driver Quote:** *Just about every operating center we have a physical therapist. You can go in there and ask them questions about it, exercise and diet, but not related to [OSA] specifically. They do have the health [information], maybe they should link the two up a little bit...make it a little bit more specific.*
- **Driver Quote:** *[Carrier's] got a better health and living coach and if you do that program, which is another free program that they offer, they will call you up periodically and say, "How are you eating, are you getting exercise, what's the deal, how are you doing?"*

Program Staff Feedback and Supporting Quotes

OSA program staff discussed PAP treatment, primarily APAP, as being the most readily prescribed treatment for drivers with OSA. A secondary use of the PAP machines can be to recognize and diagnose other or additional sleep disorders which may not be identified during the sleep test.

- **Staff Quote:** *When we developed the program with [OSA provider], we selected what type of PAP machine we preferred for the driver to receive originally. As far as treatment goes, we said we want the drivers to get APAP, not CPAP.*
- **Staff Quote:** *And I purposely say PAP every time because there are a few drivers who have had to go on a different kind of PAP machine and, if that is the case, because their apneas are not being controlled effectively. In some cases we've had to do [PSGs] for those drivers in order to understand which kind of machine they need to be given and in other cases, the OSA Provider sleep physician could tell from the initial test that he didn't think the APAP would control it, the driver came back, wasn't able to work with it and they were able to provide the other type of PAP machine without having to do a PSG.*
- **Staff Quote:** *Sometimes the use of [PAP], itself, will allow you to see central apnea. It will actually bring out other complex apnea, that's how it's diagnosed, not just based on what we see on the [portable sleep monitoring] test. So you have to follow that very closely because it could give you clues that there are other disorders there. And that's the medical management part.*

Lifestyle changes, including weight loss, dietary changes, exercise habits, and sleep hygiene were noted as treatment options to accompany PAP that should be highlighted and emphasized

more to drivers. Staff agreed that arming drivers with tools to be healthier on the road should be a priority for all company drivers, not just those participating in the OSA programs. Carrier staff noted that health and wellness coaching was a separate, voluntary service available to drivers, but that these services were not utilized often.

- **Staff Quote:** *Well at [CARRIER] this year it's new for our medical plan that we've started to do some things with wellness and part of that is through our medical carrier, they have the ability to ask for some weight loss coaching through a health coach at United Health Care (they're our current medical plan provider). We also have therapists at some of our large operating centers, occupational therapists, who we contract with another organization but they do some weight loss and exercise help for drivers as well. And both of those programs are very new for us.*
- **Staff Quote:** *But that's actually something I think we probably could improve in the trial, is actually providing [OSA treatment] alternatives up front. And give them a lot of other small things that are inexpensive to make the APAP work better. You know, we don't design the trailers or the cabs, so like position of their body is an important part of any kind of PAP, and also the type of pillow they use can be important. Weight loss is a part of this too.*
- **Staff Quote:** *And then the other thing that I think would be beneficial, for all drivers, not just the ones with sleep apnea, is trying to provide them more ways on the truck to help them. Maybe it's just the stretch bands to be able to do some exercise in the truck or by the side of the truck. Things like that that would help with those weight management or diet issues that you mentioned before, that the OSA provider staff does talk to the drivers about.*
- **Staff Quote:** *Just overall we've had these wellness programs for years where we've offered smoking cessation, weight management, and personal coaches for free for these drivers, that help them through these processes before this [OSA] program even. And I will tell you that those programs are not utilized very effectively or often. So I would say it's probably difficult for the driver.*

Along with the PAP machine, drivers are given all equipment and accessories needed to properly treat their OSA, including masks, hoses, filters, humidifiers, and compliance monitoring equipment. OSA provider staff feel that PAP compliance is largely influenced by the fit of the mask; therefore, they work to ensure drivers receive masks that fit comfortably and are effective. Drivers may be given two masks when they begin treatment, to offer them options and allow them to choose the mask type most comfortable for them. Some drivers must purchase the inverter required to use the PAP machines in some of the trucks; however, equipping the trucks with the inverter, and the labor required to do so, is provided by the carrier.

- **Staff Quote:** *They're given a bag that has the flow generator that's an APAP, the humidifier, it has the tubing, electrical cord, everything they need by the time I'm done handing them masks, they've got everything they need to walk out the door to start therapy.*

- **Staff Quote:** *The [PAP] therapy, they can have all the bells and whistles, but it's not going to do anything for them if they can't tolerate the mask or it doesn't fit well. It's the mask that makes or breaks the deal.*
- **Staff Quote:** *We give them a full face mask and one of the nasal masks. The reason is, when they leave, for the vast majority of them, it's extremely inconvenient to next to impossible for them to just come back here if one mask doesn't work. Initially we'd give them one mask, the one that seemed to be the best one. And then I did a lot of mailing masks back and forth, trying to find what works. So we can at least nail down which system they seem to tolerate best. Sometimes we match the perfect mask right then and there, sometimes we don't. Also, it gives them a back-up. Really we give them the two so they can work that out for themselves and help us figure out which one is the best for them.*

OSA program staff noted that an important feature of their OSA program is quick turnaround between testing, diagnosis, and treatment. Once they have been diagnosed with OSA, drivers are unable to drive until they receive treatment. Most drivers are not making money unless they are driving so, in order to keep them on the road and working while still maintaining safety, both OSA programs highlight the importance of no more than a 24-hour turnaround between when drivers are tested and when they return to the roadways.

- **Staff Quote:** *Drivers are given feedback immediately the next morning following their test...which is another thing we think is very important. Because once a commercial truck driver is tested, they cannot drive again until they receive their diagnosis and treatment if they're positive.*
- **Staff Quote:** *For me, the aspect that I really like is being able to not only diagnose the drivers, but get them on medical therapy and have the whole process in under 24 hours, which is amazing, considering when you look at a clinical setting like we have here. And this is a high-risk population so being able to do that, I think, you can't get any better than that!*

Carrier staff reported delays in routing drivers to operating centers to install the power inverters in the trucks. The power inverter is often necessary to power the PAP device, especially for some PAP devices or older trucks. Thus, this can delay drivers from beginning PAP treatment until the power inverter is installed. The carriers are working to improve this process and are seeking PAP devices that do not require a power inverter (thereby the driver can begin PAP treatment immediately).

- **Staff Quote:** *So where there is another opportunity for process improvement until the technology takes place, is that that driver is immediately, because of a lot of maintenance and facility resources and guys are in there with flat tires that have a hot load, or there are engine stalls, whatever. There's a lot of triaging that goes on in the maintenance and facilities departments as well. The next step is to get them to an operating center that actually has the inverter and the man power to hardwire it into their truck. So sometimes there is a delay from that driver getting that inverter.*

- **Staff Quote:** *And that's part of in the scheduling when COMPANY Coordinator gets in touch with me she sends an email out to all the fleet managers and the maintenance shop saying, "these are the people who are testing, these are the ones who will need power sources if they're positive, so you want to prepare, get equipment ready, get everything together."*

OSA program staff noted that it can be challenging for drivers to properly clean and care for their PAP machines and accessories while on the road. It was suggested to set aside an area within the terminal facilities that would allow drivers a private and well-equipped area to clean and care for their machines. Another challenge voiced by program staff was routing and distributing PAP equipment and supplies to drivers as needed, especially when they are over the road.

- **Staff Quote:** *In talking to our drivers about how they care for their machines and their hoses and filters and stuff, we discussed, for instance, should we set up some place in our facilities that allow the drivers to go in and wash their hoses and do that more in private than just going into the break room or bathroom and doing that. Maybe there needs to be more acceptance out in just the working world. Like with truck stops – having a place for drivers to be able to do that kind of thing. And care for their equipment the way they need to care for it.*
- **Staff Quote:** *We could improve, and this is actually something we are working on, streamlining our patient support, as far as getting supplies out to people as needed. Many reasons why it's a challenge but one of the reasons is that we initially dispense masks to people. If those don't work and they're over the road, it's tough to help get them the equipment that's going to work for them. So just the distance for some of these drivers.*

Theme 5: Compliance Monitoring and Long-Term Management

During the focus group, drivers were asked to describe and give their opinions of their carrier's OSA compliance policy. Program personnel were asked if they monitor drivers' OSA compliance and, if so, how difficult (or easy) it was to monitor PAP compliance. Drivers and program staff were asked to discuss long-term care, follow-up, and medical management for drivers participating in the OSA program.

Driver Feedback and Supporting Quotes

Drivers discussed how their carrier was up front with their OSA compliance policy and how they were given a document explaining the company's OSA compliance policy. Drivers that do not adhere to the OSA policy are restricted from operating a CMV for their carrier until they demonstrate adequate PAP compliance (at least 4 hours/night for 70% of nights). Some drivers reported using the minimal level of acceptable PAP compliance, and other drivers reported using the PAP machine each time they slept and napped. Drivers did not appreciate that their carrier mandated their PAP use during their time away from work and at home; they felt that it should be their choice what they do in their personal time away from work. Drivers noted that the OSA provider personnel were understanding if they had valid reasons for non-compliance, such as equipment issues while on the road. Communicating with staff as issues or problems arise is important so everyone is on the same page and solutions can be found.

- **Driver Quote:** *I like [PAP treatment], I sleep better with it and I also use it to take a nap. That's the only way I can take a nap because I will not get to sleep otherwise, it helps a lot.*
- **Driver Quote:** *I don't mind doing it when I'm working, but when I'm off I don't want to have to mess with the sucker. I just want to go home, lay back in my bed and just snore if I want to snore! I hate having to do that every night that I'm at home!*
- **Driver Quote:** *My truck broke down, regeneration unit just quit and they put me in a different truck. I ended up going three nights in a row without it, then I went home for Saturday and Sunday, then it was another three nights until I got my regular truck back. I never had them change the inverter and all that. But what I did was I talked to [OSA provider staff] and I told her what had happened. I gave her the monthly card there and I said, "you're gonna find on there that there's gonna show three nights in a row and then another three nights in there where I didn't use it, but this is why." And she said, "OK, that's not a problem."*

Drivers discussed equipment issues that would interfere with their PAP use, such as humidification problems, mask discomfort, sleep discomfort (due to not being able to sleep on their stomach), and power inverter issues that prohibited use of the humidifier in the truck cab. Drivers also complained that the inverter takes up a lot of their cab space, which is already limited.

- **Driver Quote:** *That's the only way I can use [the PAP machine]. I gotta put water in it...in the humidifier. If I don't, I wake up and my nose is all dried up....I gotta use it. And I can't use the full mask. They tried like 3 masks on me and the one I use now is just the one with only the nostrils. And I can sleep perfectly with that one. Other ones, [I] turn to the left and pull, turn to the right and pull.*
- **Driver Quote:** *First of all, the fellow that designed this thing, can we not, first of all, make that thing smaller? And secondly, when working with the maintenance people, I only have limited storage area in that truck. The first time they put it in, they put it right plop in the middle section underneath the bunk. When they could have put it to one side or the other, and they just ate up 2/3 of the storage area that I have in that truck.*

Most drivers rated PAP use as “easy” or “very easy” as it only requires placing the mask over the face and turning on the PAP machine. Some drivers indicated it was more convenient to use PAP at home rather than while on the road, citing it being a hassle transporting the machine back and forth between home and their truck. Drivers had different experiences with how long it took them to get comfortable with the PAP device. For some drivers, only one week was needed for them to become accustomed to the PAP device while they slept while others indicated they had been on PAP for several years and still cited discomfort. Drivers indicated the comfort of the mask played a significant role in their satisfaction and compliance with PAP. Some drivers indicated that access to PAP maintenance and replacement parts was “easy” while others indicated it could be inconvenient or delayed if they were over the road.

- **Driver Quote:** *Yeah, [PAP use is] very easy. Easy as sleeping, literally. You've basically just got to put it on and go to sleep.*
- **Driver Quote:** *But as far as difficult or easy, I can't decide difficult or easy because, again, some of these guys sounds like it's a miracle, hallelujah-my life is wonderful now! But for me, I don't like using the machine, I don't like putting the mask on. I do it because I have to for my job. Again, there's been some improvement in my life but I'm not having a miracle like these guys are. Because I don't like wearing it! I don't like having to sleep on my back every night, every single time. So for me, I'm going to have to say difficult for CPAP.*
- **Driver Quote:** *Well, it's not so much using it in the truck, it's breaking it down, taking it home and setting it back up.*
- **Driver Quote:** *So there was a little bit of frustration because I had a mask initially using the full face one, it just didn't work for me at all. I was in misery, just terrible misery.*
- **Driver Quote:** *First of all they sent me off with a mask that didn't work. And I'm like, "I'm dying out here!" I gotta use this thing but I can't use it! It's so uncomfortable, I'm waking up continually, I was almost in tears! I cannot fall asleep with this thing on my face but I gotta use it, you gotta get me a new mask!*

Drivers rated weight loss as something “very difficult” to achieve, citing their job and lifestyle as the main reason for this difficulty. Some drivers have taken initiatives to make lifestyle changes and have had success in doing so, although they also cite difficulties that they were able to overcome. Drivers noted that their carrier had health and wellness programs available to them, although it was not linked with the OSA program and some drivers were hesitant to utilize these services for fear that their carrier may use their health information against them and fire them.

- **Driver Quote:** *For some people [weight loss is] easier than [for] others. I put it in the difficult column because I have lost weight out here and then I stopped what I was doing because of winter and I gained it all back! It's not hard to do if you dedicate yourself to it, but overall it is difficult, at least.*
- **Driver Quote:** *And [weight loss has to do with] what you have to choose from to eat. Either processed food or fried food or cold sandwiches that got fatty meat, cheese. It's not set up for someone to maintain a healthy weight, unless you say "I'm not going to eat too much of anything." You sit in a truck stop any given day and you see a lot of big dogs walking across the parking lot.*
- **Driver Quote:** *There are a lot of things that go into exercise and an exercise plan and it's just difficult to do over the road. And gyms are not a good option because they don't like people like us that drive large vehicles, they don't want us anywhere near them.*
- **Driver Quote:** *The way I exercise, I jump out of the truck, do 10-20 push-ups and when I get up first thing in the morning I do 20 crunches, like every other day. That's all I do, that's all I have time to do. I park my truck further and I walk. I walk all the way across the truck stop and that's how I get my exercise. 10 push-ups every other day, 20 crunches when I first wake up, and just walking and eating the right stuff, not walking to McDonalds but walking to a place where I can get a nice meal.*

- **Driver Quote:** *And I don't know whether it directly relates but every physical therapist [from carrier's health and wellness program] I've ever talked to says, "we need your driver number but only so we can keep demographic information." It's like nobody wants to go in there and talk.*

Drivers indicated that the PAP compliance monitoring procedures work fairly well. They reported that the ResTraxx™ monitoring system was easy to use, as it was very hands-off for the driver and only required them to return the monitor to the OSA provider after they had demonstrated adequate compliance (on average, after one month of daily compliance downloads).

- **Driver Quote:** *After my initial diagnosis I was given a machine and I had to send in...it was a wireless thing you just stuck on the back of the machine. . . it sent daily transmissions [to the OSA provider team].*

Drivers indicated the importance of carrier and OSA provider staff support as predictors for success in PAP compliance. Drivers reported the financial support received from their carrier as "very helpful." Drivers appreciated the continued PAP support they received with the replacement of PAP supplies twice yearly. Some drivers indicated that their fleet managers were not very involved in the OSA program or helpful to participating drivers. Overall, drivers had positive opinions about the OSA providers, although some cited difficulty getting in touch with them when needed.

- **Driver Quote:** *Yeah, but as soon as they found out that I was having the inverter changed [in my truck] because of the sleep apnea program, I went right on the priority list and, like I said, it was under an hour to change it over.*
- **Driver Quote:** *I don't expect my fleet manager, because he has other trucks, so I don't expect him to be real deep in it. Hell, I gotta remind him that I have a machine in the truck and he's traded trucks three times, and I'm like, "you have to schedule me to get the inverter!" And I don't even bother telling him anymore!*
- **Driver Quote:** *There was a real conflict there with your fleet managers! On the one hand I would need to run this truck in order to run this machine and I have to use this machine to stay DOT-compliant, but if I actually did that every single night then I'm getting bitched at by my fleet manager because I'm idling my truck too much! And the thing is, you're in a constant fight!*
- **Driver Quote:** *[OSA provider staff] always calls on a Friday, then you pull the truck over, try to call her back and she never answers! And the thing is, they were having problems with me getting the data. Twice I sent it in and it was blank so I had to send it again. So I'd call and say, "Did you get the data?" I didn't hear back from her for like 3 weeks!*

Drivers talked about their concerns regarding the data cards that monitored their PAP compliance. Drivers were responsible for sending these cards to the OSA provider staff and feared these cards would get lost in the mail or used by the authorities if they were pulled off the

road. Drivers indicated this was a weakness in the program because they rely on the receipt and review of those cards to prove their compliance so that they may continue driving.

- **Driver Quote:** *So if this [data] card I drop today goes missing, I'm going to get a nasty message next week, asking where my card is. ... But this is another weakness in the program. It's just difficult to.....a lot of it's on faith.*

Drivers in the OSA program should receive a limited DOT certification card because they have been diagnosed with OSA (and are currently on treatment). Some drivers were given a 1-year certificate, which they thought was the DOT regulation for drivers being treated for OSA. Some drivers received a 2-year DOT certificate even though their DOT physician was aware of their OSA diagnosis; and other drivers indicated that their DOT certifying physician did not even know of their OSA diagnosis. There was little consistency regarding the DOT certificates issued to the drivers.

- **Driver Quote:** *I got it, got the machine and did another physical. I actually did two physical exams within 2 or 3 days but I immediately got the 1-year deal. I heard from NAME after that that they started, the doctors started getting queasy about doing the 1-year right off the bat so he knocked it down because he wanted to make sure people were in compliance. Being one of the earlier guys, I guess, they were still figuring things out.*
- **Driver Quote:** *When I did my DOT physical about 4 months ago, they didn't even know anything [about my OSA]! I actually snitched on myself.*

Program Staff Feedback and Supporting Quotes

OSA program staff provide drivers with all PAP supplies and replacement parts needed to maintain their PAP machines and be compliant with treatment. The carriers cover these costs as they want to provide the driver with the tools and support to ensure their success with treatment.

- **Staff Quote:** *When we developed the program with OSA PROVIDER, we... said we want the drivers to get APAP not CPAP, we want the wireless monitoring, we want this periodic monitoring, which is the compliance piece of it, and we will pay for masks to make sure that the drivers... through our study we're going to pay for the original mask and replacement masks throughout this 12 months to make sure they're given everything they need to be successful and that we agreed to pay for the labs and follow-up kind of stuff because that was something we wanted to make sure is that we got these guys who had never been tested or treated in the past, off to a good start and provided everything in the process they needed to be successful.*

OSA program staff reported that drivers acclimate to PAP treatment at different rates (some adapt very quickly and others take longer). Carrier staff noted that newly diagnosed drivers have the most problems adjusting to PAP therapy. Program staff also reported the need to remind drivers of the importance of using the PAP device when they are off duty. Program staff indicated that drivers frequently reported issues with the PAP equipment, including using the equipment in their truck, poor mask fit and mask discomfort, claustrophobia, and trouble sleeping with the machine. The staff also recognized that the inverter, which is required for PAP use in many of the trucks, takes up a lot of the already limited storage space in the cab of the

truck. Since the inverter must be installed in trucks and be ready for PAP use that first night, before drivers can leave the terminal, this can cause delays and frustrate staff and drivers.

- **Staff Quote:** *The vast majority of our drivers are compliant but we tend to have problems with the newly diagnosed. Sometimes they don't understand exactly what the requirements are. Sometimes they won't use it at home. They feel it is okay to go home to get rest and then not get any sleep and come back out and drive. So we kind of have to reinforce that with them.*
- **Staff Quote:** *As an overall group [compliance is] good. We have more that are complying than are not. We've lost less than 10% to noncompliance out of the program altogether, you know where the driver decided they weren't going to use it and we were going to pull them off the truck so they self-terminate. We have other drivers, we probably have at least 35-40% who struggle and have to have repeat visits to have mask fittings or education or more serious discussion. I would say 35-40% at least, yeah. Because it's not an easy thing to acclimate to.*
- **Staff Quote:** *If you are just thinking about the machine itself, claustrophobia and the uncomfortableness of that mask is the biggest complaint. That is the largest complaint. And I can't sleep with it on. And when you think about our drivers versus drivers who are home every night ...it is not a great lifestyle anyway for sleeping and when then they have to use a mask it is really important that we strive to get them the best mask, the most comfortable fit that they can. You know if the humidifier is needed 'cause that aids their nasal passages and their congestion level that is administered properly. So it is really critical to get that machine right.*
- **Staff Quote:** *It's also cumbersome because it robs the drivers of some of their storage space under the bunks. I know that's probably an issue, I hear about it all the time, I hear it! These trucks weren't designed to have that inverter in there with this wire coming through, so they have to cut a hole for the wiring. And the experiences have been variable. Some guys are in and out and I've had guys that wait until almost midnight before they get their inverter put in their truck.*

Carrier staff noted that OSA provider staff are an important support system for the drivers. The OSA provider staff is well trained in coaching drivers to become PAP-compliant and resolving any issues; however, in most circumstances, it is the responsibility of the driver to contact the OSA provider team if they need assistance. Carrier staff also indicated the importance of support from the OSA program staff (such as understanding that PAP use can be a difficult adjustment) and carrier staff – especially fleet managers who work closely with drivers – need to be supportive of the driver's needs.

- **Staff Quote:** *I think it is just an understanding from our department... we do realize that this could be a difficult adjustment for them to be a commercial truck driver... they do need to be on treatment and to be consistent with their treatment and follow the COMPANY requirements or it can affect their livelihood.*
- **Staff Quote:** *You know... so you try and put yourself in their position at the same time but not just shutting them out and pushing them towards someone else... but you know*

you have that type of relationship with your driver. Some things you can say with and to your driver to make them feel comfortable in using the machine.

Carrier staff indicated they do not monitor driver compliance with treatment. PAP compliance is monitored by the OSA provider and carrier staff are only notified if a driver is not complying with PAP treatment. Lifestyle modifications (nutrition and physical activity) and weight loss – other recommended treatments for OSA drivers – are not monitored by OSA program staff. Fleet staff reported they did not feel it was their place to tell a driver how to live his life, although it may be appropriate for the occupational health team to make health and lifestyle recommendations.

- **Staff Quote:** *Well actually it is OSA PROVIDER that monitors PAP compliance. And then they communicate with us and OC health. Also, their data program is very easy to read. I like the format of their data presentation around usage. It is a neat calendar kind of format; you can easily read the program indicators to see how long he's used it, whether the machine didn't have a read out or if there was a mechanical malfunction.*
- **Staff Quote:** *If the driver is not working with OSA PROVIDER then they notify me. So, it's whether a notification that OSA PROVIDER comes back with to say that this driver will not communicate with them or this driver needs to come in and get a mask fitting so that we can reduce leaks, or this driver needs a lab. At that point is when [the carrier] is contacted.*
- **Staff Quote:** *But they have to make the conscious decision because I think that is personal. I'm not going to tell you to exercise, you know. You want to be fat you can be fat. If you want to smoke for 20 years it is all on you. You know, we are responsible for compliance and this is a business. We are here to make money and provide a service to a customer and I am not going to sit there and have a conversation with a driver about why he can't walk a mile a day when I've got guys waiting on the line that actually need business-related items. I mean I think that is crossing, it can come from occupational health, it can come from other sources, but it doesn't need to be coming from an operations group that are responsible for utilizing capital equipment and generating revenue with those assets you know.*

OSA program personnel believe the compliance monitoring protocol works well. The OSA provider does a good job with monitoring drivers' compliance and communicating issues with carrier staff. The wireless ResTraxx™ monitoring device used in both OSA programs allows drivers to be monitored daily for compliance, thereby enabling the OSA provider staff to identify and resolve problems immediately, ensuring the success of long-term compliance. There can be limitations with the ResTraxx™ monitoring system if drivers do not follow proper procedures so that staff can remotely and wirelessly pull compliance data from the PAP machines. After drivers are taken off ResTraxx™ monitoring (after adequate compliance has been demonstrated), they are instructed to mail compliance data cards from their PAP machines to OSA provider personnel for review and compliance checks. The data cards are utilized for long-term compliance management.

- **Staff Quote:** *One of the things that I think works well.....I like the ResTraxx™ monitoring that we do. That really helps our knowledge of how their acclimating is going.*
- **Staff Quote:** *That first month [of compliance monitoring] is a critical intervention point.*
- **Staff Quote:** *In the very beginning the drivers are instructed that they have to leave everything plugged in together and the power plugged in all the time so the ResTraxx™ can transmit. Sometimes they're worried about that, they might put everything away and try to get it out in time when they think the transmission is going to happen and we miss data. If we have missed data we have to call them and try to find out, is it because they're out of range? Is it because they have everything unplugged? And tell them to plug things back in and I have to request histories from ResTraxx™. So that can be challenging with them.*
- **Staff Quote:** *A lot of drivers are good about sending [the compliance data cards] back. We had a batch of bad cards for some reason! I've had a few drivers that have had to send me a couple of cards because I couldn't read them. For the most part they do work pretty well! One of the things I don't like is that it only can record 6 months' worth of information and so I have to really look at a couple of reports overall. And some of their specific programs can be quirky and have issues. But it allows us to give the drivers really good feedback about how they're doing.*

OSA provider personnel explained that monitoring drivers' PAP history provides them information on not only drivers' use, but also the efficacy of PAP treatment, and can alert them to more complicated sleep issues or disorders.

- **Staff Quote:** *The first step is to get them on the APAP and just see what happens. Sometimes the use of a device, itself, will allow you to see central apnea. It will actually bring out other complex apnea, that's how it's diagnosed, not just based on what we see on the test. So you have to follow that very closely because it could give you clues that there are other disorders there. And that's the medical management part.*
- **Staff Quote:** *Now, I also said it depends because if we have diagnosed a driver with OSA and they're a part of our program, and yet, the data from the machine indicates that the driver's apneas are not being controlled effectively, which could be an indication of more complex sleep apnea or another sleep disorder, then as part of our trial, we are paying for those labs and our drivers are going to the COMPANY lab, having the overnight evaluation, having the consultation with COMPANY and being treated for those things. Because at that point, COMPANY PHYSICIAN is their physician because they agreed to go through the lab. Now, those sleep disorders, unless it is one that would disqualify them from driving, we find out about because the driver has to be DOT re-certified. We are facilitating their treatment of other sleep disorders, I should say.*

OSA program staff reported that drivers need to be monitored more closely at the beginning of PAP treatment, but as compliance requirements are met, they can monitor them less closely. At a minimum, staff would like to see PAP compliance reports from drivers every 3-6 months for long-term compliance management. OSA provider staff noted the importance of documenting and taking detailed notes on everything related to drivers' statuses in the OSA program;

documentation can be important for supporting and advocating for drivers, as well as backing up OSA provider staff if issues arise. Staff reported that driver outreach regarding PAP monitoring can be problematic given the distributed nature of their work force.

- **Staff Quote:** *So we had talked about long term, if this is regulation, we'd have to at least get it once a year because we'd have to know the driver was being compliant before they could get their DOT recertification. But we're thinking we probably want to do it at least twice a year. And it may be every 3 months.*
- **Staff Quote:** *We take meticulous notes on our phone calls, email correspondence, we keep all of that. Because if we need to back up a driver with, "look they're really trying but here's what's going on," we can do that. Or, just the opposite, if we can't get ahold of somebody and we're asking for help but we're not getting responses back, then we've got something on it as well.*

Carrier staff reported that same-day outreach with drivers having problems would improve the OSA program. OSA provider staff mentioned that the data cards were problematic at times (i.e., driver failed to send the data card or the data card was corrupted). A suggestion for improvement was to use a QualComm system to better download and receive the PAP use and efficacy information rather than mailing data cards.

- **Staff Quote:** *A lot of drivers are good about sending [the data cards] back. We had a batch of bad cards for some reason! I've had a few drivers that have had to send me a couple of cards because I couldn't read them. For the most part they do work pretty well! One of the things I don't like is that it only can record 6 months' worth of information and so I have to really look at a couple of reports overall. And some of their specific program can be quirky and have issues. But it allows us to give the drivers really good feedback about how they're doing.*
- **Staff Quote:** *Because we depend on those data cards, there is a lot of opportunity for problems. Yesterday I counted 167 cards that had errors on them and I'm working with the manufacturer to understand why these cards are coming to me with errors. Is it a problem in transit, is it the postal system, is there a magnetic issue? Did some of my drivers know that, well, if they don't download it properly it buys them another month of driving non-compliant or giving them time to come into compliance – absolutely! So I think that until these technological holes improve, we have to deal and manage with the data cards.*

Carrier staff feel their company's compliance policies work well; suspending a driver from the road until they can show adequate compliance is critical to demonstrating the carrier's safety culture (although staff reported that non-compliance costs the company significant losses in revenue). OSA program staff also agreed that their policies to limit DOT physician certifications for drivers with OSA to ensure they meet compliance standards before they are given long-term certification cards work well. OSA provider staff reported that their role in this part of the program is to monitor compliance, work with drivers who are having trouble with compliance, and notify carrier staff of non-compliant drivers. They emphasized that they do not make decisions regarding pulling drivers from the road or allowing them to drive, which is the

responsibility of the carrier staff. Some staff also reported significant fuel costs with OSA drivers as they are allowed additional idling time to use their PAP machines.

- **Staff Quote:** *It is a well-run program, I think; it's very hands-off when it does fall out of compliance, when a driver does fall out of compliance there are some consequences, but on the whole it is a pretty self-sustaining program from an operations perspective.*
- **Staff Quote:** *I feel like not only as part of the role of making sure that equipment is installed, when a driver is not compliant we feel like that is a safety violation and we shut the driver down when they are not compliant.*
- **Staff Quote:** *If they're below compliance, we work out, based on how low they are, what they can do to get that up. And most of the drivers, they might be angry to hear, if they don't do something quick they may not get that letter for the next [certification] card. But once I explain that I'm trying to do this to help them so they can stay on the road, they'll do what they need to and they'll get extra [compliance data] cards to us and prove their compliance...Sometimes, they're trying but they may have issues. They may have some physiological issues or sinus issues that have to be addressed with additional therapy. So they may not necessarily get the 1-year card but they might get another 90 day [card] while we're working out issues. Sometimes we extend the ResTraxx™ monitoring.*
- **Staff Quote:** *And if they're below compliance, the typical policy with them is they get pulled off the road for a week to prove for that week that they can be onboard and be compliant. And once that's proven, then we can start them over again but they're monitored more closely. And like you were saying, they get weaned off.*
- **Staff Quote:** *We basically [tell the driver], "This is where your compliance is, if it's below a certain amount then I am obligated, per [the carrier's] policy, to report that to the project manager and your fleet manager and then they will discuss with you what they want to do." I don't want the drivers feeling like we are pulling them off the road if that's the decision that's made. I try to be very clear with them about what our role is. And I try to be very clear with the fleet managers too. If I get one who's not sure what to do and they call me and say, "Well what are you telling me to do?" I'm telling you to call the COMPANY Coordinator, so you guys can make a decision because I'm not telling you who drives and who doesn't. It's not our role in that.*
- **Staff Quote:** *Also, there is a cost involved with . . . we have certain idle percentages that drivers have to hit. Those without sleep apnea are allowed 5%, for instance, for this quarter. If they do have sleep apnea they are allowed 40%. And that amounts to about 10 hours a day of idle time. So you multiply that by how many gallons of fuel they are going to burn to regenerate the sleep apnea machine so that they can use it again. So there is definitely a big cost associated.*

OSA program staff stressed the importance of communication and synchrony between all players, including driver, OSA provider staff, and carrier personnel. OSA provider staff noted that it can be challenging to communicate with drivers as some do not have cellular phones or rely only on computers in their truck cabs. It can be difficult to reach them, get messages to them, and then wait for a return phone call. Program staff emphasize to drivers the importance of communicating with them regarding all issues, problems, or setbacks they may experience with

PAP treatment and compliance, as the staff can only help them and advocate for them if they know what is going on. OSA provider staff also noted challenges with carrier staff, including delays in getting inverters installed in trucks and prioritizing getting drivers back on the road before they are fully trained and equipped to begin PAP treatment. They felt that education plays a key role in garnering this support from fleet staff and a suggestion from OSA provider staff was to improve and increase the OSA education that the fleet staff receive.

- **Staff Quote:** *The most challenging thing is communication, especially if a driver does not have a cell phone. We have a couple drivers who are OBC only, onboard computers only, so that is very difficult to get messages to them and then wait for them to call back. And then, if they do have a cell phone, and that doesn't always work, so the communication issue can be very challenging. People who work at night and sleep during the day...that's a whole other correspondence issue because we're working on opposite schedules.*
- **Staff Quote:** *And the drivers, one of the things is getting them to understand to get onboard with corresponding with us. If they have to call me everyday to tell me what their issues are so we can record them, then do it. Some of these guys have a very, "I'll just put my head down and do what I'm told and not make any waves." But then if they're having problems and not telling us, that's another one of the challenges. When it comes down to I have to look at their compliance numbers and if those aren't where they think they are based on their effort, that's just a big challenge for us.*
- **Staff Quote:** *Yeah, that was kind of like part of it... well, a lot of times it's 'cause they don't have to wait because they are busy or backed up. We've heard some attitude problems with some of the personnel in regards to that.*
- **Staff Quote:** *Fleet manager and safety manager education would be helpful in being supportive of the drivers when they need to get back to us. But if the people at CARRIER that control the routes are a little more understanding of the importance of...some guys have great support from their managers and some guys do not and that also plays a role in their response to compliance.*

OSA provider staff noted that an important element of long-term medical management of drivers is reviewing and considering their medical history and progress throughout the OSA program to ensure they are receiving proper diagnoses, treatment, and medical care. This requires constant communication and coordination between OSA provider staff, carrier staff, and drivers. Program staff indicated that a goal for long-term medical management of drivers with OSA is to increase driver participation in the company's health and wellness initiatives.

- **Staff Quote:** *One of the things we also do as part of the medical management is when we're doing the download, the scoring, and the interpreting, we're also looking at the medical history. Oftentimes it's informative because they may have elements on their sleep test that are not just straightforward. So we can pick up all those little variations and that will inform the compliance team when they're out there talking to the guy who says, "I'm not doing well," well, it's probably because he has restless leg syndrome as well. And he probably also has heart failure and he may also have Cheyenne Stokes respirations or complex apnea. So it kind of helps us in our compliance program.*

- **Staff Quote:** *We do have those [health] programs and our longer term view was to try and facilitate the driver using more than one of these if they have a medical condition. We have a third party that identifies drivers at risk for certain medical conditions and contacts them and we don't know which drivers they contact. Our thought was to have those drivers work with that group to try and help improve their overall health, long-term.*

Theme 6: Summary of Program Outcomes

After discussing all components in the OSA program, including screening, education, testing, treatment, and compliance, drivers were asked to list benefits and drawbacks they experienced while participating in the OSA program. Carrier and OSA provider staff were asked to list and discuss supports that assisted in the implementation of the OSA program for company drivers, as well as challenges they faced.

Driver Feedback and Supporting Quotes

Below are benefits drivers experienced from participating in the SNI or JBH OSA program.

Benefits: Drivers reported having better quality sleep and getting deeper sleep since starting PAP treatment. Participants also claimed that being on PAP has reduced or stopped their snoring, which has a positive impact for them as well as their sleeping partners.

- **Driver Quote:** *My quality of sleep is a little better.*
- **Driver Quote:** *I find myself yawning a lot less. Truth of the fact is that I probably wasn't getting good sleep so that's a good thing.*
- **Driver Quote:** *But now sleeping on the machine, I don't snore at night, my wife tells me, "you slept the whole night and you didn't snore." So I know its benefitting her too as well as me.*
- **Driver Quote:** *I was waking up a lot in the middle of the night but I'm not doing that as much to urinate.*

Drivers reported feeling better rested and having more energy since being on PAP treatment for their OSA. Some reported that they are able to maintain their energy without requiring as much sleep as they used to.

- **Driver Quote:** *I like [the PAP treatment], I sleep better with it and I also use it to take a nap. That's the only way I can take a nap because I will not get to sleep otherwise, [the PAP] helps a lot.*
- **Driver Quote:** *I now have more energy. But see there's a downside to that – at the end of the work day I've noticed I'm still ready to do another 10 hour!*
- **Driver Quote:** *I'm not nearly as tired when I get ready to shut down at night.*
- **Driver Quote:** *I sleep less but I have the same energy.*

- **Driver Quote:** *I notice I have a lot more energy. I used to have a large thermos that I used to keep full and just chug the coffee to stay awake during the day. Sometimes in the middle of the day I would just be useless. A lot of times I'd have to pull the truck over and go to sleep, which greatly impacts your day if you have to work a 14-hour day. I'm not doing that anymore. One cup of coffee, if any. Some days I don't pick up a cup of coffee at all.*
- **Driver Quote:** *I normally was a light sleeper, but since I've been on the machine, I get into a deeper sleep. I don't hear as much going on around me as I did before I started on the machine.*

Many drivers were excited about the health benefits and improvements they have noticed since beginning PAP treatment for their OSA.

- **Driver Quote:** *Well, I like that it keeps you alive cuz you never know; they tell you you might die without [PAP treatment].*
- **Driver Quote:** *I'm making better eating choices [since being on PAP treatment]. Just to give you a quick example. When I had my ambulatory test done, I could not walk from my truck to the testing trailer there, about maybe 100 yards, without stopping to catch my breath. After a couple of months with that machine I could walk 2.5 miles. I would just get out there and start walking. But I was 315 pounds when I went up for that test. Doctor never once mentioned about losing weight. You know, it's just better eating choices, having more energy, just being active and the pounds started coming off!*
- **Driver Quote:** *This has energized me so much it's lifted my attitude in a positive way. I feel mentally better because of this and what it's done for me. I haven't had any aches and pains since I started! I'm saying it has improved to such a point I can use my hands better! My circulation is better, my sight is better! My last physical I didn't need my glasses to pass the physical. It's been wonderful for me – I'm really upbeat about it. I could go on all day about my positive view of it... my whole body is operating better!*
- **Driver Quote:** *I've been in the program about 8 months now. What it's done for me is that I deal with high blood pressure and diabetes. When I sleep at night, sometimes I used to wake up with a terrible headache and my heartbeat fluttering, it would be beating so that I could feel it right there in my temple. And that's before I started in the program. Once I got on this program, matter of fact I haven't had it since I got on it, about 8 months ago!*
- **Driver Quote:** *My blood pressure came down in 3 months...after being on this [program].*
- **Driver Quote:** *I've lost a few pounds, not a lot but a few pounds over the past 7 months, probably 10 or 15 pounds.*
- **Driver Quote:** *I've been in the program 18 months. When I got the initial [sleep] testing I was having 69 apnea events per hour, so for 7 hours I had over 400 times when I stopped breathing! If I have 1 [apnea] per hour now, it's a lot. I've lost over 100 pounds. I couldn't say this 18 months ago but I used to wet the bed every night and I couldn't understand why. Being a man, I was 50 years old; I thought it was my prostate. I used to*

have to line my bed with those puppy training pads, just to keep the bed from getting all soaked. Ever since I started the [PAP] treatment I haven't had that problem once. They said it's because if your body isn't getting enough oxygen during the night when it sleeps, your whole body shuts down, your kidney shuts down, your liver shuts down. I guess my case was so severe that my kidneys were shutting down and I was wetting the bed.

Some drivers noticed that PAP treatment improved their driving because they were more alert and less fatigued while driving.

- **Driver Quote:** *I can drive better.*
- **Driver Quote:** *It was always a concern of mine, am I going to fall asleep at some point [while driving]? I don't have that problem anymore.*

Some drivers reported that participating in the OSA program and treating their OSA has improved their relationships with their spouses.

- **Driver Quote:** *Actually marital life is better because [I'm not] snoring! I can't tell you the last time we had an argument! We're like two teenagers. Just not only my sleep [is improved], but her sleep also, for those who have a partner.*

A few drivers reported no improvements or benefits from participating in their carrier's OSA program.

- **Driver Quote:** *My likes, I don't really notice anything about it that improves.....I don't really have any likes about it.*
- **Driver Quote:** *I can't tell any difference before, let's say I went 6 months without it, no difference.*

Drawbacks: Below are drawbacks that drivers experienced from participating in the SNI or JBH OSA program.

Drivers disliked the PAP device and features of the machine, including the humidification and the mask, which most drivers had experienced problems with. Many drivers reported their spouse, sleeping partner, or family members poking fun at them for their machine and how they looked with it. Drivers also disliked that their sleep revolved around the PAP device.

- **Driver Quote:** *I've only got one dislike. The blasted machine, depending on your elevation, depending on your atmosphere, where you are, whether the humidity is high or anything; it will inadvertently fill up with water, the mask will come loose and I'm having to make constant adjustments, that sort of thing.*
- **Driver Quote:** *I have one more for you. I wanted to add one with the humidity. I don't use the humidity, because it will, it doesn't know when to stop... and you just wake up and it's like, just water everywhere!*
- **Driver Quote:** *The one thing, I have a full facial mask, and it does cause your eyes to water. You may see the discolorations on my nose as well as my eyes are puffy. Because*

you wake up and both your eyes are just red. I started noticing I'm rubbing this eye raw because it just waters during the day from having that mask on at night.

- **Driver Quote:** *The mask is the biggest aggravation.*
- **Driver Quote:** *My girlfriend, every once in a while when she spends the night, since I wore the nasal [mask], she calls me Snufflupagus. That's when I tell her it's time for her to go home!*
- **Driver Quote:** *I just have a problem with being on [the PAP]! It's not that I mind being in compliance or using it. I just don't like my life being attached to a machine! I'd rather breathe on my own and be happy....that's just me. It's the biggest drawback I've got with it...I don't want to be on a machine.*

Drivers cited that their carrier was not up front about the OSA testing and the requirements of the program until they were at the point that they could not leave the program without being fired from the company.

- **Driver Quote:** *I guess since we're talking about the CARRIER'S policy, I somewhat agree about how they kinda forced it on us without a lot of explanation going in. They didn't say it was going to be monitored, which I don't really have a problem with; I just have a problem with not being told that up front. When they said you're going to do a sleep apnea survey, and then like he said a couple of months later, you've got to go do this and it's going to be monitored or you're not going to work here, it was kind of slammed in your face. I'm glad to have it but I didn't like the way they went about that.*
- **Driver Quote:** *It seemed like it was a little bit sneaky.*
- **Driver Quote:** *Biggest dislike actually was getting into the program...getting inducted into it. I just didn't appreciate the way it was done or how COMPANY's people handled it. At the beginning I didn't know anything, I mean, they could have been a little more.....explain a little more, been a little more polite on the phone, I just didn't appreciate it.*
- **Driver Quote:** *To me it's conflict of interest for the people that's doing the sleep apnea [testing] to have the machines, because I didn't even sleep that night, but I was told that I had moderate to severe sleep apnea... Next morning I got up, got a machine, and now I'm stuck with it...can't get off of it.*

Drivers stated dislikes and drawbacks with their OSA testing experiences, both with the laboratory PSG and the portable testing device. The drivers' main concern with the portable device was the accuracy and thoroughness of the test. The primary complaint drivers had with the PSG was the uncomfortable testing experience, including having to sleep in an unfamiliar place and being connected to multiple wires.

- **Driver Quote:** *So I wish there would have been a little more thorough testing of what my actual situation was and then meeting me up with the proper equipment, given that this is a life-changing, forever thing; and I can't even continue to work as a truck driver if I'm not using this thing!*

- **Driver Quote:** *They just put this [portable testing] equipment on me one night and that's how I got tested. I wish that would have been more of a preliminary thing and once I got that preliminary testing I would have maybe gone into a lab and had a little bit more thorough examination of what my actual condition is and what my problem is.*
- **Driver Quote:** *I think I slept about 30 minutes that whole night [of the PSG]. They kept coming in and rummaging around in my room. I'd wake up and they'd be over there in some drawers...people just kept coming in and waking me up and rolling me over and saying this little thing came undone. I woke up about a dozen times and I know they came in the room six or seven times.*
- **Driver Quote:** *I don't like the lab either. You want to tear everything all to pieces; you don't really get the comfort level you need to get proper data to them.*

Drivers disliked the PAP data cards and found it a hassle to send them to OSA provider staff.

- **Driver Quote:** *Dislike is probably keep sending the chip in...that's a hassle.*
- **Driver Quote:** *Convenience. You can just leave and somebody call you on your cell phone, "time to send your card back in." I'm like, why didn't y'all call me 2 days ago? ... when I'm gone, I'm gone. I'm not going to make a special trip to come back through home to just [to send in my data card]. You could [mail it in while on the road], but a lot of times you go to Occupational Health. Anybody got any envelopes? Anybody got a stamp? So you got to carry those things around. I don't particularly carry those things around.*

Some drivers reported that PAP treatment actually gave them less morning energy than they had before they began treatment.

- **Driver Quote:** *My dislike is I actually sleep less and I have less energy than I had before. I was a morning person and now I'm not one at all.*
- **Driver Quote:** *I do wish I had my energy back. I will say though, now, I can get in the truck and drive 10 hours down the road.*

Many drivers reported feeling discomfort during sleep when they began PAP treatment. Some drivers reported still feeling this way after months and years of trying to adjust to PAP.

- **Driver Quote:** *Sometimes, a lot of times, it'll wake me up, almost every night, at least once [the PAP machine] wakes me up just from drying me out. I go back to sleep well enough but... I just... I wake up coughing and then I gotta rummage around to find a water bottle...hopefully I have one and don't have to get out of my truck and go into a truck stop or something.*
- **Driver Quote:** *Sometimes I wake up a lot adjusting the mask. I never did before; I never woke up at night. ...but now I wake up every once and a while. And sometimes I take the mask completely off and I don't know what time I took it off, I have no idea. It's beside me but I don't know when I took it off!*

Some driver participants reported that they never saw or met with a sleep physician, which they disliked. Some drivers met only with a sleep technician during testing and diagnosis and preferred to see and talk to a sleep physician.

- **Driver Quote:** *I never saw a doctor. I was completely diagnosed over the Internet, or whatever it was. They sent my test results to a hospital and the diagnosis came back... I never saw any doctor attached to their name, which kind of ticked me off because, you know, you have sleep apnea, what does it mean? Can you give me an explanation? One of the technicians said, "well your case is pretty mild...your right near the borderline." And I'm like, "OK, that's great," but I'd like to have heard that from a doctor.*
- **Driver Quote:** *I just had a lab technician... when I got [to the sleep lab], she was there and hooked everything up to me... I woke up the next morning and she was like, "you stopped breathing five times." She told me that she would give me the machine and that was it. I never talked to anyone that said "my name is doctor this or doctor that." I never even asked her what her qualifications was. She had on a white jacket, but that was it. I never talked to a doctor, I talked to my own personal doctor, but not any sleep apnea people.*

Drivers reported that the logistics of the trucking industry often made it difficult to get the support they needed to comply with PAP treatment.

- **Driver Quote:** *They just said, "Here take this [PAP machine] and go out on the road." And if it's not working it's really hard for us to get it fixed again because I'm wherever and you're over here and how can we meet again? You can't send something to me because I don't know where I'm going to be in 2 days even!*

Drivers disliked that PAP treatment for OSA was a life-changing event that carries into all areas of their life, including work and personal time.

- **Driver Quote:** *[I have to use the PAP] every single day. I can't take 2-week vacations, I can't go up to Alaska anymore like I used to and go camping in the middle of the woods for a month. I can't do that anymore! My whole life has changed! And not all for the good either!*
- **Driver Quote:** *I'm not going to lie, it was very frustrating up front because when people threaten you with your livelihood... that makes you very unnerving.*
- **Driver Quote:** *I was ready to quit. I was so upset when I did that, it's like, you're telling me if I don't do this now I cannot work for this company anymore? It's like, "I don't want to do this, I want to back out...I do not want to do this!" I felt like cattle in a corral, kept getting narrower and narrower and I ended up going through that shoot, and I wasn't ready to go through that shoot! Now I'm not saying I'm disappointed now, because I have had some improvements in my life, but, I regretted it for a long time. Forever now, as long as I want to be DOT compliant, I have to use this machine. It's like crap, you know!*

Some drivers disliked that their carrier mandated their PAP use on their nights off. They did not appreciate that their compliance was expected during their personal time away from work. Some

also noted the inconvenience of moving their PAP machines between sleeping locations (i.e., truck cab and home) and having to take it on vacations.

- **Driver Quote:** *I don't want to use this sucker when I'm off!*
- **Driver Quote:** *Having to break [the PAP machine] down and take it home or break it down and put it in the truck. If we had two machines, that would be perfect!*
- **Driver Quote:** *And that's part of the pain in the butt that I find, is, even on weekends! I got a daughter that lives almost 200 miles [away]. And I got to take the machine with me when I go out to see her and spend the night...I don't have a choice, I have to use this or I can't work.*

Program Staff Feedback and Supporting Quotes: Below are supports that assisted the program staff in implementing the OSA program with SNI or JBH drivers.

Supports: OSA program staff reported that program operations and management is a significant support of the OSA programs and their sustainability within fleet operations.

- **Staff Quote:** *It is a well-run program I think, it's very hands-off when it does fall out of compliance, when a driver does fall out of compliance there are some consequences, but on the whole it is a pretty self-sustaining program. From an operations perspective.*

OSA program staff noted the importance of having carrier support of the program, including management, fleet staff, the maintenance team, and the occupational health team.

- **Staff Quote:** *You know you try sleeping with something over your face. You know so you try and put yourself in their position at the same time, but not just shutting them out and pushing them towards someone else... but you know you have that type of relationship with your driver. Some things you can say with and to your driver to make them feel comfortable in using the machine.*
- **Staff Quote:** *I think it is a fairly seamless process from our end. Through e-mail, "hey your driver has been identified as potentially having sleep apnea you need to get him routed." We work with PROVIDER to get them in there and they know as soon as the test is over: And if it's here in LOCATION the shop is very good about getting the inverter installed and I mean within 24 hours... if your driver's been diagnosed he has the equipment that he needs and knows how to use it. So I think it is a pretty seamless turnaround.*

Program staff noted that the OSA provider staff does a great job with all facets of the OSA program and they are an integral reason that each OSA program has been successful. Specifically, staff noted that their follow-up with drivers after they have been identified with OSA, put on treatment, and are back on the roads is a huge support for the program, as drivers always have a knowledgeable team to refer to.

- **Staff Quote:** *But OSA PROVIDER does the majority of it because they administer the machines and they will send out new hoses, new masks, and new equipment. So OSA PROVIDER does the majority of the machine work if you will. The hardware work.*

- **Staff Quote:** *I would say the number one complaint that we get from drivers who have been diagnosed is ‘Now what do I do? You’ve given me this machine.’ And we know that they are told how to use it but it is a whole different way of sleeping and living with this and then they are frustrated and OSA PROVIDER does a great job of helping them work through those issues if they call.*
- **Staff Quote:** *The staff is extremely good at addressing issues. They are just a facility that this is their position and they are very good staff adjusting to questions asked by the drivers and difficult questions being asked and it can be very beneficial to the driver if the driver reaches out to them. And with the monitoring system too, PROVIDER staff is in contact with them regarding any issues that they are having.*

Program staff reported that the carriers’ focus on safety and driver health was a primary driving factor and support as each OSA program was designed and developed. Recognizing safety as a core value of the carriers supports and drives the success of each OSA program.

- **Staff Quote:** *We are fortunate that way because we have always taken such a high road when it comes to safety and they know that culture and they hear it from training, they hear it in the way we dispatch, they hear it all the time, all the training that we do, we can say, “look, we’ve always considered your safety and your well-being to be the most important thing.”*
- **Staff Quote:** *Well I think [drivers] see [that] we care and we do and that is one of our core values—safety.*
- **Staff Quote:** *Health-wise of course...we implement the program for safety and health-wise.*

OSA program staff also commented that testimonials from drivers that have had success with the program are often encouraging to newly diagnosed drivers, which supports them as they adjust to life with PAP treatment.

- **Staff Quote:** *We found that within our own practice, testimonials coming from patients are very important to other people. Because it’s changing major behavior. Their night time is a very big, personal time, and we just invaded it.*
- **Staff Quote:** *One of the neat things we have here at LOCATION in the form of education is an individual on our floor that is positive for sleep apnea. And he will do some testimonials with the driver if a guy is really struggling with it. He is very willing to step in and say “Hey, let me tell you about my personal experience.” So having that in-house testimonial I feel by NAME has been really helpful with drivers.*

Challenges: Below are challenges that program staff faced while implementing the OSA programs with company drivers.

Program staff reported that drivers struggled with adjusting to PAP treatment and it could be challenging for staff to encourage and support drivers when they were resistant to PAP.

- **Staff Quote:** *There are many drivers that are struggling for many reasons on APAP. They may have mask leaks; they may have a feeling of suffocation or too much pressure.*

Staff reported that the logistics of the trucking industry and the mobile workforce of drivers can be challenging to schedule and route drivers to sites for OSA testing.

- **Staff Quote:** *When we first began the program four years ago we only had about three sites actually where the sleep study could be done. Now we are up to, I believe, about 15 sites around the country. So initially I would say it was probably more time-intensive with scheduling and routing drivers.*

Some staff reported that the organization, collection, and reporting of data related to the OSA program is currently limited and could be improved upon as the OSA programs expand.

- **Staff Quote:** *What I would love to see attached to [the screening questionnaire] is some biometrics with it. So I put the driver on the scale, I take a tape measure around his/her neck to get a little bit finer data, if you will. That's what I like about it and that's where I see the possibility of some improvement.*

Staff reported that gaining driver buy-in and acceptance of the OSA program is a significant challenge they face with many drivers.

- **Staff Quote:** *Sometimes the drivers drag their feet about calling occupational health back. One, they may not know what it is and two, they're a little defensive about this sleep apnea issue right now. "I'm not going for the test, there is nothing wrong with me, I don't snore, I don't have this, I sleep just fine" is usually what we hear. From our position we just encourage them to go take the sleep study, if they are not positive they'll get a good night sleep in a nice warm bed and they'll be out the next morning at 8:00 and you know they are on their way. But if they are identified then we try to stress to them that this is for their own safety and the safety of the motoring public. It is not really optional at that point.*

Staff reported that the time lags within the program, often between OSA screening and testing, can be challenging given the number of drivers that are screened and identified for testing. Driver's mobility and schedules can add to this challenge.

- **Staff Quote:** *So there is a little time lag where [the screening questionnaire] loses its validity, if you will. In other words [the driver] may say, "I took this months and months ago, why am I just now getting called in for this? What is going on?"*

Program staff reported technological limitations that introduced unique challenges for them to deal with, including data collection limitations of the portable monitoring testing device, and issues with the PAP compliance data cards that are submitted to the OSA provider by drivers.

- **Staff Quote:** *There are limitations on the recording device. Since we do not have the capacity to monitor brain waves, we are potentially losing diagnosis of mild or to moderate population of truck drivers that could still be having issues that are affecting*

alertness and higher functioning that they need to be driving big rigs. So getting a device in there that can monitor EEG too would be good in the ambulatory device.

- **Staff Quote:** *We have a wonderful process in place and, because of some technology restrictions, it's still a little bit more of a manual process in that there's some exchange of data back and forth that has to go through the mail from the driver to [the OSA provider]. Certainly we look to explore other venues that could make that happen in this technological age, much easier.*

CHAPTER 5: CONCLUSIONS

Summary of Driver Opinions and Perceptions

Overall, the majority of drivers expressed satisfaction from participating in their carrier's OSA program. Drivers reported the benefits of the programs, including that their quality of sleep was better, they had more energy and felt better rested, they were experiencing improved health, and they were less worried that they would fall asleep while driving. Drawbacks of the programs reported by drivers included discomfort while sleeping with the PAP device and mask discomfort, and complaints about the PAP device (including using it at home and cleaning and maintaining it). Drivers also complained about being "tied to" the PAP device, having to use the device during their personal time, and treatment being a life-long adjustment.

Drivers in one OSA program felt the screening process they experienced as part of their carrier's OSA program was not explained to them up front and the context of the questionnaires they completed was vague. Drivers from another OSA program recalled that once they agreed to participate in the OSA program and complete the screening process, they were unable to back out of the program (which they believed should have been disclosed up front). Some drivers felt the screening process was fast-paced – which some appreciated – and others were concerned about the thoroughness with which they were screened. Some drivers also recalled significant gaps between when they were screened for OSA and when they were tested for OSA.

Drivers reported receiving educational materials about their carriers' OSA program and policies via carrier newsletters, pamphlets, broadcasts, and network portals. Driver recalled receiving general information about OSA from OSA provider staff, but suggested that viewing a video about the disorder would have been helpful. Few drivers reported receiving general health and wellness education, as it relates to OSA, as part of the OSA program education they received. All drivers reported receiving adequate education about PAP treatment and the device, but many would have liked to receive information about additional treatment options (such as losing weight and lifestyle modifications) to control OSA. Drivers felt that communities, including law enforcement, would benefit from education about OSA and how it affects CMV drivers and their regulations (i.e., idling regulations).

Drivers disliked that they could not refuse OSA testing after they were screened as "high risk." They also expressed positive and negative opinions about the laboratory PSG and the portable monitoring test for OSA diagnosis. They felt the PSG was a very uncomfortable test, yet thorough and reliable; drivers reported that the portable device was more comfortable and convenient, but they had less confidence in the set-up and the results. Drivers received their sleep test results from their OSA provider staff; however, while some felt the reports were adequate, others felt the information they received was inadequate. Drivers also reported not interacting or meeting with a sleep physician, which bothered some participants, but others felt the sleep technician that consulted with them was adequate. Drivers reported they would prefer to have the option to re-test for OSA if they perceived they were inaccurately diagnosed. Some drivers also reported that it was a conflict of interest to be tested and prescribed PAP by the same group and there should be a separation of these two steps to ensure that the company selling the PAP machines was not profiting from diagnosing drivers with OSA.

PAP treatment was recommended and prescribed to all driver participants with OSA. Some drivers were also recommended adjunct treatments to accompany PAP use, including weight loss through healthy eating and exercise. Drivers unanimously stressed the difficulty of making these lifestyle modifications given the nature of the trucking industry. Drivers felt that PAP use in the truck was fairly easy but some found it challenging to comply with treatment at home, citing that they would forget to bring their machine home with them or just not want to. Drivers reported that proper mask fit, humidification, and cleaning and maintaining the PAP device are keys to effective treatment and staying compliant. Drivers cited the challenges to compliance, including PAP equipment problems and logistical issues, adjusting to PAP, and having adequate idling time to run their PAP machines during sleep. Some drivers reported being reprimanded by their fleet managers for exceeding idling regulations in order to use their PAP devices. Drivers stressed the importance of receiving support from and communicating with their fleet managers and OSA providers.

Summary of Staff Opinions and Perceptions

Overall, OSA program personnel believed their OSA programs were successful and were eager to continue refining and improving the programs. OSA program personnel cited several supports that aided in implementing and maintaining the OSA programs, including having a supportive team of carrier and OSA provider staff that prioritized roadway safety and driver health. Another significant support noted by staff was having an effective compliance monitoring protocol in place accompanied by consistent follow-up with drivers. Staff also reported challenges they faced while implementing and maintaining the OSA programs, including gaining driver acceptance of the program and significant time delays between screening and testing drivers for OSA due to the high volume of drivers at risk for OSA. Staff also noted logistical challenges inherent to the trucking industry and the mobile workforce of drivers, as well as collecting and organizing PAP compliance data due to the volume of data received.

OSA program staff reported that having several ways to screen and identify drivers that should be tested for OSA is critical for this population due to drivers' desire to avoid PAP treatment and fears of being terminated for having OSA. The latter issue is especially important and there was some evidence that OSA-positive drivers were more likely to stay with their respective fleets than were non-OSA positive drivers. Thus, carriers implementing an OSA program should be clear that a positive OSA test will not result in termination.

OSA program staff believed that establishing a good rapport with drivers early in the process was critical for gaining driver trust and acceptance of the program. Staff recommended training for DOT examiners so they are more aware of OSA symptoms, the health and safety risks of untreated OSA, and how to identify drivers at risk for the disorder. Staff felt that in addition to OSA and health screening questionnaires, assessing anthropometrics and performing a physical examination to screen drivers was important. Personnel emphasized the need for coordination and communication between drivers, the carrier, and the OSA provider. Staff also encouraged the involvement of the Occupational Health team, as these individuals are more aware and involved in drivers' health histories and medical information; thus, they can recommend drivers for OSA testing. Staff also emphasized the importance of having a protocol in place to identify the level of OSA risk for drivers and prioritize those at highest risk for immediate testing.

Staff highlighted the importance of educating drivers about the policies and procedures in each carrier's OSA program as well as general OSA education as early as the first meeting with drivers. Staff found that educating drivers about OSA and the OSA program as a group, rather than individually, was supportive for drivers and more efficient for the staff. Carrier staff believed that medical/health education as it relates to OSA should be provided by qualified individuals, such as the occupational health team or the OSA provider staff. OSA program staff also highlighted the need for support groups or driver mentors for drivers newly diagnosed with OSA. OSA program staff agreed that carrier staff would benefit from OSA education, as it would help them support their drivers with OSA. OSA provider staff felt that DOT physicians should receive more education regarding OSA and how to screen CMV drivers (this would aid in the early identification and testing for OSA).

Given the two different OSA testing methods used by the fleets and OSA providers, staff opinions on testing were very different. Program staff at one of the OSA programs noted that nationwide participating sleep laboratories are critical for the success of an OSA program with a large, nationwide carrier (given the logistical issues in such a distributed organization). Program staff involved in the other OSA program felt strongly that testing drivers over the road with an appropriate portable device is more convenient and minimizes time away from work and family. Program staff did note pros and cons with both OSA testing methods. Program staff recommended a portable monitoring device that included technologies and features to ensure chain of custody and channels to monitor and record EEG and leg movement data. OSA provider staff felt it was important inform a driver that he/she has sleep apnea, but also to review their sleep test results with them and explain the details of the diagnosis (thereby reducing confusion and involving the driver in the process). Program staff agreed that prioritizing a quick turnaround (less than 24 hours) from when drivers are tested and diagnosed to treatment set-up and sending them back out on the road is critical for the industry and the livelihood of the driver. Finally, it is important for the OSA program staff to communicate and coordinate with the DOT certifying physician so everyone is informed of the driver's diagnosis and what type of certification card he/she may receive (3- or 6-month versus 1- or 2-year).

Program staff agreed that APAP is the preferred first-line treatment for drivers and that proper mask fit is critical for PAP compliance. Staff noted the importance of the power inverter for PAP use in most trucks. OSA provider staff highlighted the utility of the PAP compliance records for tracking PAP use and treatment efficacy, but also for indicating other sleep disorders or the need for follow-up PSG to assess more complicated sleep issues. Staff noted the importance of the wireless PAP monitoring device, ResTraxx™, for daily compliance monitoring which allows for early identification of problems, with quick resolution, to keep drivers in compliance with treatment. OSA provider staff felt the data cards for monitoring compliance were adequate, but there was opportunity for improvements. Staff unanimously agreed that communication between the OSA provider, carrier staff, and drivers was critical for success in the compliance monitoring part of the OSA program. Providing drivers with the tools they needed to be successful with PAP treatment – including all equipment, replacement parts and accessories, and provider support and availability – was critical for immediate and long-term success with PAP. OSA program staff felt that their program protocol to pull non-compliant drivers from the road until they could demonstrate compliance was an effective method for establishing the importance of PAP compliance. Finally, driver champions (i.e., drivers who were successful with OSA treatment),

were an effective group to speak to, work with, and support newly diagnosed drivers or those who were having trouble with PAP treatment.

CHAPTER 6: RECOMMENDATIONS

Several recommendations resulted from the focus groups with drivers and staff. Being up front and honest with drivers about the OSA program and what they are being screened for was important to drivers and critical to gaining their trust and cooperation. It is recommended that carriers include subjective and objective assessments to screen drivers for OSA, including sleep and health questionnaires, physical examinations, and personal observations. Involving the carrier's occupational health team at this point in the program is recommended, as they are often more familiar with the drivers' medical and health history and can be helpful in recommending drivers for OSA testing. Having a graded rating system for OSA screening to assess drivers as high, medium, and low risk for OSA is recommended so the highest risk drivers are prioritized for OSA testing.

Providing drivers with an OSA educational video and information about the carrier's OSA program – including what is expected of participating OSA drivers – early in the process is important. Providing education to drivers about additional treatment options, such as losing weight and lifestyle modifications to control OSA, is also recommended. Additionally, educating carrier staff about OSA is recommended as it will enable them to better assist and support their drivers with OSA.

Pros and cons accompany each testing modality for OSA. Laboratory PSG is considered the gold standard for diagnosing OSA; however, it is expensive and requires access to a sleep laboratory. Portable sleep monitoring is more cost-effective and convenient for drivers; however, there are concerns regarding chain of custody and limitations of the physiological data collected. It is recommended that each carrier evaluate the needs and parameters of their OSA program when determining with their OSA provider how to test drivers for OSA.

APAP is the recommended first-line treatment device for drivers with OSA and providing drivers with the appropriate mask is crucial for PAP success and compliance. Carriers and OSA providers should have detailed compliance monitoring protocols in place and drivers should be aware of these policies, which should include a removal process for drivers who are non-compliant. Wireless compliance monitoring devices are recommended for all newly diagnosed OSA drivers for daily compliance downloads until they have established adequate patterns of compliance. Data cards are an acceptable way to monitor long-term compliance for drivers that have an established record of PAP compliance.

Providing drivers with 24-hour support as they adjust to PAP treatment is critical, as patterns of PAP compliance are established within the first two weeks of treatment and it is important to identify and resolve any issues. It can be challenging to get replacement parts, supplies, and equipment to drivers when they are over the road; thus, it is important for the OSA program team (carrier and OSA provider staff) and drivers to work together to route drivers and send supplies to a convenient pick-up location to ensure uninterrupted PAP use. OSA treatment is a life-changing event for CMV drivers; therefore, ensuring they have a solid support team is important. Organizing driver support groups for drivers to share problems and solutions, and using driver champions to speak to, work with, and support fellow drivers is recommended.

When possible, it is recommended that there be a quick turnaround (less than 24 hours) from when drivers are tested and diagnosed to treatment set-up and sending OSA-positive drivers back on the road. This is critical for the industry and the livelihood of the driver. Finally, it is important for all OSA program players, including drivers, carrier staff, and OSA provider staff, to communicate and coordinate throughout each step of the OSA program to ensure the success of an OSA program for CMV operations.

**APPENDIX A: PRECISION PULMONARY DIAGNOSTIC SOMNI-SAGE®
SCREENING QUESTIONNAIRE**

SOMNI-SAGE® Health Screening Survey Results: Mobley, Quantney

Personal Information

Name: Mobley, Quantney (Change)
 SSN: 123-32-3322
 Phone Number: N/A
 Company: Example Company
 Driver Status: N/A (Change)
 Classification: N/A (Change)
 Location: N/A (Change)
 Driver #: 78945 (Change)
 Applicant: No (Change)
 Date of Hire:
 Term Date:
 Driver Leader:

Sex: Female
 Age: 45 yrs. (DOB: 1/1/1967)
 Height: 5', 3"
 Weight: 225 (lbs.)
 Comments: Driver needs sleep study for DOT recertification physical. KLM
 (Print Comments) (Edit Comments)

Delete Survey

Return to SOMNI-SAGE® Screening Survey Rankings | Print This Page

Scoring
 Class (Class 1)
 WA , EDS , BMI 39.9
 Recalculate

Sleep Test
 This individual has no available sleep test results.
 Update Sleep Test Results
 View CPAP Compliance Information

Documents
 Upload New Document

Follow Up
 This individual has been emailed, contacted, scheduled and completed.
 Modify

Doctor Status
 This applicant is using PPD.
 Modify

Insurance Status
 This applicant has insurance.
 Modify

Complete List of SOMNI-SAGE® Survey Responses (Recorded on 6/3/2008)

Health Information

1. Have you ever, currently or in the past, smoked cigarettes?	Yes
2. Currently, how many packs of cigarettes per day are you smoking?	1/2 to 1 pack/day
3. The following health conditions run in my family?	Heart Disease, High Blood Pressure, Diabetes, Cancer
4. Do you take any medications for your breathing, including inhalers?	No
5. Do you have high blood pressure?	Yes
6. Do you have diabetes?	Yes
7. Have you been treated for heartburn?	Yes
8. Do you have heart problems?	No
9. Have you ever undergone a heart operation or procedure?	No
10. Do you take any medications to thin your blood?	No
11. Do you take any medications for your heart?	No
12. Do you have sleep apnea?	No
13. Do you take ANY medications to control your blood sugar?	Yes
14. Do you have COPD (emphysema)?	No
15. Do you have asthma?	No
16. Have you been treated for depression?	Yes
17. Do you snore louder than talking?	Yes
18. Does your snoring bother other people?	No
19. Do you take ANY of the following medications: Protonix, Prevacid, Nexium, Pepcid, or Tagamet?	Yes
20. On average, do you urinate more than once per night?	Yes
21. Do you become drowsy while driving?	Never
22. Does head, back, neck, or joint pain affect your sleeping?	Yes
23. Do you take ANY medications to control your blood pressure, including diuretics ("fluid pills")?	Yes
24. Do you sleep restlessly or find the blankets on the floor in the morning?	No
25. Has anyone noticed that you quit breathing during your sleep?	No
26. Have you awakened from sleep with gasping breaths?	No

Epworth Information

1. Sitting and reading	Slight
2. Watching TV	Slight
3. Sitting inactive in a public place (e.g., a theater or meeting)	Slight
4. As a passenger in a car for an hour without a break	Never
5. Lying down to rest anytime circumstances permit	Never
6. Sitting and talking to someone	Never
7. Sitting quietly after lunch without alcohol	Never
8. In a truck or car, while stopping for a few minutes in traffic	Never

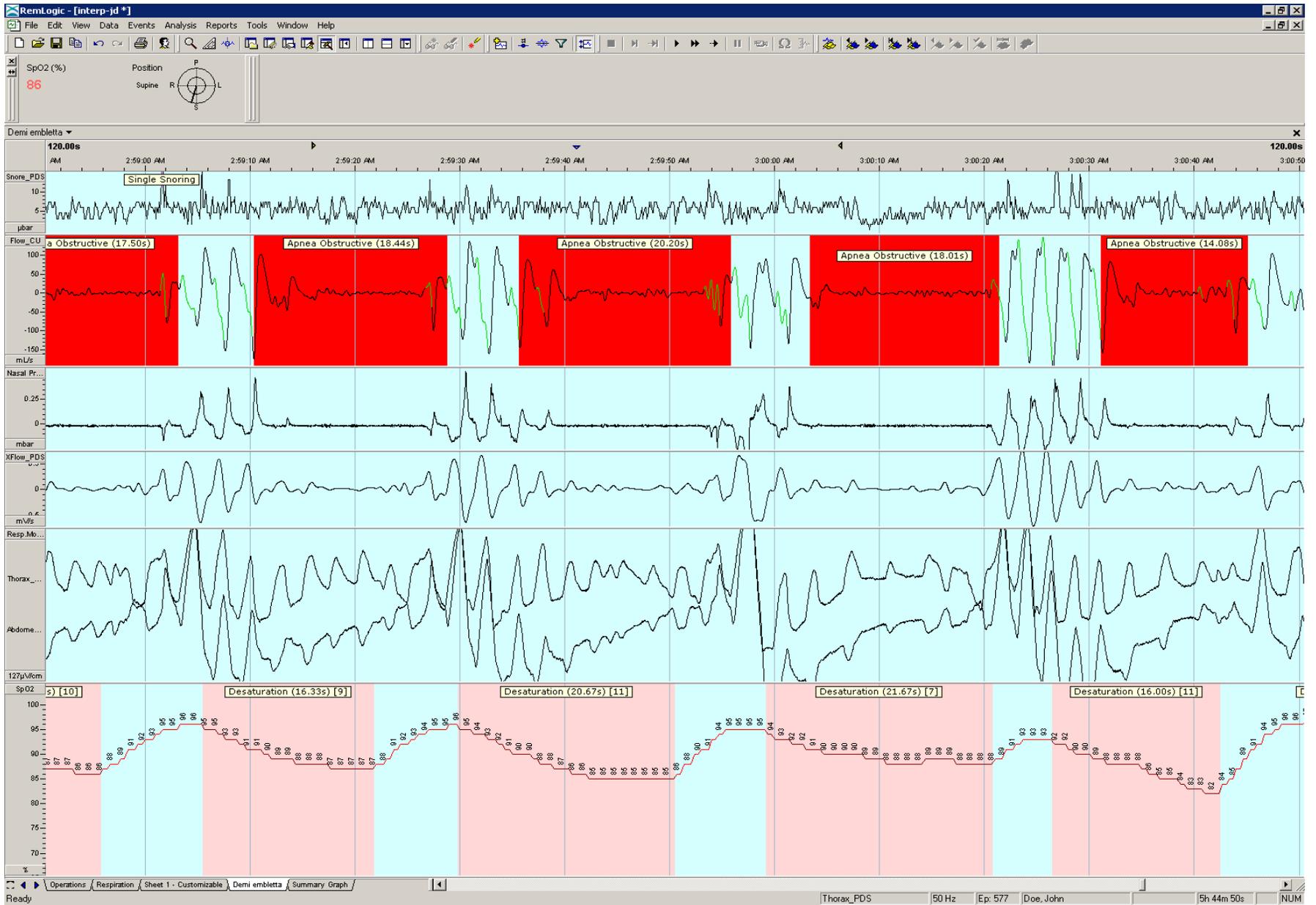
Sex-Specific Information

1. Do you take estrogen replacement therapy? No

SOMNI-SAGE® Screening History

	Date	BMI	EDS±	WA±	Level	Odds Ratio	Probability	Alert	Status
1.	6/3/2008	39.9			1,000	4.462			

**APPENDIX B: TWO-MINUTE SCREENSHOT OF EMBLETTA SCORED APNEA
DATA**



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