

REDUCING THE COSTS, RISKS AND LIABILITIES OF OBSTRUCTIVE SLEEP APNEA

Kirsty J. Kerin, Ph.D.

Acacia Aguirre, M.D., Ph.D.

Introduction

For many people—factory shiftworkers, IT staff, utility control room operators, oil rig workers, emergency room doctors, long-haul truck drivers, locomotive engineers, and many others—24/7 is now a way of life. Working around the clock has many inherent risks, from the excessive fatigue leading to accidents, errors, injuries, and fatalities, to the elevated risk of cardiovascular and gastrointestinal disease. Most managers recognize that understanding and addressing the issues of 24/7 life improves employee performance, safety and health, and can dramatically improve the bottom line of the company. However, a significant but commonly overlooked concern in 24/7 workforce health and safety is the high prevalence of the sleep disorder “Obstructive Sleep Apnea Syndrome” (OSA).

Obstructive Sleep Apnea Syndrome (OSA) is a common sleep disorder found in approximately 5% of the general population but 11.6% of the shiftwork population. Each undiagnosed employee in the workforce costs an additional \$6,000 per year in apnea-related expenses, including increased physician and hospital visits, cardiovascular treatment costs, increased on-the-job injuries, and absenteeism, to name but a few.

To address the many obstacles in successfully finding, diagnosing, treating and sustaining the compliance of OSA sufferers in 24/7 workforces, Circadian developed the unique Confidential OSA Diagnosis and Treatment Program, successfully used in 24/7 industries across North America. The program maximizes compliance rates through a systematic process of education, confidential screening, standardized case management of the diagnosis and treatment process with high quality providers, patient support and

counseling. Managers report returns from reductions in healthcare, absenteeism, turnover, presenteeism, and overtime costs, as well as longer-term benefits in workers' compensation payments, insurance premiums, and ultimately brand value.

Through a recent partnering with one of the leading manufacturers of OSA diagnostic and treatment equipment, Circadian has integrated the very latest remote-delivery diagnosis and treatment technology into the program and is pleased to announce that the Confidential OSA Diagnosis and Treatment Program can now be offered using entirely home-based technology, passing considerable cost savings on to the program members.

What is OSA?

Obstructive Sleep Apnea (OSA) is a sleep disorder in which a person's airway becomes partially or completely obstructed during deep sleep, causing a temporary cessation in breathing. The obstruction is caused by the relaxation of the soft tissues around the airway (the tongue and soft palate), causing them to fall onto the posterior pharynx and close off the airways. Partial obstruction causes loud snoring, and complete obstruction causes "apnea" (cessation of breathing). Chest movements continue to attempt to draw breath, but the blockage prevents air from reaching the lungs, eventually causing a decrease in the oxygen content of the blood (oxyhemoglobin desaturation). On sensing the decrease in oxygen, the brain arouses the body from sleep, and the person will awaken gasping for breath. These frequent awakenings result in highly disrupted sleep and chronic exhaustion during waking hours.

Risk Factors & Prevalence

Risk factors for OSA include smoking (Kashyap, 2001), obesity, having a neck size of 17" or greater, the regular use of alcohol or sleeping pills, and moderate sleep deprivation (National Institute of Health, 2003). Demographic data shows that many of these risk factors are common among shiftworkers.

Although often unheard of, OSA is a relatively common disorder. Several studies have described average prevalence of OSA in different populations, ranging from 2% to 33% (Young, 1993; Agency for Healthcare, Research and Quality, 2000). A conservative and acceptable measure from the sleep special-

ist community for the average prevalence of OSA in the working age population in the U.S. today is 5%. However, a steady increase in the proportion of obese people in the U.S. population will directly increase the prevalence of OSA going forward.

Recognized OSA risk factors such as smoking, obesity, and alcohol use are more prevalent in the shift-work population. Circadian's databases (containing data from more than 10,000 shiftworkers) show that 11% of shiftworkers have OSA and 15% present with risk symptoms for OSA or other sleep disorders related to excessive sleepiness.

Due to interrupted sleep patterns, apnea sufferers rarely have restorative rest, manifesting in excessive daytime sleepiness, increased accidents, and more frequent health problems:

- 40% increase in excessive daytime sleepiness (Ulfberg, 1996)
- Twice as many traffic accidents per mile (Horstmann, 2000)
- Threefold risk of occupational accidents (Ulfberg, 2000)
- 1.3 to 2.5 times more hypertension (Krieger, 2002; Smith, 2002)
- 2.2 times increased risk of nocturnal cardiac arrhythmia (Smith, 2002)
- 3.9 times more likely to have congestive heart failure (Smith, 2002)
- 1.6 times increased chance of stroke (Moore, 2001; Shahar, 2001)
- 1.4 to 2.3 times greater risk of heart attack (Saito, 1991; Shahar, 2001)
- 40% increased risk of depression (Smith, 2002)

Though apnea is a highly disruptive and risky disorder in its unmanaged state, the costs of accidents and health problems are mitigated when the OSA sufferer receives simple treatment to correct the airway obstruction during sleep. However, in order to receive the simple, non-invasive, corrective treatment, the sufferer needs to know that he or she has OSA in the first place. Up to 95% of people diagnosed with OSA thought that they just had a snoring or fatigue problem, causing sleep specialists to suggest that high-risk groups should be educated and screened (Baumel, 1997). We'll explain more later about how to educate those at risk—first, we'll discuss why it should be a priority.

Costs of Unmanaged OSA

Many areas of cost are attributable to OSA in any workforce. Figure 1 shows some of the areas that are often directly affected, including workers' compensation costs, health care costs, safety- and insurance-related costs, productivity costs, and brand protection costs.

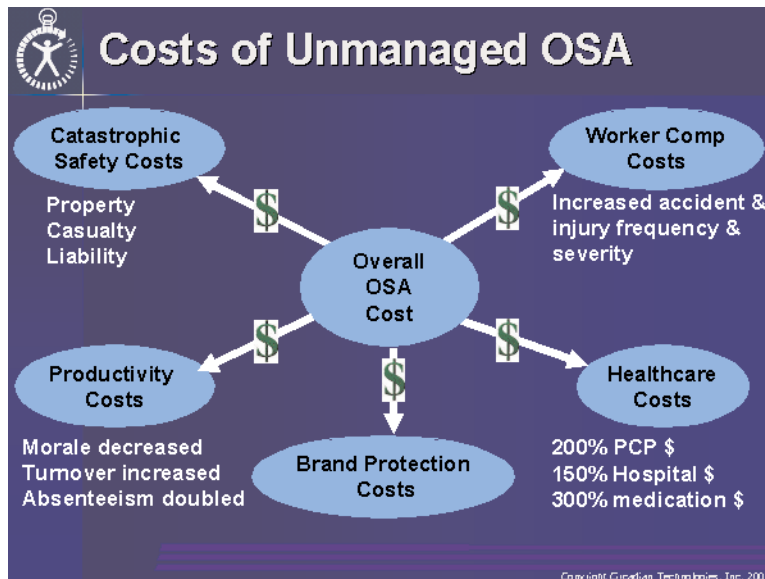


Figure 1. The costs of unmanaged OSA to the 24/7 business.

Comparing the cost of OSA employees to the costs of non-OSA employees reveals the importance of dealing with this issue, especially when talking about 11.6% or more of the workforce. Every year, an OSA sufferer has excess costs resulting from:

- more than twice the number of physician claims (Kryger, 1996; Kapur, 1999; Smith, 2002)
- 1.9 times more cardiovascular medication (Otake, 2002)
- 2.7 times more hypertension medication (Otake, 2002)
- 50% more hospital stays (Smith, 2002)
- 2.63 times the amount of absenteeism (Servera, 1995)
- 20% reduction in performance (Ulfberg, 1996)
- increased costs for accidents, injuries, absenteeism and overtime, workers' compensation, property damage, scrap and rework, etc.

A highly conservative estimate of the yearly excess cost per employee with unmanaged OSA is approximately \$6,091. In a shiftwork population where 11.6% of the workers are unmanaged OSA sufferers, that adds up to \$706,556 per one thousand workers every year (\$6,091 x 116 workers).

The cost estimate of \$6,091, shown in Figure 2, can be considered highly conservative, as it DOES NOT include:

- Costs associated with any downtime from occupational accidents or injuries that do not result in time away from work
- Overtime costs to fill positions of absent workers
- Property or workers’ compensation costs resulting from accidents
- Scrap and/or rework costs
- 20% reduction in performance and productivity in unmanaged OSA sufferers—a cost highly specific to each workforce
- Impact on shareholder value of a major high-profile accident or industrial catastrophe caused by an employee with diagnosed or untreated OSA

Field experience in running corporate sleep apnea programs, as well as discussions with corporate medical directors, suggest that several thousand dollars should be added to the \$6,091-per-worker figure when calculating the average cost of unmanaged OSA in any workforce.

	Costs per Employee per Year		
	Treated or no Apnea	Untreated apnea	Excess Cost
Health Care Costs	\$ 2,509	\$ 5,227	\$ 2,718
Occupational Injuries (time off work)	\$ 1,160	\$ 2,552	\$ 1,392
Occupational Fatalities	\$ 33	\$ 72	\$ 39
Absenteeism	\$ 789	\$ 2,076	\$ 1,287
Driving Accidents	\$ 546	\$ 1,201	\$ 655
TOTAL COSTS	\$ 5,037	\$ 11,128	\$ 6,091

Figure 2. Breakdown of the specific costs of OSA in excess of non-OSA costs.

Treatment of OSA

In order to mitigate the risks associated directly with OSA, and lower the sufferer's risk to the same level as a non-OSA worker, the obstruction of the airway during sleep must be prevented. In short, the patient needs to keep breathing.

General measures are often effective. These include weight loss, avoidance of alcohol and sleeping pills, use of medication to relieve nasal congestion, and use of oral appliances that modify the position of the tongue, soft palate or jaw. More extreme measures include nasopharyngeal surgery, although the long term efficacy of this approach is questionable due to the accumulation of scar tissue. However, the most effective medically recognized method for maintaining an open airway in those suffering from moderate to severe OSA is "Continuous Positive Airway Pressure," or CPAP for short.

A CPAP machine is used during sleep to deliver a supply of air under slight positive pressure through a small face mask that the patient wears while sleeping. The air pressure keeps the airway open by pushing back soft tissues, therefore eliminating any cessations in breathing and providing uninterrupted and restorative sleep. Bi-level positive airway pressure (BiPAP) differs from CPAP in that less pressure is applied during exhalation compared to inhalation. The latest advances in CPAP technology have created machines that constantly monitor the breathing pattern of the user on a breath-by-breath basis, and modify the air pressure level so that only the very minimum pressure is delivered to maintain an open airway. These "self-titrating" devices are more comfortable to use as there is never too much pressure delivered, leading to a higher compliance and success rate (Massie, 2003; Fitzpatrick, 2003).

Employees receiving CPAP treatment experience a dramatic improvement in their health and quality of life (Sin, 2002), and their health care costs return to normal levels. Performance (as measured by tests of simulated driving, daytime sleepiness, cognitive performance and mood) shows significant improvements (Weaver, 2001), while absenteeism diminishes after treatment (Servera, 1995). Essentially, all the adverse health and performance consequences and costs are thus reversed in the compliant, treated employee.

The Challenges of OSA

Five key challenges must be addressed to ensure a successful outcome for a company-sponsored OSA initiative. The first of the challenges is educating those who might be at risk. A very close second is maintaining an environment free from fear of discrimination.

There is a distinct lack of awareness about the symptoms and risks associated with OSA. Although this issue can be addressed using an OSA educational or awareness program in the workplace, educational materials about OSA can often be overly technical and not specifically related to real-life examples. In addition, educating workers' family members in addition to the workers themselves can result in a higher rate of successful diagnosis and compliance. It is often the spouses who recognize symptoms while their partners are sleeping fitfully.

Without a complete confidentiality barrier around OSA education and screening, workers concerned about their OSA risk rarely come forward and risk their manager labeling them as a high-cost, high-risk employee. A key challenge in any OSA screening program is to maximize participation rates and successfully treat all those with OSA so that risk and cost to the business is minimized.

The third challenge is accurately and rapidly screening the workforce for OSA. The symptoms of OSA can be easily missed, and it has been shown that even primary care physicians need more information about screening for patients with OSA to ensure proper diagnosis and treatment of those with the condition (Chung, 2002). Poorly designed screening questionnaires can cause false positive and negative results, leading to unnecessary and costly visits to the PCP by those who are not at risk, or the failed diagnosis of OSA sufferers and their return into the population still unmanaged.

The fourth OSA challenge in a shiftwork environment is overcoming the inconvenience of the sleep lab visit. Traditionally, diagnosis has been confined to the nearest sleep laboratory, where an "overnight visit" is needed so that a sleep specialist can diagnose the OSA sufferer. Several problems generally occur with this pathway:

- Not every hospital has a sleep lab, so sometimes the "local" sleep lab is several hours away from shiftworkers' homes. Night shift workers sleep during the day, and so an "overnight visit" does not easily suit their schedule (and taking time off might reveal their OSA risk).

- For night shift workers, the idea of spending yet another night away from home and family is not a popular one.
- When one is not used to traveling regularly, sleeping in any strange environment, like a hotel or sleep lab, can cause sleep disruption, and so measurements may not reflect the normal sleep habits of the shiftworker being tested.

The fifth challenge is addressing the lack of structured follow-up support for diagnosed OSA sufferers while they are learning to use their CPAP devices. Often, the sleep lab will pass the care of the OSA sufferer back to the primary care physician or a Durable Medical Equipment Supplier (DME). However, the standard of follow-up care and attention can be variable, and poor follow-up has been shown to lead to low treatment success rates (van de Mortel, 2000). It is generally recognized that the first seven days of learning to use the CPAP are the critical time for reaching a level of compliance with the treatment, with the next two months also a key time period in determining long-term success. Unfortunately, many newly diagnosed OSA sufferers receive limited support during this critical time, resulting in high drop-out rates and wasted diagnosis costs.

Solutions to Address OSA

Solution 1: Educating those who might be at risk

Circadian has a proven history of successfully educating the workforce about the risks and treatments of OSA. Through specially adapted educational materials for the workers and their families, health fairs and training sessions, the importance of addressing this serious issue is explained in full. The training materials are customized with company logos to show the support of the program by management. The health risks, as well as the choices for screening, diagnosis, and treatment, are explained in easy-to-understand terminology. A free phone support line is on hand to answer any questions that workers or their families may have.

sleep apnea
Screening and Treatment Program

**Are you tired all the time?
Have you been told you snore?
Do you suffer from low energy, irritability or depression?**

YOU COULD HAVE SLEEP APNEA

What is sleep apnea?
Sleep apnea occurs when you stop breathing for a few seconds during sleep. Similar to snoring, this happens when soft tissues partially block the airway. These "breathing events" can happen every few minutes and may wake you up hundreds of times a night without you realizing it, causing you to get poor quality sleep. If you have untreated sleep apnea, you are usually tired, lack energy, suffer from headaches and get irritable easily. It's a very common disorder with about one in ten shiftworkers suffering from its effects.

Why is it important to treat sleep apnea?
If sleep apnea is not treated, your long term health is at serious risk. Untreated, you are 2.3 times more likely to have a heart attack compared to someone without sleep apnea. You would also have increased risk of high blood pressure (2.5 times more likely), irregular heart beat (2 times more likely), congestive heart failure (3.9 times more likely), stroke (1.6 times more likely), depression (1.4 times more likely), daytime sleepiness (40% higher), and car accidents (2.2 times the number of accidents).

A free screening program is available to you.
We are going to send you a free screening survey in the mail to your home. It's completely CONFIDENTIAL - so you don't need to share your answers with anyone else. All you need to do is complete and return it in the postage-paid envelope. If you are found to be at high risk for sleep apnea, you will receive a letter from Circadian and a follow-up phone call from a Circadian counselor to discuss your results and options for care.

You can choose to be diagnosed and treated if you want to.
If you find out that you are at risk, you can choose to participate in the diagnosis and treatment program. This program is run in your own home and you will simply receive all the necessary steps through the mail. There is no waiting list to visit a sleep clinic - it's simple and private.

Questions?
Circadian Technologies is a consulting company specializing in the health and well being of employees who work around-the-clock. Please contact us if you have any questions.
Call 1-800-284-5001 and ask for the Sleep Apnea Program.
Email apnea@circadian.com or Fax 781-676-6999

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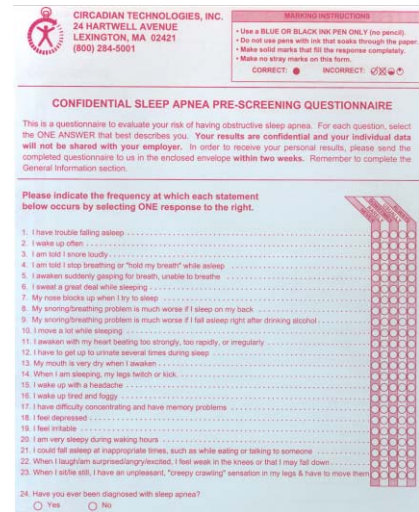
Solution 2: Maintaining an environment free from fear of discrimination

The success of any OSA screening and treatment program depends on the ability of management to provide a guarantee of confidentiality for anyone who wishes to come forward and be treated. As an independent third party, Circadian can provide the guarantee of complete confidentiality for the employees participating in the program, while still regularly presenting general program results for managers to monitor the program’s return on investment.

Solution 3: Accurately and rapidly screening the workforce

OSA symptoms can be easily misinterpreted, even by primary care physicians (PCP) (Chung, 2002), and so only screening questionnaires with a high specificity and sensitivity (which accurately detect those at risk and those not at risk) should be used.

Circadian’s proprietary in-house screening questionnaire is 80% specific for identifying those at risk from OSA. This questionnaire also identifies other sleeping disorders that could result in excess employee fatigue and put the business at risk. Only employees requiring a confirmed OSA diagnosis are directed into the program and to their PCPs, saving unnecessary costs for those not at risk.



In addition to screening the employees to find those most at risk, Circadian provides:

- PCP educational materials with the latest research on OSA diagnosis and treatment
- A complete program information package describing regional and national information resources, and a full description of the diagnostic pathway on offer through the program

Solution 4: Overcoming the inconvenience of the sleep lab visit

Historically, the sleep lab visit has been the most difficult obstacle to overcome in successfully treating 24/7 employees. However, novel technology in the field of OSA diagnosis has led to the development of at-home diagnostic devices. These pocket-sized devices are worn by the employee at home during one regular sleep period. Chest movements, nasal airflow, blood oxygen levels, and sleeping position are

all measured non-invasively while the employee sleeps in his or her own bedroom.

Circadian provides this complete at-home diagnosis using overnight delivery of the latest technology directly to the employee's home. The accompanying manuals are specially designed for at-home use, and a free phone support line is on hand to answer any questions that may arise. The unit is simply returned in the mail for remote diagnosis by a sleep specialist. This simple at-home procedure replaces the unwanted overnight sleep lab visit, yields the same diagnosis results, and saves the cost of the overnight study, which would otherwise average \$2,500 per employee (Parra, 1997; Kristo, 2001; Golpe, 2002).

Previously, the overnight visit was also necessary so that the sleep specialist could determine and prescribe the correct pressure level for the CPAP machine in order to keep the airway open. Thanks to the latest technological advances in the field of OSA treatment, there are now more options including at-home titration. The new "self titrating" CPAP units constantly vary the pressure levels to deliver personalized breath-by-breath air pressure to keep the airway open during sleep. Although this technology is brand new, studies have clearly shown that home self-titration of CPAP has been proven to be as effective as in-laboratory manual titration in the management of patients with OSA (Massie, 2003; Fitzpatrick, 2003).

Circadian provides the very latest in self-titrating CPAP units, humidifiers, and masks to the employees, considerably increasing their chances of successful treatment. During self-titrating therapy, patients have reported more restful sleep, better quality sleep, less discomfort from pressure, and less trouble getting to sleep during the first week of therapy—the key time period for compliance—compared to traditional CPAP therapy (Massie, 2003).

Solution 5: Addressing the lack of structured follow-up support

The solution to maximizing the ultimate compliance levels is expert case management and close follow-up of all those in the program (Zozula, 2001; Stepnowsky, 2002). Closely monitoring CPAP usage, accurately troubleshooting problems, and providing immediate solutions are the key to success. Thanks again to the very latest in remote-monitoring technology, CPAP usage characteristics and changes in the quality of life of the user can now be tracked, recorded, and very closely monitored using onboard computer chips in the CPAP machines.

The Circadian Case Manager can immediately detect if there is a problem with compliance (perhaps with the mask leaking, continued cessations in breathing, non-usage, etc.) and initiate a closer investigation to troubleshoot any problems. From the time the questionnaire reads “at risk,” to scheduling a diagnosis, to being on call around the clock to answer any worries about using CPAP (or discuss the kids’ softball game results), the Circadian Case Manager is on hand to support, guide, and ease the patient through the treatment pathway, maximizing the program success and achieving the goals of reducing the costs, risks, and liabilities of OSA in the workforce.

Customized OSA Screening and Treatment Programs

OSA creates a significant cost to any company’s bottom line when 5% of the average workforce suffers from unmanaged OSA. But the cost can be threefold in a 24/7 company where an elevated frequency of risk factors increases the prevalence of OSA to more than 11.6%. Historically many obstacles had to be overcome to successfully find, diagnose, treat, and sustain the compliance of OSA sufferers, especially in 24/7 environments. For that reason, Circadian developed the unique Confidential OSA Diagnosis and Treatment Program, successfully used in 24/7 companies across North America.

Now, Circadian is pleased to incorporate the very latest in proven OSA diagnosis and treatment technology to offer a remote-delivery, entirely home-based program. The programs are entirely customized based on the needs and requirements of the management team and the health care coverage of any health plans involved in the program.

**The health care and operational costs from failing to address OSA
in a 24/7 workforce can be significant.**

These costs can be professionally and effectively managed.



For more information about OSA, or details about how to implement a customized OSA Screening and Treatment Program in your workplace, please call Circadian at 1-800-CTI-5001 or email Dr. Kirsty Kerin at apnea@circadian.com.

References

- AHRQ, 2000. Evidence Report/Technology Assessment No. 1, Systematic Review of the Literature Regarding the Diagnosis of Sleep Apnea (AHCPR Publication No. 99-E002).
- Baumel MJ, Maislin G, Pack AI. *American Journal of Respiratory and Critical Care Medicine* 1997 Jan; 155(1):9-14. Population and occupational screening for obstructive sleep apnea: are we there yet?
- Chung SA, Jairam S, Hussain MR, Shapiro CM. *Canadian Family Physician* 2002 Jun; 48:1073-80. How, what, and why of sleep apnea. Perspectives for primary care physicians.
- Fitzpatrick MF, Alloway CE, Wakeford TM, MacLean AW, Munt PW, Day AG. *American Journal of Respiratory and Critical Care Medicine* 2003 Mar 1; 167(5):716-22. Can patients with obstructive sleep apnea titrate their own continuous positive airway pressure?
- Golpe R, Jimenez A, Carpizo R. *Chest* 2002 Oct; 122(4):1156-61. Home sleep studies in the assessment of sleep apnea/hypopnea syndrome.
- Horstmann S, Hess CW, Bassetti C, Gugger M, Mathis J. *Sleep* 2000 May 1; 23(3):383-9. Sleepiness-related accidents in sleep apnea patients.
- Kapur V, Blough DK, Sandblom RE, Hert R, de Maine JB, Sullivan SD, Psaty BM. *Sleep* 1999 Sep 15; 22(6):749-55. The medical cost of undiagnosed sleep apnea.
- Kashyap R, Hock LM, Bowman TJ. *Sleep & Breathing* 2001 Dec;5(4):167-72. Higher prevalence of smoking in patients diagnosed as having obstructive sleep apnea.
- Krieger AC, Redeker NS. *Journal of Cardiovascular Nursing* 2002 Oct; 17(1):1-11. Obstructive sleep apnea syndrome: its relationship with hypertension.
- Kristo D, Eliasson AH, Netzer NC, Bigott T. *Sleep & Breathing* 2001 Jun; 5(2):97-9. Application of telemedicine to sleep medicine.

Kryger MH, Roos L, Delaive K, Walld R, Horrocks J. *Sleep* 1996 Nov;19(9 Suppl):S111-6. Utilization of health care services in patients with severe obstructive sleep apnea.

Massie CA, McArdle N, Hart RW, Schmidt-Nowara WW, Lankford A, Hudgel DW, Gordon N, Douglas NJ. *American Journal of Respiratory and Critical Care Medicine* 2003 Jan 1; 167(1):20-3. Comparison between automatic and fixed positive airway pressure therapy in the home.

Moore T, Franklin KA, Holmstrom K, Rabben T, Wiklund U. *American Journal of Respiratory and Critical Care Medicine* 2001 Nov 15; 164(10 Pt 1):1910-3. Sleep-disordered breathing and coronary artery disease: long-term prognosis.

National Institute of Health. 2003. Obstructive Sleep Apnea.
<http://www.nlm.nih.gov/medlineplus/ency/article/000811.htm>

Otake K, Delaive K, Walld R, Manfreda J, Kryger MH. *Thorax* 2002 May; 57(5):417-22.
Cardiovascular medication use in patients with undiagnosed obstructive sleep apnoea.

Parra O, Garcia-Esclasans N, Montserrat JM, Garcia Eroles L, Ruiz J, Lopez JA, Guerra JM, Sopena JJ. *European Respiratory Journal* 1997 Aug; 10(8):1699-700 and 1720-4. Should patients with sleep apnoea/hypopnoea syndrome be diagnosed and managed on the basis of home sleep studies?

Saito T, Yoshikawa T, Sakamoto Y, Tanaka K, Inoue T, Ogawa R. *Critical Care Medicine* 1991 Jul; 19(7):938-41. Sleep apnea in patients with acute myocardial infarction.

Servera E, Perez M, Signes-Costa J. *Chest* 1995; 108(Supplement):162S. Changes in work absenteeism in patients with obstructive sleep apnea syndrome after treatment.

Shahar E, Whitney CW, Redline S, Lee ET, Newman AB, Javier Nieto F, O'Connor GT, Boland LL, Schwartz JE, Samet JM. *American Journal of Respiratory and Critical Care Medicine* 2001 Jan; 163(1): 5-6 and 19-25. Sleep-disordered breathing and cardiovascular disease: cross-sectional results of the Sleep Heart Health Study.

Sin DD, Mayers I, Man GC, Ghahary A, Pawluk L. *Chest* 2002 Nov; 122(5):1679-85. Can continuous positive airway pressure therapy improve the general health status of patients with obstructive sleep apnea?: a clinical effectiveness study.

Smith R, Ronald J, Delaive K, Walld R, Manfreda J, Kryger MH. *Chest* 2002 Jan;121(1):164-72. What are obstructive sleep apnea patients being treated for prior to this diagnosis?

Stepnowsky CJ Jr, Bardwell WA, Moore PJ, Ancoli-Israel S, Dimsdale JE. *Sleep* 2002 Nov 1; 25(7):758-62. Psychologic correlates of compliance with continuous positive airway pressure.

Ulfberg J, Carter N, Talback M, Edling C. *Chest* 1996 Sep; 110(3):659-63. Excessive daytime sleepiness at work and subjective work performance in the general population and among heavy snorers and patients with obstructive sleep apnea.

Ulfberg J, Carter N, Edling C. *Scandinavian Journal of Work, Environment and Health* 2000 Jun; 26(3):237-42. Sleep-disordered breathing and occupational accidents.

van de Mortel TF, Laird P, Jarrett C. *Contemporary Nurse* 2000 Jun; 9(2):161-8. Client perceptions of the polysomnography experience and compliance with therapy.

Weaver TE. *Sleep Medicine Reviews* 2001 Jun; 5(3):223-236. Outcome measurement in sleep medicine practice and research. Part 2: assessment of neurobehavioral performance and mood.

Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. *New England Journal of Medicine* 1993 Apr 29;328(17): 1230-5. The occurrence of sleep-disordered breathing among middle-aged adults.

Zozula R, Rosen R. *Current Opinion in Pulmonary Medicine* 2001 Nov; 7(6):391-8. Compliance with continuous positive airway pressure therapy: assessing and improving treatment outcomes.