Continuous Positive Airway Pressure Therapy for Obstructive Sleep Apnea Syndrome: Do the Dollars Make Sense?

Comment on Albarrak M; Banno K; Sabbagh AA et al. Utilization of healthcare resources in obstructive sleep apnea syndrome: a 5-year follow-up study in men using CPAP. SLEEP 2005;28(10):1306-1311

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OBSTRUCTIVE SLEEP APNEA SYNDROME (OSAS) IS A SIGNIFICANT CAUSE OF MORBIDITY AND MORTALITY. THE DISEASE IS CHARACTERIZED BY RECURRENT collapse of the upper airway during sleep leading to nocturnal hypoxemia, sleep fragmentation, excessive daytime sleepiness, hypertension, and an increased risk of motor vehicle crashes.1 First line therapy of patients with OSAS is continuous positive airway pressure (CPAP). By establishing a positive pressure in the airway during sleep, CPAP prevents collapse of the upper airway resulting in elimination of sleep fragmentation and nocturnal hypoxemia.2 Research has documented numerous benefits of CPAP that span essentially every organ system. These include improvements in cardiovascular function (eg, blood pressure,3 ejection fraction3), endothelial function,4 neurocognitive function,6 endocrine function (eg, hyperlipidemia,7 glucose control9), systemic inflammation,9 oxidative stress,10 gastrointestinal function,11 and hematologic function (eg, platelet aggregability12). Studies have also shown that CPAP may reduce risks of motor vehicle crashes13 and cardiovascular disease.14

One area of investigation that has received relatively little attention is the economic impact of OSAS and its therapy.15 Although research has been published in this area, substantial deficiencies in knowledge exist.

Economic Burden of Untreated OSAS

Given the high prevalence and the adverse health effects associated with OSAS, one would expect that the disease would have a tremendous economic burden to society. Sassani and colleagues have recently attempted to assess part of the potential economic burden of OSAS.16 In particular, they estimated costs associated with OSAS-related motor vehicle collisions (MVC) by using data from the National Safety Council and performing a systematic review of research relating rates of MVC with the presence of OSAS. They estimated that in the year 2000, 800 000 American drivers were involved in MVC related to OSAS; the costs of these crashes was approximately $15.9 billion. Furthermore, the authors estimated that CPAP therapy in these patients would have reduced these costs by $11.1 billion and saved 980 lives.

Patients with OSAS also have an increased rate of work-related injuries17 and experience a reduction in work productivity.18 However, the potential economic burden of these occupational consequences is currently unknown, but may be substantial.

Cost-Effectiveness of Therapy for OSAS

Because healthcare resources are limited, evaluating costs and benefits of healthcare interventions is important in helping to decide which therapies offer best value for money. The cost-effectiveness of medical therapies is usually assessed by the incremental cost-effectiveness ratio, which is the ratio of the incremental costs associated with therapy divided by the incremental quality adjusted life years gained (QALYs). A ratio of less than $50,000/ QALY is generally considered cost-effective, although there is some evidence that this value should be higher.19

Mar and coworkers reported a cost-effectiveness analysis of CPAP therapy in patients with moderate to severe OSAH in Spain.20 In their economic model, they considered the effects of CPAP on improving quality of life, reducing rates of motor vehicle collisions, and preventing cardiovascular disease. Markov modeling was then used to calculate the cost-effectiveness of CPAP therapy. The cost-effectiveness ratio was 4938 Euros (year 2000 currency) per QALY saved, and well within the range of what would be considered cost-effective. Similar cost-effectiveness analyses from the United States perspective show that CPAP compares very favorably to other medical interventions.21 However, the cost-effectiveness of other therapies for OSAS, such as dental appliances, is unknown.

Healthcare Expenditures

Because of the adverse health effects of OSAS, one would speculate that patients with sleep apnea would have greater healthcare utilization compared to individuals without sleep apnea (all other things being equal). Furthermore, costs should be reduced with therapy. The study in this issue of Sleep by Albarrak and colleagues addresses the potential benefit of CPAP with respect to reducing healthcare expenditures.22 The investigators linked clinical information from patients seen in their sleep clinic to a Canadian provincial health database that included detailed information about healthcare costs. In doing so, they were able to track healthcare utilization in patients with sleep apnea before and after diagnosis. Costs during a similar time frame in a group of matched controls were also compared to the 342 male sleep apnea patients. The investigators found that in patients diagnosed...
with OSAS, costs were much greater in the year prior to diagnosis ($372) than in the 5 years before diagnosis. Furthermore, costs decreased after diagnosis such that healthcare expenditures 2 ($281) and 5 ($358) years after diagnosis was less than the year prior to diagnosis. In contrast, healthcare costs in control subjects gradually increased over time. Furthermore, at all time points, expenditures in the OSAS patients were greater than controls. The authors concluded that CPAP therapy reduces healthcare expenditures, and that this reduction in costs is sustained for at least 5 years.

Although these results are strong evidence that CPAP therapy reduces healthcare utilization in patients with OSAS, the limitations of the study need to be considered. First, costs were determined from a Canadian healthcare perspective, and the results may not be applicable to other countries given differences in costs and organization of healthcare. Second, the OSAS patients in the study had severe disease with a mean apnea hypopnea index of 47 events per hour. The applicability of these results to patients with less severe degrees of sleep apnea is thus unclear. Third, controls were matched for body mass index. The patients in the study were very overweight with a mean body mass index of 35.6 kg/m², and were likely much heavier than their matched controls. Given the relationships between obesity and increased healthcare expenditures, one cannot exclude the possibility that the differences in costs may have been at least partially due to obesity rather than sleep apnea per se. Fourth, the increased costs associated with the year prior to diagnosis may have been affected by referral bias. That is, patients with sleep apnea are sometimes referred to the sleep clinic as a consequence of being evaluated or treated for other diseases (which may not be present in the controls). For instance, it is not uncommon that a patient will be referred after an anesthetist or surgeon detects the presence of sleep apnea post-operatively. This may falsely increase healthcare costs in the year just prior to diagnosis of sleep apnea.

Despite these limitations, OSAS likely increases healthcare expenditures and CPAP therapy likely reduces them. Furthermore, these results are consistent with those of Kapur and associates. Using cross-sectional data from the Group Health Cooperation of Puget Sound, these investigators assessed healthcare expenditures in 238 patients with OSAS in the year prior to their diagnosis and compared these to 476 control subjects matched for age and gender. Mean medical costs of OSAS patients was $2720 compared to $1384 in the control subjects. In OSAS patients, medical costs were positively associated with the severity of sleep apnea (as assessed by the apnea hypopnea index).

OSAS is a common, under-diagnosed disease associated with significant morbidity and mortality. As such, the cost implications of OSAS when left untreated are potentially immense. These costs include those associated with occupational injuries, motor vehicle crashes, reduced work productivity, and associated morbidity (including the development of cardiovascular and cerebrovascular disease). CPAP therapy would likely reduces these costs, potentially making CPAP an extremely efficient use of healthcare resources.

OSAS is an under appreciated disease, and healthcare policy makers in many countries do not commit adequate resources for the diagnosis and treatment of this disorder. More research to better understand the costs associated with OSAS and the potential economic benefits of treatment are required. These types of studies will help to convince policy and healthcare decision makers of the importance and value of therapy for OSAS.

REFERENCES