Health, social and economical consequences of sleep-disordered breathing: a controlled national study

Authors: Jennum P, Kjellberg J


URL: http://thorax.bmj.com/content/66/7/560.long

Comment: This Danish study examined the socioeconomic (healthcare and loss of employment) costs for three groups of patients: snorers (n = 12,045; 7% on CPAP), those with OSA (n = 19,438; 21% on CPAP) and those with obesity hypoventilation syndrome (OHS) (n = 755; 8% on CPAP), as well as a control group (four per patient). Medication and hospital costs were 2 to 3 times higher in the OSA and OHS groups compared with the controls; total health costs were more than twice as high. Employment rates were more than 30% lower in OSA and OHS patients than in controls and wages were significantly lower. These effects increased with the severity of OSA. Annual excess total costs (direct and indirect) were €705, €3860 and €11,320, for snorers, OSA and OHS patients, respectively. These socioeconomic consequences were present up to eight years prior to the first diagnosis in patients with OSA and OHS, and increased with disease progression. Significantly greater mortality was seen in the OSA and OHS groups compared with the controls. CPAP use reduced mortality in the OSA group. Although age, gender and socioeconomic status were considered, this study did not control for obesity, smoking, craniofacial abnormalities or cardiovascular disease. The authors assert that to achieve significant reductions in socioeconomic outcomes, morbidity and mortality, early diagnosis and management are needed. The authors argue that a screening and disease management program should be considered.
Predictors of long-term compliance with continuous positive airway pressure

Authors: Kohler M et al.
URL: http://thorax.bmj.com/content/65/9/829.long

Comment: Long term rates of adherence with CPAP are usually quoted as approximately 60%. A number of factors, including Epworth Sleepiness Score (ESS), severity of OSA and nasal resistance have all been found to be major determinants of compliance. This paper analysed objective CPAP adherence data for 639 of 3900 patients, for whom data was available, and who started using CPAP for OSA between 1994 and 2005. Severity of sleep disordered breathing (oxygen desaturation index, ODI) was defined as the number of oxygen desaturations of >4% per hour of study. Neck circumference and ESS were also assessed. Objective data on CPAP compliance was available for all 639 patients, of whom 81% were adherent with CPAP therapy after five years and 70% were adherent after 10 years. Multivariate analysis indicated that ODI was the only significant variable associated with long-term compliance with CPAP. Sleepiness (objective and subjective) were not associated with adherence in a subgroup of 302 patients. This is the largest dataset and longest follow up of adherence with CPAP. A limitation of this study was the inability to obtain complete medical record data on all 3900 patients.

Flexible pressure delivery modification of continuous positive airway pressure for obstructive sleep apnea does not improve compliance with therapy: systematic review and meta-analysis

Authors: Bakker JP, Marshall NS
URL: http://chestjournal.chestpubs.org/content/139/6/1322.long

Comment: Since the invention of CPAP three decades ago there have been numerous device modifications attempting to improve adherence with CPAP. Manufacturers have developed flexible pressure or ‘pressure-relief’ CPAP, which reduces the pressure at the beginning of expiration in a bid to improve adherence. Trade names for this technology include Expiratory Pressure Relief, Flexline, eAdapt and C-flex. It is unclear whether these modifications improve adherence with CPAP. The authors reviewed trials that compared flexible CPAP with fixed pressure CPAP. Ten studies were included in the analysis, giving a combined sample of 599 patients. All studies compared C-flex with fixed pressure CPAP. Compared with fixed pressure CPAP, flexible pressure CPAP did not significantly improve adherence, objective or subjective sleepiness, or residual AHI. The authors concluded that flexible pressure CPAP cannot be recommended over standard CPAP and that the additional costs were unwarranted.
A novel nasal expiratory positive airway pressure (EPAP) device for the treatment of obstructive sleep apnea: a randomized controlled trial

Authors: Berry RB et al.

Reference: Sleep 2011; 34: 479-84.

URL: http://www.journalsleep.org/ViewAbstract.aspx?pid=28090

Comment: Although CPAP, the mainstay of therapy for OSA, is safe and effective, adherence is problematic. Nasal expiratory positive airway pressure (EPAP) is a novel device that contains a valve with high expiratory but minimal inspiratory resistance, and is inserted into both nostrils and sealed with adhesive tape. In this multicentre parallel group study, 240 patients were randomised to either the nasal EPAP device or a sham nasal device for three months. Exclusion criteria included severe oxygen desaturation, past treatment for OSA and nasal occlusion. Polysomnography (one with the device, one without the device) was performed at week one and at three months. Drop out rates were similar for the two groups and were approximately 20%. Mean AHI fell from 14/h to 5/h in the active arm of the study and from 12/h to 11/h in the control arm. Whilst there was a significant reduction in Epworth Sleepiness Score for both groups, the difference was significantly greater in the treatment group (change of 2.7 vs. 1.3). Self reported adherence was 88% for nasal EPAP and 92% for the sham device. These results are promising and suggest that the nasal EPAP device may be an effective treatment alternative for some patients with OSA. Larger trials that include more patients with severe OSA are required before this treatment can be widely recommended.

Prospective study of obstructive sleep apnea and incident coronary heart disease and heart failure: The Sleep Heart Health Study

Authors: Gottlieb DJ et al.


URL: http://circ.ahajournals.org/content/122/4/352.long

Comment: In this study, 4,422 adults (44% male) over 40 years of age, who were free from heart disease, underwent home polysomnography and were followed for a median of 8.7 years for incident episodes of coronary artery disease and the development of heart failure. After adjustment for multiple risk factors, OSA was a significant predictor of incident coronary heart disease, but only in men less than 70 years of age. This association was not seen in older men or in women of any age. OSA predicted incident heart failure in men but not in women (adjusted hazard ratio 1.13). Men with an AHI >30 were 58% more likely to develop heart failure than those with an AHI <5. This is the first prospective study of OSA that included a significant number of women and reported on incident heart failure. Previous cohort studies demonstrated a stronger association between OSA and heart disease but included patients who refused CPAP or were non-adherent with therapy. Such patients are potentially non-adherent with all medications. The absence of an association in older patients may be due to the healthy survivor effect or competing cardiovascular risk factors. Possible explanations for the absence of an association in females include later onset of OSA, lower prevalence or a true physiological gender difference.
Sleep apnea testing and outcomes in a large cohort of Medicare beneficiaries with newly diagnosed heart failure

Authors: Javaheri S et al.


URL: http://ajrccm.atsjournals.org/cgi/content/full/183/4/539

Comment: Previous studies of consecutive patients with heart failure (HF) have estimated the prevalence of sleep apnoea (SA) to be as high as 60%. In this study, over 30,000 patients from the American Medicare database, who were diagnosed with HF, and who had no pre-existing SA, were retrospectively studied and followed up for two years. Amazingly, only 2% of patients were tested for SA. Among those suspected of having SA, the diagnosis was confirmed in 97%. The low rates of testing may be due to lack of resources, unwillingness of patients, lack of awareness of physicians, or absence of classic symptoms of OSA in this population. Patients with HF who were tested, diagnosed, and treated for SA had a better 2-year rate of survival compared with patients with HF who were not tested. Furthermore, patients who were confirmed as having treated SA had the lowest health-care expenditure and hospitalisation rates, as well as better 2-year survival than those who were undiagnosed or untreated. A potential source of bias is that patients referred for testing for SA may have been more mobile, healthy and adherent with medications. The results led the authors to conclude that amongst Medicare patients with HF, SA is likely to be dramatically under-diagnosed and under-treated. If SA can be diagnosed and treatment initiated, impressive improvements in survival, as well as cost benefits, can be expected. For this reason, a systematic approach is required to the evaluation and treatment of SA in patients with HF.

Occurrence of coronary collateral vessels in patients with sleep apnea and total coronary occlusion

Authors: Steiner S et al.


URL: http://chestjournal.chestpubs.org/content/137/3/516.long

Comment: There is a wealth of evidence supporting the observation that OSA is a risk factor for cardiovascular morbidity and mortality. It is thought that intermittent hypoxia contributes to atherosclerosis (see next article). However, there is also evidence to support upregulation of vascular growth factors, which may result in compensatory formation of collateral vessels to protect the myocardium from further ischaemia. This study examined the influence of OSA on the development of coronary collateral vessels (CCV), as measured by the “Cohen and Rentrop” grading system [0 = no collaterals; 3 = many collaterals]. Patients with suspected OSA and total occlusion of one or more coronary artery vessels on coronary angiography were included in the study. Patients were divided into OSA (AHI >10, n = 15) and non-OSA (AHI <10, n = 19) groups. Those with OSA were found to have higher (i.e. better) Cohen and Rentrop scores (2.4 ± 0.7 vs 1.6 ± 1.2, P<0.02) for CCV. An accompanying editorial highlighted the epidemiological data suggesting that OSA in elderly patients may be cardio-protective. They hypothesise that intermittent hypoxia due to OSA may lead to ‘ischaemic preconditioning’ which protects against myocardial infarction. The results of Steiner et al. provide a physiologically plausible explanation for the cardio-protective effects of OSA in the elderly.
Obstructive sleep apnea–hypopnea and incident stroke: The Sleep Heart Health Study

Authors: Redline S et al.
URL: http://ajrccm.atsjournals.org/cgi/content/full/182/2/269
Comment: In this study, 5,422 adults (45% male) over 40 years of age, who were free from stroke and treated OSA, underwent home polysomnography and were followed for incident stroke (3.6%) for a median of 8.7 years. After adjustment, a significant positive association was observed between ischaemic stroke and obstructive apnoea-hypopnoea index (OAHI) for men of all ages. Men with moderately severe OSA (OAHI >19) had an almost threefold increased risk of ischaemic stroke, equivalent to that seen with atrial fibrillation. In women, increased risk was observed for an OAHI >25. This is the first prospective community based study of OSA that has examined incident stroke. It is also significant because a large number of women were included. These results suggest that the association between OSA and stroke may be stronger than the association between OSA and heart disease. Postulated pathophysiological mechanisms that relate OSA to coronary and cerebrovascular disease include local vascular vibrational endothelial damage, and surges in sympathetic nervous system activity and blood pressure due to recurrent pharyngeal occlusion and resultant oxyhaemoglobin desaturation. This process leads to generation of free radicals and release of pro-inflammatory and pro-thrombotic mediators.

Early treatment of obstructive apnoea and stroke outcome: a randomised controlled trial

Authors: Parra O et al.
URL: http://erj.ersjournals.com/content/37/5/1128.long
Comment: OSA is an important risk factor for cardiovascular disease, including stroke. The effects of treatment of OSA with CPAP upon stroke related morbidity and mortality is unclear, possibly due to delays in initiating treatment. This randomised, controlled multicentre trial assessed the impact of early vs no CPAP in 140 patients aged <75 years, with acute first ever ischaemic stroke and OSA (AHI >20/h), by portable cardiopulmonary monitoring within three days of the stroke. Fourteen of 71 patients refused CPAP, with the remaining 56 being analysed as the “CPAP” group. Neurological recovery at one month was better in the CPAP group. There was a non-significant trend for improvement at later time points. Time to first cardiovascular event was significantly longer in the CPAP group than in the control group (14.9 vs 7.9 months). There were no improvements in survival of patients or quality of life. Limitations of this study included failure to use an intention to treat analysis and the small numbers of patients. Moreover, patients with severe stroke were excluded. These results do suggest some benefit from early CPAP; however, larger studies with longer follow-up periods are required to further clarify effects on mortality.
Obstructive sleep apnea: brain structural changes and neurocognitive function before and after treatment

Authors: Canessa N et al.


URL: http://ajrccm.atsjournals.org/cgi/content/full/183/10/1419

Comment: For the past decade it has been appreciated that OSA is associated with structural brain changes. Voxel-based morphometry (VBM) is an MRI technique used in this field to detect diffuse reductions in grey matter. In this study, 17 patients with severe OSA who were naïve to treatment, and 15 healthy age-matched controls were assessed at baseline by polysomnography, cognitive function tests and MRI. The OSA group received CPAP therapy for three months. The OSA group were severely hypoxic (mean of 30% of time with SaO2 <90%). Using VBM, the authors showed that OSA led to a reduction in grey matter volume in the left hippocampus, left posterior parietal cortex, and right superior frontal gyrus, and that this loss was associated with cognitive dysfunction. It has previously been postulated that intermittent hypoxia causes oxidative stress and cell death in grey matter. Importantly, CPAP treatment of OSA resulted in increased grey matter volume in the hippocampus and frontal brain regions, as well as improvements in cognitive function. An editorial in the same issue of the journal suggested that these results mount a strong argument for the early treatment of severe OSA, even in the non-sleepy patient.