

“Using CPAP” Improves Cardiovascular Outcomes: Physicians must look behind the RCT veil and focus on long-term adherence

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Obstructive sleep apnea (OSA) is associated with increased morbidity and mortality from cardiovascular disease (CVD)¹⁻³ and strongly associated with hypertension (HTN), resistant HTN, pulmonary HTN, atrial fibrillation (AF), stroke, transient ischemic attack, heart failure (HF), coronary heart disease, myocardial ischemia, myocardial infarction, and sudden death.⁴⁻⁶ Central sleep apnea is also associated with HF, stroke, and AF.⁴⁻⁶ The mechanisms have been extensively reviewed.⁴

OSA is highly prevalent in patients with CVD,^{4,7} yet only a small percentage of patients with CVD undergo evaluations for OSA.⁷ This is likely because the main treatment of OSA, continuous positive airway pressure (CPAP), has had historically poor adherence,⁸ and recent meta-analyses⁹⁻¹² of randomized controlled trials (RCTs) utilizing CPAP to treat OSA have failed to show improvement in cardiovascular (CV) outcomes.

However, two recent exhaustive reviews^{13,14} summarized a preponderance of observational data, including the secondary analyses of three RCTs, that showed improvement in CV outcomes in those patients who used CPAP 4 or more hours per night long-term. CPAP usage, which has been shown to be dose dependent, was clearly higher in observational studies than in RCTs. This could have accounted for the improved outcomes, but confounding factors were possible. RCTs were also limited by ethical constraints requiring exclusions of many patients (i.e. sleepy patients) more likely to use CPAP and patients with more severe disease who were more likely to benefit from the treatment. Despite the poor adherence, the RCTs still had secondary outcomes of improved blood pressure (lowering risk of CVD), daytime sleepiness, and quality of life.

RCTs refer to a population, not an individual. In the largest RCT¹⁵ the average CPAP usage was 3.3 hours per night, and only 42% used CPAP 4 or more hours long-term. There were just not enough users to improve CV outcomes for the whole population. But this does not address outcomes for participants in the trial with excellent adherence. Observational studies and secondary analyses of RCTs clearly showed those using CPAP > 4 hours per night had improved CV outcomes whether the improvement was from the CPAP or a confounding factor. Considering the low cost and low risk of harm of CPAP relative to a CV event, patients with CVD should be evaluated for OSA and not denied the likely benefits of CPAP found in the observational data and the clear benefits of the secondary outcomes in RCTs.

Again, CPAP adherence is historically low⁸ as reflected in the RCTs, despite efforts to improve adherence in the treatment groups. The largest RCT¹⁵ used a trial of CPAP (below therapeutic levels) before randomization which eliminated 14% of patients from the treatment group likely not to use CPAP. This suggests “real world usage”¹⁶ is even worse than the RCTs, with possibly less than 30% of CPAP patients using long term.

Most sleep medicine physicians (many who also practice another specialty and only spend part of their time in sleep medicine) are paid to perform sleep consultations, interpret polysomnograms, and limited follow-up visits. Medical equipment providers are paid to provide

CPAP equipment and obtain a minimal short-term adherence,¹⁷ which translates to only 2.8 hours per night. Currently, there is little incentive for sleep medicine providers and medical equipment companies to focus on long-term usage. Without long-term CPAP usage, the value of a sleep consultation, polysomnogram, and CPAP equipment in OSA patients become limited. Again, this perceived limited value among referring physicians may account for the small percentage of patients with CVD undergoing OSA evaluations,⁷ especially considering the high cost of polysomnography in hospital-owned sleep laboratories.¹⁸

There is a solution. A recent RCT¹⁹ showed that motivational enhancement increased average CPAP usage from 3.3 hours (similar to the largest RCT)¹⁵ to 4.4 hours per night at 6 months, with similar results at 12 months. Motivational enhancement (part of cognitive behavioral theory), patient education, remote monitoring, and troubleshooting CPAP problems are each associated with increased CPAP adherence.¹² Sleep medicine practices which utilize these practices in their care-model are likely to achieve better outcomes.

We recently submitted a large, retrospective cohort study²⁰ evaluating CPAP adherence in a community setting (age 20-64) where the treatment group (n=1849) averaged 4.4 hours per night over 12 months with 72% still using after 12 months. The usual care group (n=2023) averaged 3.3 hours per night over 12 months with 42% still using after 12 months, similar to the largest RCT¹⁵ and the usual care group in the RCT mentioned above.¹⁹ If we had included patients over age 65 our number of long-term users would have been higher.²¹ We believe our results are obtainable in community practice settings but will first require a change of focus among many sleep medicine providers, and possibly a change of incentives. Our results could possibly improve the outcomes of patients with CVD on CPAP in future RCTs, but the behavioral interventions to increase adherence could become a confounding factor (encouraging other healthy behaviors) as well.

For comparative purposes, long-term adherence rates to many CV medications are also poor²² and may be worse than CPAP adherence in the largest RCT.¹⁵ The 12-month CPAP adherence we found in our treatment group²⁰ was nearly twice that of many CV medications.²² With poor adherence to many CV medications being associated with increased cardiovascular morbidity and mortality,²² patient interventions may be warranted similar to those needed to improve adherence with CPAP.

In the meantime, physicians, particularly Cardiologists, should select a sleep medicine program in the way they select a CV medication. Providers select the most cost-efficient medications expected to provide the best outcome for their patients. Physicians should also select a sleep medicine program that performs cost-efficient testing and has the systems and trained staff to focus on long-term CPAP usage, for only with proven long-term usage can providers expect improved outcomes for their patients with CVD. The sleep medicine program must also offer alternative treatments for non-users of CPAP.²³

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