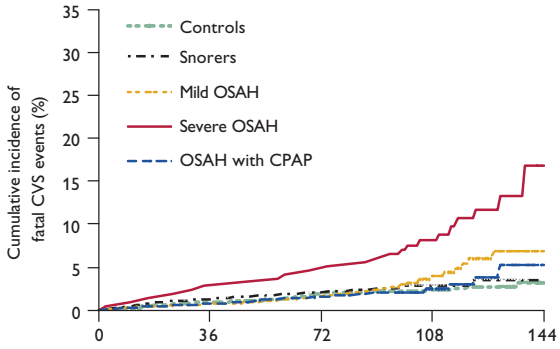
Cardiovascular effects of CPAP and auto-CPAP during sleep in patients with OSA

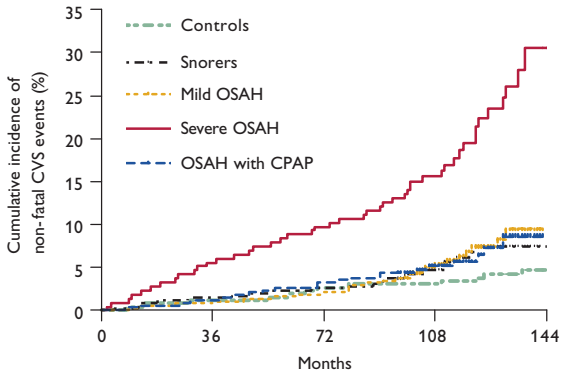
Operational auto-CPAP algorithms differ significantly between manufacturers

Obstructive Sleep Apnea (OSA) is characterized by intermittent narrowing (hypopnea) and total closure (apnea) of the upper airway during sleep and snoring. Each breathing episode is resolved by an arousal from deep sleep that results in sleep fragmentation and daytime hypersomnolence. It has been well demonstrated that untreated OSA is associated with activation of the sympathetic nervous system. Activation of the sympathetic nervous system can lead to hypertension and other cardio-cerebro-vascular diseases. As figures A and B demonstrate, patients with severe OSA who are untreated are at a significantly increased risk of fatal and non-fatal cardiovascular events.[1]

A



B



As can be seen in the survival curves, the data supports that long-term treatment of OSA with Continuous Positive Airway Pressure (CPAP) decreases the risk of fatal and non-fatal cardiovascular events. For many years, the gold standard for treating patients with OSA effectively has been fixed pressure CPAP.

Treatment with auto-CPAP therapy

With the ongoing advancements in technology through the past decade, auto-CPAP has displayed an advantage over fixed pressure CPAP in its ability to treat the patient's changes in sleep state, sleep position, or long-term changes in the patient's condition. Several brands of auto-CPAP devices are commercially available, with the common objective of maintaining airway patency by adapting the delivered pressure in response to partial and total closure of the upper airway. The operational algorithm of each manufacturer's device differs considerably, and these differences can affect the ability of the devices to detect and treat respiratory events during sleep. The following two studies demonstrate these differing patient outcomes based on the auto-CPAP device used.

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Fixed and autoadjusting continuous positive airway pressure treatments are not similar in reducing cardiovascular risk factors in patients with obstructive sleep apnea[2]

Recent data suggests that despite significant effects on OSA indices and symptoms, differences between the operational algorithms of auto-CPAP devices may affect their ability to alter cardiovascular risk factors.

CPAP treatment has been shown to improve cardiovascular and metabolic outcomes on patients with OSA. Patruno et al. randomized 31 newly diagnosed, severe OSA patients to either CPAP (Weinmann Somnocomfort) or auto-CPAP (ResMed Autoset T). Over a three-month treatment period, the apnea/hypopnea (AHI) was significantly reduced in both groups, and compliance to therapy was similar.

Patruno measured cardiovascular risk factors at baseline and at the end of the three months of treatment, including C-reactive protein, blood pressure, and insulin resistance. C-reactive protein was reduced on both CPAP and auto-CPAP therapy, however, both blood pressure and insulin resistance did not show similar improvements on both treatment modes (as can be seen in Figures 1 and 2).

The author concluded that the results of that study should be regarded as limited to the specific brand of auto-CPAP device used, since auto-CPAP devices have different algorithms that might lead to different observations.

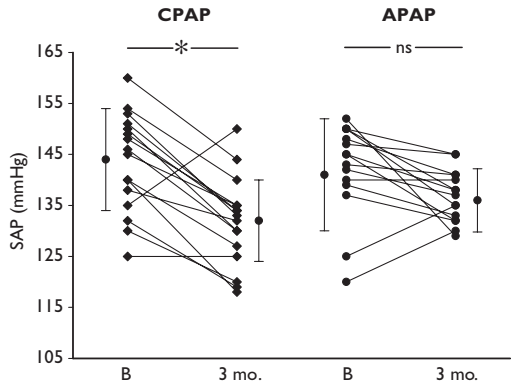

Figure 1. Individual and average changes in SBP (SAP) in patients treated with CPAP or APAP. B = baseline. *p < 0.05. Average data are expressed as mean ±SD.

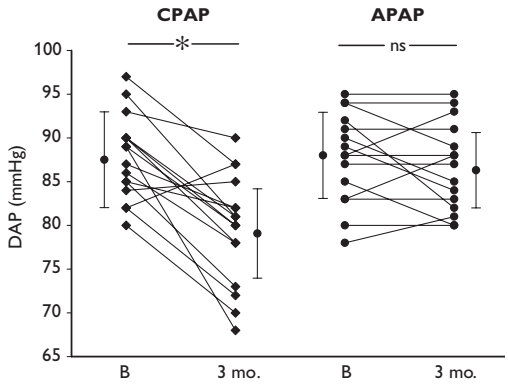

Figure 2. Individual changes in DBP (DAP) in patients treated with CPAP or APAP. See Figure 1 for expansion of abbreviations.

Effects of fixed and autoadjusting CPAP on cardiac sympathovagal balance during sleep in Obstructive Sleep Apnea patients[3]

At the 2008 SLEEP conference, further insights to support the conclusion of varying patient results based on the auto-CPAP device chosen were provided by Dr. Castronovo in collaboration with Dr. Patruno. Castronovo randomized 12 consecutive patients with severe OSA (AHI >30) to one month of CPAP and auto-CPAP treatment. In this case, the Respironics REMstar Auto was studied.

Patruno and Castronovo measured cardiovascular risk factors at baseline and at the end of therapy. Similar to the aforementioned study, the AHI was significantly reduced on both treatment modes, and compliance to therapy was similar.

This comparative study used the Respironics REMstar Auto, which contains a different operational algorithm. Unlike the Petruno study that did not show a difference in blood pressure reduction between the CPAP and ResMed Auto groups, titration with the REMstar Auto did lead to a reduction in systolic and diastolic blood pressure between the two groups.

These findings suggest that just like CPAP, the treatment of OSA by the Respironics REMstar Auto was effective in reducing blood pressure, a known cardiovascular risk factor.

Since operational auto-CPAP algorithms differ significantly between manufacturers, your patient's outcomes will differ significantly as well.

The evidence presented by these two studies suggests that the REMstar Auto operational algorithm may provide treatment equivalent to fixed CPAP in terms of AHI, compliance, and blood pressure.

The ResMed AutoSet, for reasons that are unclear at this time, does not lead to the same decrement in cardiovascular risk that is seen with CPAP.

Only the Respironics REMstar Auto has been shown to treat the patient and, like regular CPAP, was effective in reducing blood pressure, a known cardiovascular risk.

[1]Marin, J., et al., *Lancet* 2005;365:1046-53

[2]Patruno, V., et al., *Chest* 2007;131:1393-1399

[3]Castronovo, V., et al., *Sleep* 2008;31:A150

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