Comorbid OSA and post-traumatic stress disorder: improving PAP adherence with SensAwake™

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The link between OSA and PTSD

The link between military combat and post deployment mental health conditions is well established, with reported prevalence as high as 31% for men and 27% among women, compared with a 7% to 8% incidence in the general population.[1,2] The prevalence of sleep disorders related to post-traumatic stress disorder (PTSD), such as sleep-disordered breathing, is increasing.[3,4] Williams *et al.* conducted a polysomnography study on 131 military veterans with PTSD, finding a diagnosis of obstructive sleep apnea (OSA) in 67.3% of their population.[5] If left untreated, PTSD-related sleep disturbances can negatively impact the response to medical therapies and can contribute to the increased risk of suicidal thoughts.[6–8]

Longitudinal studies on veteran populations have shown an association between sleep disturbances following trauma and the progression of PTSD.[9–11] The comorbidity of these conditions forms a negative feedback cycle, with each having a negative impact on the treatment of the other. Conversely, the treatment of one of the co-occurring diseases can improve the other. The restorative effects of sleep are well documented.[12] Sleep enhances processes like fear extinction;[13] therefore, by treating OSA there is the added possibility of concomitant recovery from PTSD. A study by Orr *et al.* showed a dose-dependent improvement in PTSD symptoms with the effective treatment of OSA via positive airway pressure (PAP) therapy.[14]

Individuals with PTSD show reduced levels of compliance across a number of areas of medical care, such as missing appointments or non-adherence to antidepressant medication.[15,16] Therefore, patients with PTSD and OSA show poor adherence and response to PAP therapy compared with OSA-only controls.[17–19] Sleep symptoms specific to PTSD-related OSA include hypervigilance and insomnia, making it even more difficult for these patients to adapt to PAP therapy. Factors that play into low adherence in the OSA population include mask discomfort, claustrophobia, inability to tolerate pressure, and dyspnea. These factors may be amplified in patients with comorbid PTSD.[19,20]

Considering there are over two million US service member veterans since 2001, the OSA population among active and veteran military members is significant as seen with recent military veterans with PTSD who are evaluated with polysomnography (PSG), 51–63% have OSA.[3,5,17] When designing therapies for OSA we need to keep these cohorts of patients in mind. In the context of OSA patients with PTSD, they may require a more considered approach to ensuring comfort and feeling at ease when initiating PAP therapy.

SensAwake as a comfort technology

There are a large number of challenges to adapt to when starting PAP therapy, such as wearing a mask and breathing against pressure. Our goal at Fisher & Paykel Healthcare (F&P) is to try and lessen these uncomfortable aspects of PAP therapy as much as possible, to promote a positive introduction to this treatment. SensAwake (SA) is one such approach. The discomfort of breathing only experienced during wakefulness.[21] Reducing therapy pressure during these periods may reduce this discomfort and thereby improve adherence. SA is a pressure-relief technology which uses an algorithm to detect changes in respiratory flow signal, indicative of the transition from sleep to wake.[22,23] When a transition from sleep to wakefulness is detected by SA, the PAP device quickly reduces pressure to aid falling back to sleep (Figure 1). The goal of this feature is to improve adherence while maintaining the comfort and efficacy of therapy.

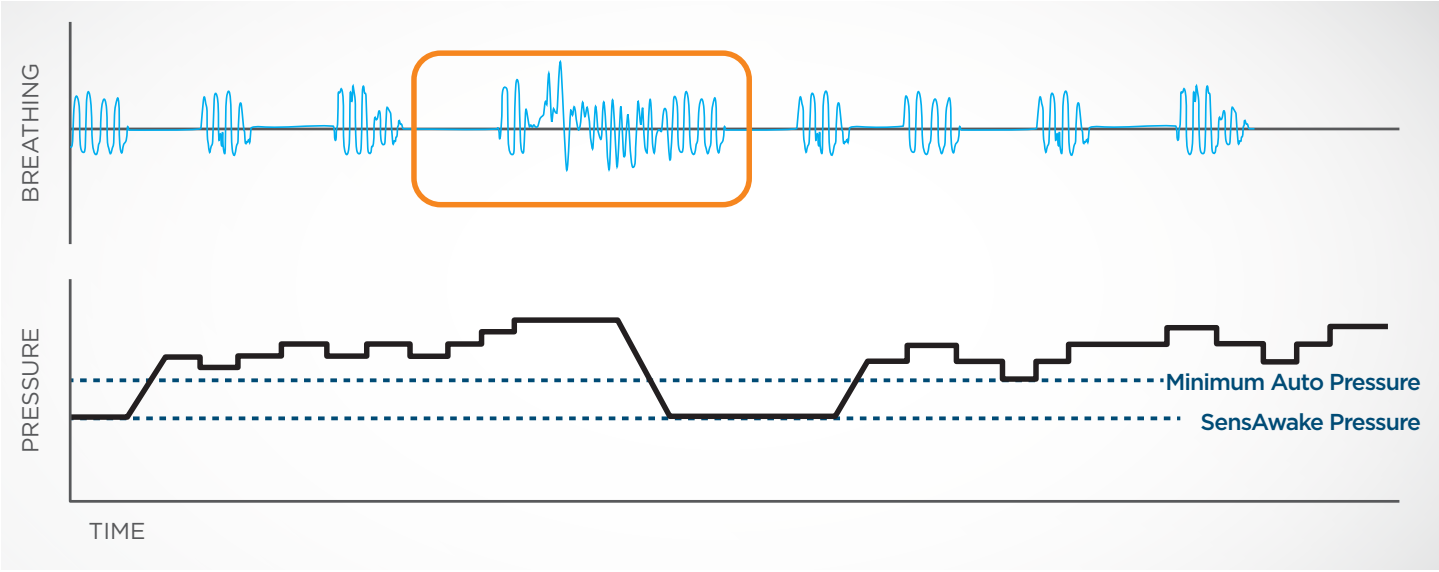

Figure 1. The SensAwake algorithm lowers pressure in response to changes in the respiratory signal. The top graph shows the breath flow rate over time, the bottom graph shows the device pressure over time.

Several trials have assessed the clinical outcomes of using SA with PAP therapy.[24–28] These studies show that PAP therapy with and without SA provide equally effective management of OSA symptoms. In addition, a number of clinical benefits of SA have been reported, including significantly lower respiratory effort-related arousals,[27] demonstrated patient preference for SA,[25,26] significantly reduced mean and 90th percentile pressures delivered during therapy,[24] and trends towards improved adherence.[28]

Given the improved comfort this technology may provide, this feature may be useful in OSA populations who characteristically demonstrate poor adherence to PAP therapy, such as those with comorbid conditions like PTSD and insomnia.

SensAwake and PTSD-OSA

A recent study by Holley *et al.* assessed whether SA can improve PAP adherence and OSA-related symptoms in a cohort of PTSD-OSA patients.[29] The study population consisted of 38 active-duty military members with PTSD and recent diagnosis of OSA. Patients received automatic PAP (APAP) and were randomized to either four weeks on SA or four weeks without and then crossed over to the opposite treatment arm. After four weeks there was a significant improvement in hours of PAP use per total nights for the SA group (ß = 1.13 (95% CI 0.16–2.1); p = 0.02), as well as the percentage of nights used for ≥ 4 hours (ß = 14.9 (95% CI 1.02–28.9); p = 0.04). By the standard definition of regular use (≥ 4 hrs per night on 70% of nights),30 the SA group also showed a trend towards improved adherence.

The presence of SA did not impact PAP efficacy, with each treatment arm being equally effective at reducing OSA symptoms (AHI < 5 events/hr). After completion of the eight-week cross-over, there was no effect of SA on adherence variables. This may be explained by the high rate of patient drop-out (36.5% of patients), which impacts the power to detect differences between treatment modes. This drop-out rate is consistent with studies on similar patient cohorts,[17–19] highlighting the need for studies on larger cohorts and multimodal approaches to improving adherence.

Despite PAP therapy being regarded as the gold-standard treatment for OSA, adherence is still a major problem. Improvements in adherence from individual factors are likely to be observed as small increments. Many of the other strategies to improve adherence (e.g. educational programs and frequent follow-up appointments) require significant time and resources and may not be reflective of actual or practical clinical practice. The low resource requirement and easy integration of SA that comes standard with F&P's CPAP/APAP offering into a patient's therapy therefore could make it an attractive strategy in terms of business efficiency. Taken together, SA should be further investigated as a strategy to improve PAP therapy adherence, especially in OSA populations where comorbid conditions make adjusting to PAP particularly challenging.

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