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COMMENTARY

Home sleep apnea testing for chronic heart failure: time to break the Cheyne?

Commentary on Li S, Xu L, Dong X, et al. Home sleep apnea testing of adults with chronic heart failure. *J Clin Sleep Med*. 2021;17(7): 1453–1463. doi:10.5664/jcsm.9224

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Sleep-disordered breathing (SDB), comprising several entities including obstructive sleep apnea (OSA), central sleep apnea (CSA), and sleep-related hypoventilation,[1] is highly prevalent, with significant medical burden on both an individual and population level.[2] Globally, it is estimated that 936 million individuals have OSA, the majority of whom are undiagnosed and subject to the myriad complications of untreated disease.[2–4] Treatment of OSA improves health outcomes and is cost-effective.[5,6] The hidden cost of untreated OSA is estimated at $149 billion annually in the United States when accounting for health, safety, and loss of workplace productivity.[7] The American Academy of Sleep Medicine has rightly suggested that OSA severity should be confirmed within 2 months of initial evaluation.[8] However, wait times for diagnosis often far exceed these recommendations,[6,9,10] highlighting the importance of alternative diagnostic approaches.[11,12]

Home sleep apnea testing (HSAT) with limited-channel portable monitors has emerged as a diagnostic tool to circumvent treatment delays resulting from limited availability of polysomnography. In 2008, the Centers for Medicare and Medicaid Services approved the use of HSAT for diagnosis of OSA in uncomplicated adults.[13,14] The American Academy of Sleep Medicine clinical practice guidelines for the diagnosis of OSA recommend HSAT or polysomnography in medically uncomplicated adults with signs and symptoms consistent with moderate to severe OSA.[13,14] The guidelines recommend against the use of HSAT for diagnosis in those with comorbid conditions, including heart failure, underlying lung disease, neuromuscular disease, opioid use, those with severe hypoxemia, and for diagnosis of other types of SDB including sleep-related hypoventilation and CSA.

SDB is estimated to occur in 48–81% of adults with congestive heart failure (CHF).[15,16] CSA and Cheyne-Stokes respiration are particularly common among patients with heart failure and portend a poor prognosis in this population[15,17–20] due to direct adverse effects such as sleep disruption, oxygen desaturation, and sympathetic hyperactivity.[21] Identification of patients with SDB among patients with CHF also has therapeutic implications; positive airway pressure (PAP) therapy in patients with CHF and concomitant SDB has demonstrated reduction in the apnea-hypopnea index and may improve quality of life, cardiac function, and heart-transplant-free survival.[22–24] Consistent with guideline recommendations, diagnosis of SDB in individuals with CHF is typically made using polysomnography; however, the high cost and limited availability of laboratory-based testing may preclude timely diagnosis in many patients. With the benefit of HSAT clearly established for uncomplicated OSA, is there a role for ambulatory diagnostic testing in other comorbid populations?

In this issue of the *Journal of Clinical Sleep Medicine*, Li and colleagues[25] sought to validate the use of HSAT in a prospective cohort of 83 patients with stable, chronic CHF with preserved or reduced ejection fraction who were referred for sleep testing. Patients underwent HSAT using the NOX-T3 (Nox Medical Inc. Reykjavik, Iceland) portable monitor (PM) followed by in-laboratory polysomnography with simultaneous PM using the NOX-T3 device. The primary objective was to evaluate the operating characteristics of PM for diagnosing SDB in this population and to secondarily determine the performance of PM for identifying CSA and Cheyne-Stokes respiration. Patients were generally older (58.7 ± 16.3 years), nonsleepy (Epworth Sleepiness Scale score, 8.6 ± 4.2) males (86.9%) with reduced ejection fraction (40.3% ± 11.5%), modestly increased body mass index (29.4 ± 13.0 kg/m^2), and moderate SDB (apnea-hypopnea index of 23.8 ± 21.3 events/h by polysomnography, notably with similar levels of agreement across all modalities). Using several apnea-hypopnea index thresholds, HSAT had high sensitivity, specificity, and positive- and negative-predictive value compared with polysomnography and agreement between modalities was moderate to high. As would be expected for simultaneous testing, in-laboratory PM during polysomnography showed similar or higher predictive results and agreement. Detection of CSA and Cheyne-Stokes respiration using HSAT was also excellent (sensitivity, 94.6%; specificity, 91.1%; positive- and negative-predictive values, 88.6% and 97.6%, respectively). The authors concluded that the use of HSAT in patients with stable CHF was valid to diagnose SDB, differentiate OSA vs CSA, and identify Cheyne-Stokes respiration.

In their study, the authors identify and address some known limitations of HSAT. First, HSAT is known to underestimate apnea-hypopnea index from polysomnography, which was observed in this study but notably did not affect the overall utility of testing. Second, feasibility of home-based testing may be a challenge in an older, comorbid population. Although HSAT was unsuccessful in 10 (11%) of patients, repeat testing was ultimately successful in 4 individuals. This is a reassuring finding but highlights the importance of appropriately selecting patients for HSAT-based pathways in actual clinical practice. Finally, the utility of HSAT is greatest among those with a high pretest probability of OSA, as was implied by enrollment of patients who had been referred for sleep testing. Thus, the results of this study cannot be extrapolated to the broader population of individuals with CHF.

A recent American Thoracic Society research statement for patients with CHF and SDB highlighted the importance of addressing health disparities, which may be due to socio-demographic factors and inequitable health care access.[21] In this regard, this study advances our understanding of how HSAT could be used to improve access to SDB diagnosis in this complex patient population in an era of constrained health care resources and high burden of unmet SDB care. This issue is particularly poignant during the global COVID-19 pandemic, as access to resources is even further limited and the backlog of patients requiring polysomnography continues to grow. Before implementing HSAT-based care delivery models in the heart failure population, however, several practical issues require further study. These include the optimal structure of HSAT-based diagnostic pathways, the determination of which patients with CHF are appropriate for such a pathway, and the identification of patients with more complex cardiorespiratory physiology who require in-laboratory monitoring and PAP titration. Nonetheless, this well-designed and novel study by Li and colleagues advances our knowledge in this area and lays an important foundation for this future work.

CITATION

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DISCLOSURE STATEMENT

All authors have seen and approved the manuscript. The authors report no conflicts of interest.