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When a private community neurology practice executes home sleep apnea testing: benefits identified and lessons learned in a retrospective observational study

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ABSTRACT

Objective: To investigate the feasibility and utility of a private community neurology practice–initiated home sleep apnea testing (HSAT) program.
Methods: A private community neurology practice conducted HSAT on patients clinically identified as high risk for obstructive sleep apnea (OSA). An academic board-certified sleep specialist performed all study interpretations. The presence and severity of OSA and its association with patient demographics (eg, sex, age) and comorbid health conditions relevant to OSA were evaluated.
Results: During 2011-2014, 147 consecutive patients clinically identified as highly "at risk for OSA" during their neurological visit underwent HSAT. Sixty-one percent (n = 89) of patients had a "positive" study with evidence of an apnea-hypopnea index of greater than 5 events per hour. Of those, 37% (n = 54) had mild OSA and 24% (n = 35) had moderate-severe OSA. OSA was more common among men (54%, n = 48) and in individuals with a previous documented history of depression (33%, n = 48) and hypertension 44% (n = 64). OSA treatment was ordered in 44% (n = 39) of patients by the neurologists or by a sleep specialist. Twenty-four percent (n = 21) of all patients studied were referred to a sleep specialist.
Conclusion: Implementation of HSAT in a (nonsleep) private community neurology practice in collaboration with an academic sleep program is recommended. Based on this observational study, community-based neurological practices and board-certified sleep specialists should consider teaming up to develop HSAT collaborative programs to open new sleep care access pathways for neurological patients often at risk for sleep apnea.

Introduction

The American Academy of Sleep Medicine (AASM) guidelines now state that home sleep apnea testing (HSAT) is an acceptable approach in the diagnostic evaluation of otherwise "healthy patients" (ie, absence of significant comorbid medical history such as chronic obstructive pulmonary disease, heart failure, hypoventilation syndromes, neuromuscular diseases, or concurrent primary sleep disorders) with a high pretest probability of having moderate to severe sleep apnea (SA).[1] Moreover, HSAT is also recognized as a cost-effective and convenient method of diagnosing SA in select patient populations due to its capability of conducting the procedure in a patients' natural sleep environment.[2–7] Despite the introduction of HSAT as an effective, convenient, and cost-effective diagnostic tool, up to 80% of patients remain unidentified and subsequently untreated for SA.[8,9]

Solid evidence also suggests that SA represents a prominent and debilitating comorbid condition for many neurological conditions such as stroke, cluster headaches, Parkinson disease, and multiple sclerosis.[10–12] Obstructive sleep apnea (OSA) frequently results in memory and concentration issues, changes in mood, headaches, insomnia, daytime sleepiness, weight gain, and increased risk of atrial fibrillation, which can negatively impact patients with neurological

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disease while predisposing others to new neurological diseases such as stroke. Moreover, inadequately treated OSA can negatively affect optimal management of some neurological conditions, for instance, reduced poststroke functional recovery[13,14] and increased risk of future vascular events.[15] As such, the American Heart Association now lists OSA as a primary risk factor for stroke.[16] Successful efforts to implement pathways to diagnose patients at risk for OSA who suffer from the various forms and breadth of neurological disorders remain sparse. Furthermore, there is a shortage of sleep specialists, resulting in long wait times for patients and causing an additional access to care barriers. To close the OSA care supply and demand gap, nonsleep specialists and primary care physicians are increasingly beginning to take their own initiative to diagnose, manage, and treat OSA using HSAT in their practices.[17] It remains unclear, however, whether these programs and services are being conducted under the guidance or observance of established practice parameters.[1,18] Special attention should be given to such efforts so that nonsleep specialty practices feel armed and supported to effectively provide this critical health care service.

Our aim was to investigate the feasibility of a community neurology practice HSAT program initiated and carried out by a private community neurology practice in collaboration with an academic sleep specialist as the study interpreter. A secondary aim of the study was to characterize the presence, severity, and treatment outcome paths for those patients identified as high risk for OSA that completed HSAT per the protocol developed by the practice.

Methods

This study was approved by the Johns Hopkins Medicine Institutional Review Board and was granted a consent waiver. Participants represent patients clinically evaluated within a private community neurology practice in Maryland between 2011 and 2014. The practice had previously purchased an HSAT device (Watermark Apnea Risk Evaluation System (ARES) Type II)[19] for their practice for OSA evaluation to offer another option for patients who were unwilling/unable to undergo an in-laboratory polysomnogram (ANA Practice, personal communication, January 2011). The ARES device, worn on the forehead, can store up to 3 nights of data.[19] Captured data included blood oxygen saturation, pulse rate, airflow, snoring level, EEG, head movement, and orientation.[19] Scoring criteria for obstructive respiratory events followed the AASM guidelines.[18] Specifically, automated respiratory events were identified as obstructive apnea events when flow was reduced by ≥90% for ≥10 seconds. A hypopnea was identified when flow was reduced by ≥30% for ≥10 seconds and was associated with a ≥4% desaturation. The apnea-hypopnea index (AHI) was tabulated as the average number of apneas and hypopneas (4%) per hour of valid recording time. For the ARES, the *valid recording time* is defined as the length of the sleep period (time in bed) subtracting periods when the individual appeared to be awake after sleep onset and periods of poor signal.

Practice methods were retrospectively reviewed to determine the workflow for identifying patients at risk for OSA. The neurologists clinically assessed all patients for OSA risk factors or symptoms as standard practice (without the use of a validated survey). Patients who reported snoring and daytime somnolence in the presence of risk factors (eg, obesity, hypertension, morning headaches, stroke, and arrhythmias) were recommended to complete a sleep study. Following AASM guidelines,[1,20] the private community neurology practice had linked with a local academic sleep program to have a board-certified academic sleep specialist provide all of the HSAT reading and interpretations including recommendations regarding the need for formal follow-up evaluation and treatment. However, no formal clinical workflow was implemented. Thus, the practice ordered all HSAT studies independent of the sleep center. Once the HSAT was ordered, patients were scheduled for a study by the practice staff within 1-2 weeks. The practice educated patients on the device setup and, once the device was returned, downloaded the HSAT data.. The ARES workflow included a pretest screening questionnaire that determined OSA *risk* (eg, none, low, high) based on self-reported symptoms of OSA (eg, snoring, witnessed apneas, and sleepiness) and anthropomorphic risk factors (eg, body mass index [BMI] and neck circumference) and common comorbid medical risk factors (eg, hypertension, diabetes, cardiovascular disease, and stroke).[21] If the patient demonstrated OSA on HSAT, the routine recommendation was for the patient to be referred to a board-certified sleep specialist to discuss the results of the study, diagnosis of OSA, risks of untreated OSA, and treatment options. However, the private community neurology practice implemented a primary internal protocol to help with patient convenience and cost savings, in which each neurologist individually discussed the results, OSA diagnosis, risks, and treatment options directly with his/her patient (Fig. 1).

As part of the routine initial private community neurology practice encounter, the number and type of health conditions/symptoms (eg, headache, cognitive decline) were collected from consecutive patients. If a patient was found to have significant OSA (AHI > 5), a continuous positive airway pressure (CPAP) titration, auto-PAP home titration, or a referral to a sleep specialist was ordered, depending on patient preference. If the patient was not referred to a sleep specialist, the neurologist managed PAP initiation and compliance adherence.

Cohort characterization

As part of the routine initial neurology clinic encounter, the number and type of health conditions/symptoms (eg, headache, cognitive decline) were collected from the patients. Using this collected information, the following parameters were created to assist in the characterization of the cohort both in terms of OSA presence and severity but also in relation to significant relationship to relevant comorbidities and demographic factors:

1 *OSA severity categories.* Sleep disordered breathing events were defined based on AASM scoring manual criteria for apnea (drop in the peak signal excursion by ≥90% of preevent baseline using an oronasal thermal sensor and the duration of this drop is ≥10 seconds) and hypopnea (defined by a peak signal excursion drop by ≥30% of preevent baseline using nasal pressure and the duration of this drop is ≥10 seconds, with a ≥4% oxygen desaturation from preevent baseline).[18] Three categories were included in the OSA variable. The first category identified participants with "no OSA" (overall AHI < 5). The second category identified participants with "mild OSA" (overall AHI 5-15). Given the small number of participants identified as having moderate OSA (n = 29; AHI range: 16-39) or severe OSA (n = 6; AHI > 40), the moderate and severe OSA categories were collapsed together in a third category labeled as "moderate-severe OSA" (overall AHI > 15).
2 *BMI.* Patients' documented height and weight during the examination were used to calculate the BMI (ie, *BMI categories* variable). Four categories were included in this variable using the World Health Organization International BMI classification: "underweight" (BMI < 18.50), "normal" weight (BMI 18.50-24.99), "overweight" (BMI 25.00-29.99), and "obese" (BMI ≥ 30.00).
3 *Number of neurological conditions other than headache and cognitive impairment (see below).* Type and number of primary neurological conditions were identified by taking the sum of neurological conditions noted by the neurologist in the data entered by the practice on the study report. Conditions under this category included, but were not limited to, anxiety, attention-deficit disorder, tremor, lumbago, dizziness, migraines, head trauma, multiple sclerosis,