ASK THE EXPERT

When Is Testing Beyond Overnight Oximetry Indicated for Assessment of Sleep-Disordered Breathing in Pulmonary Arterial Hypertension?

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Sleep-disordered breathing (SDB) is an overarching term encompassing several medical conditions in which breathing diminishes or ceases during sleep, often resulting in daytime sleepiness and reduced quality of life.[1] Obesity is strongly associated with SDB and both conditions are increasing in prevalence in the United States.[2,3] The pathophysiologic relationship between obesity, SDB, and pulmonary hypertension (PH) appears to be complex, although treatment approaches including weight loss and limiting intermittent hypoxemia have received the most attention as measures to improve PH. Clinical consensus recommendations state that treatment of PH in the setting of SDB may be appropriate when PH persists despite adequate therapy for SDB.[4] Current clinical research is also investigating the possibility that pulmonary arterial hypertension (PAH) may actually worsen or cause SDB,[5] a reversal of the traditional paradigm that SDB produces PH.[4] However, before a clinician may consider the ideal treatment approach for an individual patient with PH, it is imperative that SDB is either excluded or diagnosed and characterized.

Consensus statements have recommended the use of overnight oximetry as the initial pivotal test for SDB screening, with an overnight polysomnography (PSG) performed as a contingent test when necessary.[4] Two questions that follow include: (1) When is overnight oximetry considered sufficiently abnormal to warrant further investigation? and (2) Are there circumstances when pretest probability is high enough to proceed directly to PSG?

There is no universally accepted definition of oxygen desaturation in SDB. A study reviewing overnight oximetry results showed that the mean lowest oxygen saturation in 350 normal subjects was 90.4% (±3.1%) vs 65.9% (±22.6%) in 25 subjects with obstructive sleep apnea, demonstrating not only the differences between groups but also significant variability within patients with SDB.[6] The most commonly published definition of oxygen desaturation in SDB is a decrease of ≥4% from baseline. Calculating the oxygen desaturation index (ODI), however, which is the number of desaturations per hour of sleep, may more closely correlate with the apnea-hypopnea index obtained from PSG testing. The threshold for an abnormal ODI has been studied at ≥5, ≥10, and ≥15 desaturations per hour with little evidence to suggest one of these cutoffs as the most valid.[7] Overnight oximetry reports may not always contain detailed data that are conducive to waveform analysis and, since they are unmonitored, they are also subject to repeated artifacts, which may limit accurate interpretation. While overnight oximetry is accessible and relatively inexpensive, the results are only valuable when they are interpreted correctly and may benefit from a universal definition of desaturation in relation to ODI.

Compared to oximetry as a single test measurement, the typical PSG monitors approximately a dozen parameters (of which oximetry is just one) suggesting that the PSG is better suited to characterize SDB. However, a traditional overnight sleep laboratory-based PSG is an expensive test with limited availability in many areas. An argument can be made against screening all PH patients with PSG for several reasons: it is costly, labor intensive, time consuming, and requires an overnight stay at a sleep center. Furthermore, limited access in some regions may result in long wait times and delays in treatment, which may contribute to clinical worsening in PH.

However, PH patients with a high pretest probability of SDB may benefit from a screening approach that begins with a nocturnal PSG in lieu of nocturnal oximetry. Utilizing a clinical prediction assessment for SDB can help identify those who warrant initial PSG screening. For example, Flemons and colleagues developed a clinical prediction model for SDB based on increasing neck circumference, hypertension, habitual snoring, and bed partner reports of nocturnal gasping or choking.[8] Table 1 contains the major risk factors to consider in your clinical assessment.

Ambulatory diagnosis of SDB with home sleep testing (HST) is an increasingly attractive option that may offer an efficient compromise between the limited data obtained from overnight oximetry and the cost, time, and scheduling requirements of a laboratory-based PSG. Home sleep testing is becoming increasingly popular and is covered by most insurance plans. Recent studies com-

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Table 1. Risk factors for sleep apnea that increase the likelihood that a PSG will be necessary during the PH evaluation

• Male gender
• Postmenopausal state
• Excess body weight (BMI >30)
• Increasing age (especially after age 60)
• Race (risk higher with non-Caucasian races)
• Craniofacial anatomy (especially higher Mallampati score, retrognathia)
• Familial and genetic predisposition

Modified from Young et al.[10]

paring clinical outcomes support the use of HST for patients with high pretest probability of SDB, though widespread utility is limited by inadequate standardization and paucity of data that convincingly demonstrate its cost effectiveness.[9]

In summary, the current evaluation algorithm for evaluating SDB in patients with PH recommends that patients receive initial testing with overnight oximetry and those with abnormal results undergo nocturnal PSG testing. An oximetry result demonstrating on ODI of ≥5 to ≥15 events per hour may represent a prudent cutoff for proceeding to PSG testing. However, patients with sufficient risk factors for SDB may be appropriate for proceeding directly to initial testing with PSG (Table 1). A sleep laboratory-based PSG remains the established standard; however, HST may be a sufficient alternative in some patients. Consultation with a sleep specialist to help facilitate diagnosis and treatment of SDB and monitor treatment compliance in PH patients is recommended.

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