Impact of Portable Sleep Testing

Vaishnavi Kundel, MD[a,*], Neomi Shah, MD, MPH[a,b,*]

KEYWORDS

• Portable monitoring • OSA • Social and economic impact

KEY POINTS

- Portable testing (PT) is a reasonable alternative in patients with a high pretest probability of moderate-to-severe obstructive sleep apnea (OSA).
- PT should not be routinely ordered in those with coexisting sleep disorders, class 3 obesity, and severe cardiopulmonary disorders.
- A negative portable test should prompt an in-laboratory polysomnography.
- PT is cost-effective in a selected group of patients, mainly from the insurance-payer perspective, and cost-effectiveness can be enhanced when it is used in collaboration with a sleep center to ensure appropriate follow-up and adherence to treatment.
- Further research is needed to determine the utility of PT in diagnosing OSA among commercial motor vehicle operators.

INTRODUCTION

Obstructive sleep apnea (OSA) is a common condition affecting both children and adults, with an estimated prevalence of 1% to 5% in children, and 10% to 30% in adults.[1] It is characterized by recurrent obstruction in the upper airway during sleep, leading to arousals with fragmented sleep and intermittent hypoxemia, which can result in deleterious health effects, including neurocognitive problems and cardiovascular morbidity. Consequently, patients with untreated OSA present an increased use of health care resources, high socioeconomic costs, and increased overall mortality from all causes.[2]

In the past, the standard of care established by the American Academy of Sleep Medicine (AASM) was to diagnose OSA with in-laboratory polysomnography (PSG). PSG is accurate with a low failure rate because the study is attended by technical staff; however, it is considered relatively expensive and technically complex. Furthermore, access to in-laboratory sleep testing is limited because the prevalence and awareness of sleep disorders has grown in the past few decades. In preselected individuals, portable testing (PT) has been used as an alternative diagnostic test for OSA based in part on the premise that it is theoretically less expensive and quicker to deploy compared with in-laboratory PSG.[3] Portable sleep testing also alleviates the previously noted access issues by cutting back on the long wait times typically seen with in-laboratory testing.

CURRENT GUIDELINES FOR PORTABLE SLEEP TESTING

In 2007, the AASM appointed the Portable Monitoring Task Force to develop clinical guidelines for the use of PT in the diagnosis and management

Disclosure Statement: The authors have nothing to disclose.
[a] Division of Pulmonary, Critical Care, and Sleep Medicine, Icahn School of Medicine at Mount Sinai, Room 5-20, Annenberg Building 5th Floor, One Gustave L. Levy Place, New York, NY 10029, USA; [b] Department of Epidemiology and Population Health, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461, USA
* Corresponding author.
E-mail addresses: vaishnavi.kundel@mssm.edu; neomi.shah@mssm.edu

Sleep Med Clin 12 (2017) 137–147
http://dx.doi.org/10.1016/j.jsmc.2016.10.006

of OSA. The key features of the guidelines are as follows[3]:

- PT may be used as an alternative to PSG for the diagnosis of OSA in patients
  - With a high pretest probability of moderate-to-severe OSA
  - For whom in-laboratory PSG is not possible due to immobility or critical illness.
- PT is not appropriate for the diagnosis of OSA in patients
  - With significant comorbid medical conditions such as advanced cardiopulmonary disease that may degrade its accuracy
  - With evaluation showing suspected of having comorbid sleep disorders
  - With screening of belonging to an asymptomatic population.
- At a minimum, PT must record air flow, respiratory effort, and pulse oximetry.
- PT application, education, testing, scoring, and interpretation must be performed under an AASM-accredited comprehensive sleep medicine program.
- A negative or technically inadequate PT in patients with a high pretest probability of moderate-to-severe OSA should prompt in-laboratory PSG

PORTABLE MONITORING CLASSIFICATION SCHEME

The first widely used classification system for describing sleep testing devices was published by the AASM in 1994.[4] It placed available devices into 4 levels based on the number and type of leads used. **Table 1** provides details about this classification. It is important to note that level 3 and level 4 devices do not record signals to determine sleep staging or disruption.

However, with continued technological advances, many PT devices did not fit into these categories. Clinicians needed guidance to help decide which out-of-center (OOC) testing devices are appropriate for diagnosing OSA. In 2011, a new categorization scheme was developed, allowing easy classification of OOC devices based on the types of sensors that they use to aid in the diagnosis of OSA, including sleep, cardiac, oximetry, position, effort, and respiratory measures (SCOPER).[5] **Table 2** provides details about the new classification system for PT.

Table 1
Portable studies for sleep apnea evaluation: classification scheme (6-hour overnight recording minimum)

	Level 1: Standard PSG	Level 2: Comprehensive Portable PSG	Level 3: Modified Portable Apnea Testing	Level 4: Continuous Single or Dual Parameter Recording
Parameters	Minimum of 7: EEG, EOG, chin EMG, ECG, airflow, respiratory effort, oximetry	Minimum of 7: EEG, EOG, chin EMG, ECG or HR, airflow, respiratory effort, oximetry	Minimum of 4: ventilation (respiratory movement and airflow) HR or ECG, oximetry	Minimum of 1 (typically oximetry or airflow)
Body position	Documented or objectively measured	Can be objectively measured	Can be objectively measured	Not measured
Leg movement	EMG or motion sensor (optional)	EMG or motion sensor (optional)	May be recorded	Not recorded
Personnel attendance	Constant	None	None	None
Interventions Possible	Yes	No	No	No

Abbreviations: ECG, electrocardiogram; EEG, electroencephalogram; EMG, electromyogram; EOG, electrooculogram; HR, heart rate.

From Ferber R, Millman R, Coppola M, et al. Portable recording in the assessment of obstructive sleep apnea. ASDA standards of practice. Sleep 1994;17(4):378–92.