HOME SLEEP TESTING DEVICES

By Stephanie Richardson

In the past 10 years, physicians and respiratory therapists have done their part to spread the word about sleep disorders, particularly obstructive sleep apnea. As recent as April, a report stated that OSA affects as many as 18 million Americans, with 85 percent of those going undiagnosed.

But education can be a double-edged sword. While sleep professionals do their part to share the facts about potentially life-threatening health risks, the very facilities they work in may not be able to handle the influx of potential OSA patients who come out of the woodwork for testing. Often, patients sit on a waiting list for sleep studies at their local sleep center, some of them giving up on testing altogether when it's not immediate.

Over the past few years, manufacturers have taken strides to develop portable OSA testing devices that can help eliminate these delays by making screening available at home. Although some sleep physicians are still on the fence about the accuracy of these devices, home screening can help detect sleep-disordered breathing and determine if a patient needs to more quickly come into a sleep center for a full sleep study with polysomnography.

In fact, unattended sleep screenings at home are an acceptable method to screen for sleep-disordered breathing in suitable patients and with appropriate safeguards. Home screenings have been shown to provide correct diagnoses in up to 80 percent of studied cases.

New wrist-worn monitor

Earlier this year, the Centers for Medicare and Medicaid Services approved reimbursement for a wrist-worn screening device that uses peripheral arterial tone. Physicians using the device for OSA diagnosis in Medicare patients will be reimbursed for using the technology, and any subsequent CPAP therapy ordered based on the results also will be covered.

Peripheral arterial tone (PAT) is a physiological signal that reflects the changes in the autonomic nervous system caused by respiratory disturbances during sleep. The device uses an algorithm to analyze a patient's PAT signal to identify apneic events with a high degree of sensitivity.

The PAT signal is acquired through a noninvasive probe attached to a patient's finger during the overnight study. The probe connects the unit, which the patient wears on his or her wrist. During testing, the probe derives and measures several parameters, including oxygen saturation, heart rate, sleep and wake states. It also measures REM and non-REM sleep, as well as actigraphy.

Measured data is stored in the device's removable memory card. Patients can take this card to their sleep medicine provider where a technologist will download data to a computer for automatic analysis. Within minutes, the technologist is able to print a comprehensive report of findings.

Along with OSA diagnoses, this device is becoming a popular method for routine follow-up for patients using CPAP therapy. Rather than come in for an overnight test to check for compliance and health improvement, patients can take the unit home and then drop off the memory card with their health care provider the next day.

Pocket-sized recorders

Of the many patient-friendly features appearing in the world of in-home sleep screening, small size is important. Many patients requiring in-home testing are happy to see that the devices they need to use won't clutter their bureau or bedside table.

One portable recorder measures up at 3 inches by 5 inches. It's small enough for a patient to wear (including the recorder and headbox) with an armband, which allows the patient to sleep in numerous comfortable positions. The device can be used for basic sleep studies, but it features 14 data channels for more extensive screening. Sleep technologists can choose options for pH and EtCO2 when required for specialized pediatric sleep testing.

Patients can wear another small monitor by attaching it to a band that wraps around the chest. This single-channel screening device records patient breathing via a nasal cannula. It derives and analyzes a patient's apnea/hypopnea index, flow limitation and snoring in order to create a report with color-keyed risk indicator for clinicians. When adding a plug-and-play oximetry option to the device, clinicians also can record respiration, oximetry and pulse. This monitor has been shown to provide cost-effective screening for drowsy drivers, high-risk employees (such as truck drivers and night-shift workers) and chronic disease patients.

One of the smallest portable recorders on the market measures about 2.5 x 5 inches, and also is worn on the chest. It can be adapted to various ambulatory and online studies via proxy connections. The device comes with two channels for respiratory inductive plethysmography, as well as channels for nasal pressure and thermistor. Its diagnostic signals include

continued on page 62

Featured Home Sleep Testing Devices

Watch-PAT100

Itamar Medical, Inc

888-748-2627

www.itamar-medical.com

Circle Reader Action# 90

ApneaLink™

Resmed

800-424-0737

www.resmed.com

Circle Reader Action# 91

Embletta®

Embla

888-662-7632

www.embla.com

Circle Reader Action# 92

SomnoStar® Orbit

Cardinal Health

800-231-2466

www.cardinal.com/respiratory

Circle Reader Action# 93

Home Sleep Testing Devices...*continued from page 60*

position and activity, leg movement, oxygen saturation, pulse and oral flow. An extension for EKG measurements also is available to help identify cardiac arrhythmia.

Forehead monitors

Another device worn on the forehead during sleep integrates physiological data acquired in-home with clinical history and anthropomorphic data to determine the presence and severity of OSA. The recorder stores up to four nights of sleep data and can be worn comfortably in most sleep positions.

The recorder measures oxygen saturation, pulse rate, respiratory effort, snoring levels, head movement and head position using a variety of sensors and transducers. Audio and visual indicators on the device notify the patient when the recorder needs adjustment, which increases the accuracy of the in-home device.

In February, the New York University Sleep Disorders Center published an independent validation study of this monitor in the Journal of Clinical Sleep Medicine. The study made more than 380 comparisons between in-lab polysomnography and the use of this monitor at the same time. It also reported on 280 cases when this monitor was applied by patients at home. More than 20 percent of these cases included individuals who had not been referred to a sleep laboratory and were presumed to have no prior probability of OSA. The average equipment failure rate across the two studies was less than 3 percent.

Compared with traditional in-lab PSG, this device was shown to provide acceptable and accurate estimates of OSA indices for in-home recording. The high sensitivity, specificity, and positive and negative likelihood ratios obtained in the group we studied supports the utility of an ambulatory limited-monitoring approach not only for diagnosing sleep disordered breathing but also to rule out SDB in suitably selected groups.

Remote monitoring

On the horizon is a home monitoring system that provides PSG that can be remotely monitored by a sleep technologist from any location. The bedside system is ideal for testing patients who may have difficulty coming to the sleep lab such as pediatric patients or those that are elderly or in chronic pain.

This monitoring system includes a portable device, infrared video camera, power supply and mobile broadband card. The system transmits data wirelessly from the patient unit to the computer module, which is attached to a computer via USB cable or the monitoring unit. The computer can be placed up to 100 feet from the patient. Additionally, the Internet component allows the sleep technologist to monitor patient data in real-time.

As the business model for sleep apnea diagnosis slowly changes, manufacturers will continue to develop methods for screening patients at home. As more systems are validated as accurate and reliable screening systems by physicians and medical associations, sleep physicians and technologists should be able to diagnose more OSA patients more quickly and reduce the wait time at sleep labs.

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