

COMMENTARY

## Home Portable Sleep Testing Has Gone Global

Commentary on Magalang et al. Agreement in the scoring of respiratory events among international sleep centers for home sleep testing. *J Clin Sleep Med* 2016;12(1):71–77.

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In an effort to decrease wait times, decrease expense and expedite institution of therapy for obstructive sleep apnea (OSA), home sleep testing (HST) has become increasingly more popular since the 2007 AASM clinical guidelines on home portable monitoring.<sup>1</sup> The term HST is not entirely accurate, as these devices do not measure sleep. They are respiratory monitors applied to the patient during the estimated sleep time. The term sleep apnea testing is preferred as this is geared towards establishing the diagnosis of OSA. Regardless, the HST is easy to perform and can be done in the comfort of the patient's home environment. HST throughout the world has shown a good sensitivity and specificity for detecting OSA for patients with a high pretest probability.<sup>2</sup> Scoring of these studies may be performed by computer only, computer assisted with manual oversight or by a trained specialist. Scoring criteria have been established by the AASM,<sup>3</sup> but comparison of these criteria internationally has been limited.

Magalang et al. examine the agreement between independent scorers in six countries using AASM scoring criteria from 2007.<sup>3–5</sup> The initial studies were performed in a single center and then reviewed at different institutions. Apnea hypopnea index (AHI) had a strong correlation when scoring was performed from nasal pressure (NP) recordings. Hypopneas were more easily recognized from the transformed NP tracing, which has been previously demonstrated.<sup>6</sup> NP and transformed NP tracings performed better than respiratory induction plethysmography (RIP) in the detection of apneas. The detection of central apneas had less sensitivity and specificity, however transformed NP waveform was superior to NP and RIP analysis for central apnea identification. Respiratory inductive plethysmography (RIP) waveform analysis was less effective for identification of apneas, probably because it is not calibrated in clinical practice. Even when calibrated, RIP may erroneously classify events as central since it does not detect respiratory effort in up to 9% of patients.<sup>7</sup>

Clinical interpretation of HST is at times troublesome because of recognition of sleep onset and offset as well as recognition of artifacts. Editing the data manually improves the accuracy of the study interpretation.<sup>8</sup> These variables were appropriately excluded from this study since the aim was the analysis of the scored respiratory events. In practice,

experienced scorers edit the data based on actigraphy or other indicators of sleep, such as the patient's report of sleep onset and offset. If we were to relay on arbitrary start and finish times preset by the software, the calculated respiratory event index (REI) would be significantly diluted.<sup>9</sup> For instance, if the startup time is 22:00 and the recording is set to finish at 08:00 and 100 respiratory events are accounted for during the recording time, the resultant REI would be 10 events/h. On the other hand if the patient was not able to sleep well on the night of the recording and only slept from 02:00 to 06:00 and 100 respiratory events were observed, the resultant REI would be 25 events/h. We can see that the presence and the severity of OSA changes dramatically depending on actual sleep time, which is unfortunately not measured by HST.

Multiple software programs were used for analysis of the respiratory data and the automatically derived ODI showed a strong correlation. This was also very close to the scorer derived AHI. Scoring of individual respiratory events was less accurate, particularly central and mixed respiratory events. During a prior analysis by Magalang et al., central and mixed respiratory events were also shown to have less agreement among independent scorers.<sup>10</sup> While most events are appropriately recognized and scored, a discrepancy may exist among patients with central sleep apnea, particularly those with Cheyne-Stokes respiration or those taking opioid pain medications. Study of these populations may be better performed with in-lab polysomnography.<sup>1</sup>

The clinical definition of hypopneas has changed over time. Newer AASM recommendations base recognition on either a 3% desaturation or an associated arousal from sleep and use 4% desaturation as an alternative scoring criteria.<sup>3,4,11</sup> The current study used the 4% desaturation definition to establish hypopneas. Studies have shown health effects of cyclical 3% desaturation episodes. These include hypersomnolence<sup>12</sup> and metabolic impairment.<sup>13</sup> Regardless, more data are available for the health effect of 4% cyclic desaturations. The clinical significance of this may be in semantics but may ultimately prove to be of importance if we consider each individual's events to be different.

One of the strengths of this study for the clinician revolves around the process of performing the recording. Detailed

instruction to the patient by a trained technician is important to increase the validity of the recorded data. This process should ideally be followed by demonstration of how to place sensors and reproduction of this process by the patient. Finally, written instructions and a phone number to call if troubleshooting is needed at the time of the study may improve the accuracy of data recording. It remains to be studied how different centers institute this process and then score studies in different countries.

Ultimately, the scoring of respiratory events during sleep is an evolving science. As we move forward, it would be helpful to enroll patients from different ethnic backgrounds and to collaborate across the globe. Centralized scoring may not be needed if we rely on expert scorers once we have worked through detailed instruction on how to collect and process respiratory variable data from home sleep recorders.

## CITATION

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## SUBMISSION & CORRESPONDENCE INFORMATION

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## DISCLOSURE STATEMENT

The authors have indicated no financial conflicts of interest.