

Reporting the Apnoea Hypopnea Index (AHI)

Simon Smith, PhD

School of Psychology, The University of Queensland; Queensland Sleep Health Group, Queensland, Australia

J Clin Sleep Med 2007;3(3):321

To the editor:

The recent revision to the International Classification of Sleep Disorders (ICSD-2)¹ has changed both the name and diagnostic criteria for obstructive sleep apnoea, now Obstructive Sleep Apnoea (Adult). The daytime consequences that previously defined the OSAS syndrome have been de-emphasized in the ICSD-2, and are no longer an essential criterion. Instead, the presence of 15 or more apnoeas, hypopneas, or RERAs is sufficient to define the disorder. Polysomnographic measurement of the Apnoea Hypopnea Index (AHI) has therefore acquired the status of a diagnostic test. While it is conventional for clinical laboratories to report an observed AHI value as a diagnostic indicator of OSA and a proxy measure of OSA severity, this single value can be misleading. The AHI reported for a patient after a single night of laboratory assessment can be better described by a confidence interval (CI) based on these reliability estimates.

The 95% CI around an observed AHI can be calculated as $AHI \pm 1.96 * SE_M$, where SE_M the standard error of measurement can be calculated as $SD \sqrt{R_{xx} (1-R_{xx})}$, where SD is the sample standard deviation and R_{xx} is the reliability coefficient. Test-retest reliability coefficients for the AHI are in the range 0.77-0.81.^{2,3} Successive observations are likely to regress toward the mean AHI of the clinic population, and it is possible to calculate a predicted true score (PTS), where $PTS = [R_{xx} * AHI_{OB}] + [AHI_{MEAN} * (1-R_{xx})]$. AHI_{OB} is the observed AHI, and AHI_{MEAN} is the mean AHI estimated from local base-rate data. This provides a symmetrical distribution around the predicted true RDI and an asymmetrical distribution around the observed AHI.⁴ AHI distributions are often highly non-normal, with a significant skew towards zero. To adjust for non-normal AHI distributions, a transform can be applied to the data. In a consecutive series of 1338 patients with presumed OSA, the AHI mean was 28.7 events/hr (SD = 25.3 events/hr). If R_{xx} is assumed to be 0.8, the 95% CI for the PTS based on an observed AHI of 15 events/hr is 5.6 - 38.0 events/hr (after square-root transformation). The likely range for the true

AHI can therefore span conventional AHI severity categories. In this example, an observed AHI of 15 events/hr is high enough to be confident that the true AHI for that patient is greater than zero, but generously overlaps the 95% CI range for an observed AHI of 5 events/hr (with an upper CI limit of 23.6 events/hour). Better estimates of the reliability of the AHI, and AHI base-rate data adjusted for major demographic and local factors, need to be derived. Percentiles values derived from the normal population could be used to generate a true reference range for the AHI. Routine reporting of a confidence range for the AHI is necessary to properly convey the accuracy of this standard measure.

ACKNOWLEDGMENTS

Financial support provided by the School of Psychology, The University of Queensland.

REFERENCES

1. American Academy of Sleep Medicine. International classification of sleep disorders: diagnostic and coding manual. 2nd ed. Westchester, Ill: American Academy of Sleep Medicine, 2005.
2. Quan SF, Griswold ME, Iber C, et al., Short-term variability of respiration and sleep during unattended nonlaboratory polysomnography--the Sleep Heart Health Study. *Sleep* 2002;25:843-9
3. Le Bon O, Hoffmann G, Tecco J, et al. Mild to moderate sleep respiratory events: one negative night may not be enough. *Chest*. 2000;118:353-9.
4. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York: McGraw-Hill, 1994

Disclosure Statement

Dr. Smith has indicated no financial conflicts of interest.

Address correspondence to: Dr. Simon Smith, School of Psychology, The University of Queensland, St Lucia, 4072, Queensland, Australia; Tel: +61 7 3365 6408; E-mail: ssmith@psy.uq.edu.au