A predictive model using pulmonary-function parameters identified snorers at low risk for the sleep apnea syndrome

Zerah-Lancner F, Lofaso F, D'Ortho MP, et al. **Predictive value of pulmonary function parameters for sleep apnea syndrome.** Am J Respir Crit Care Med. 2000 Dec;162:2208-12.

QUESTION

In obese patients who snore, can a predictive model that uses pulmonary-function parameters identify those who are at low risk for the sleep apnea syndrome (SAS)?

DESIGN

Development and validation of a predictive model by using logistic regression.

SETTING

Sleep clinic in Créteil, France.

PATIENTS

168 obese patients (80% men) who attended the sleep clinic for snoring and suspected SAS composed the group for testing the index. 101 patients with similar clinical characteristics formed the validation group. All patients had a body mass index (BMI) between 25 and 35 kg/m^2 of body weight (mean 29 kg/m^2). Exclusion criteria were alcoholism, use of hypnotic medication, upper respiratory tract disorders, previous treatment for SAS, cardiopulmonary or neuromuscular disease, or airway obstruction.

DESCRIPTION OF PREDICTION GUIDE

All patients received polysomnography (PSG) (SAS was defined as a combined apnea-plus-hypopnea index [AHI] of ≥ 15 events/h of sleep) and pulmonary-function tests (spirometry, arterial blood gas analysis, flow-volume curves, and measurement of specific respiratory conductance [sGrs] by the flow oscillation technique). The results were read independently. Logistic regression was used to model the probability of the presence or absence of SAS in the development-group patients with AHI as the dependent variable and sGrs and daytime arterial oxygen saturation as independent variables. The model was used to predict the presence or absence of SAS in the validation-group patients.

MAIN OUTCOME MEASURES

Sensitivity, specificity, and positive and negative predictive values of the predictive model.

MAIN RESULTS

Logistic regression analysis showed that the *P*-value cutoff that correctly classified the largest number of patients was 0.5. Diagnostic characteristics of the model in the development and validation groups are in the Table.

CONCLUSION

In obese patients who snore, a predictive model that used pulmonary-function parameters identified those who were at low risk for the sleep apnea syndrome.

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For correspondence: Dr. F. Zerah-Lancner, Service de Physiologie-Explorations Fonctionnelles, Hôpital Henri Mondor, Henri Mondor, 94010 Créteil, France. FAX 33-149-812667.

Test characteristics of a model to predict the sleep apnea syndrome vs polysomnography*

Patient group	Sensitivitiy (95% CI)	Specificity (CI)	PPV	NPV	+LR	-LR
Development	98% (93 to 100)	86% (76 to 93)	90%	97%	7.0	0.02
Validation	100% (93 to 100)	84% (71 to 93)	86%	100%	6.3	0

*NPV = negative predictive value; PPV = positive predictive value. Other diagnostic terms defined in Glossary; CIs and LRs calculated from data in article.

COMMENTARY

PSG, the diagnostic standard for SAS, is expensive and time consuming, which limits its availability for the increasing numbers of patients referred to sleep laboratories. The cost and inconvenience of doing PSG, coupled with the high prevalence of apnea suspects, make a screening test desirable. Clinical prediction models, the flow-volume loop, oximetry, and cephalometric studies have been examined as possible predictors of SAS; however, none has proved both easily applicable and sensitive enough to supplant PSG.

Necessary criteria for a screening test to be useful include high sensitivity and NPV, availability, ease of application to the population in question, and low cost. In this study by Zerah-Lancner and colleagues, sGrs has a high sensitivity and NPV for SAS in moderately obese snorers. However, this test is not widely available, and its applicability in this study is limited by broad exclusion criteria to a small subset of patients (i.e., absence of cardiopulmonary disease and upper-airway disorders, and a BMI of 25 to 35 kg/m^2). Unfortunately, the excluded factors, commonly seen in patients suspected of SAS, alter sGrs (1). Measurement of pulmonary function, including sGrs, is effort dependent and associated with moderate cost. This model, applied in certain subgroups of patients, could reduce resource use in patients at low risk for SAS yet would increase cost and resource use in those still requiring PSG.

The breakpoint of an AHI > 15 used in this study may underestimate the prevalence of clinically significant sleep-disordered breathing, especially in those with rapid eye movement–specific apneas or hypopneas or with the upper airway resistance syndrome. The association of sleep-disordered breathing with cardiovascular morbidity has considerable implications for diagnostic efforts and treatment, even in those with low AHI (2).

This study is a valuable step in the search for a screening tool for SAS, and it is applicable to a subgroup of obese snorers with no associated cardiopulmonary or upper-airway abnormalities. However, caution should be exercised in broadly applying this model. Patients with excessive sleepiness should go directly to PSG with or without a multiple sleep-latency test to exclude SAS or sleep disorders.

Amy R. Blanchard, MD
Medical College of Georgia
Augusta, Georgia, USA

Joseph A. Golish, MD
Cleveland Clinic Foundation
Cleveland, Ohio, USA

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