

## Setting Standards for Pulmonary Function Measurements: What Is Reasonable?

Measurements of lung function, and the interpretation of these measurements, continue to be a source of debate in the respiratory health community. Central to this debate is the important concept of what constitutes a “normal” level, and what, consequently, should be considered abnormal.<sup>1,2</sup> The standard way of determining a normal is to examine lung function in a population that is thought to be “healthy,” which typically means free of diagnosed respiratory illness, free of respiratory symptoms, and free of respiratory risk factors such as cigarette smoking or occupational exposures to dusts, vapors, or fumes.<sup>3</sup> This process, though, is subject to potential error. For example, a recent review of 57 different prediction equations for lung function demonstrated that the same person can be classified as either “normal” or “abnormal” when different prediction equations are used.<sup>4</sup> In addition, the measurements on which these equations are based are also subject to misclassification. Height may be measured incorrectly, or not at all, and people may not report their correct age. Another source of error may be picking a reference equation that is not appropriate to the individual being assessed, typically because their racial makeup is not reflected in the reference population.

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SEE THE ORIGINAL STUDY ON PAGE 1168

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Measurement of lung function includes both commonly used measurements, such as the forced expiratory volume in the first second (FEV<sub>1</sub>) and the forced vital capacity, and less commonly used measurements, such as maximum inspiratory pressure and specific airway conductance. In addition, some respiratory testing includes a “challenge”: either to an agent such as methacholine or mannitol, or to exercise. Correct interpretation of these types of tests can have additional difficulties.

Authors Khalid et al ask the question, “Specific conductance criteria for a positive methacholine challenge test: are American Thoracic Society guidelines too generous?” Their study looked at 138 patients who had a methacholine challenge test over the course of one year because of a clinical suspicion of asthma.<sup>5</sup> The background for this study is that the current American Thoracic Society guidelines

say that a 45% drop in the specific airways conductance should be adequate to confirm a positive challenge test (and should roughly correspond to a 20% drop in the FEV<sub>1</sub>).<sup>6</sup>

Their study found that 38 subjects had a positive challenge test, based on a 20% drop in the FEV<sub>1</sub>. This drop corresponded to a 56% drop in the specific conductance. They also found that the mean drop in specific conductance among those subjects with no drop in the FEV<sub>1</sub> after the maximal challenge was about 31%, and that current recommended specific conductance decrement of 45% corresponds to an FEV<sub>1</sub> drop of about 10%.

To answer the question posed by the authors—are the current American Thoracic Society guidelines (based on these data) too generous? Do they have the potential to overclassify “healthy” people as having asthma? The answer is not perfectly clear to me. Part of the problem relates to the study population in this case series of patients. The population consisted of patients who were referred for testing because of a clinical suspicion of asthma (presumably because of symptoms or other features highly suggestive of asthma). What might this study look like in a series of patients that also included “healthy” people with no asthma or clinical suspicion of asthma? Is it reasonable to define a test for “asthma” in a population who all have been referred for a clinical suspicion of asthma?

I really do not have a definitive answer to any of the questions posed above. While we would like our clinical tests to be both highly sensitive and highly specific, the reality is that, by definition, tests that are highly sensitive tend to be less specific, and vice versa. Might the current recommended drop in the specific conductance be overly sensitive based on the high degree of variability of this test (and the results of this study)? It might be—although in looking at Figure 1 in the study, it is apparent that many people with a drop in specific conductance of 56% (the recommended level of the authors) had little to no change in their FEV<sub>1</sub>. This suggests that an alternative approach could include a decrease in either measure (to be more sensitive) or both measures (to be more specific). Do the current recommendations need to be changed? Possibly, although I would not recommend changes based on studies whose subjects included only those with suspected asthma.

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**REFERENCES**

1. Pellegrino R, Viegi G, Brusasco V, Crapo RO, Burgos F, Casaburi R, et al. Interpretative strategies for lung function tests. *Eur Respir J* 2005;26(5):948-968.
2. American Thoracic Society. Lung function testing: selection of reference values and interpretive strategies. *Am Rev Respir Dis* 1991; 144(5):1202-1218.
3. American Thoracic Society. Standardization of spirometry, 1994 update. *Am J Respir Crit Care Med* 1995;152(3):1107-1136.
4. Swanney MP, Ruppel G, Enright PL, Pedersen OF, Crapo RO, Miller MR, et al. Using the lower limit of normal for the FEV<sub>1</sub>/FVC ratio reduces the misclassification of airway obstruction. *Thorax* 2008; 63(12):1046-1051.
5. Khalid I, Morris ZQ, DiGiovine B. Specific conductance criteria for a positive methacholine challenge test: are the American Thoracic Society guidelines rather generous? *Respir Care* 2009;54(9):1168-1174.
6. Crapo RO, Casaburi R, Coates AL, Enright PL, Hankinson JL, Irvin CG, et al. Guidelines for methacholine and exercise challenge testing, 1999. *Am J Respir Crit Care Med* 2000;161(1):309-329.

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Dr Mannino has disclosed relationships with GlaxoSmithKline, Astra Zeneca, Novartis, Pfizer, Dey, and Sepracor.

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