The Accuracy of Peak Expiratory Flow Meters

Objective measurements are becoming more important in the practice of clinical medicine. The acquisition of data requires the availability of reliable and simple bedside equipment. In this regard, the sphygmomanometer and the electrocardiogram have become indispensable instruments in the routine examination of patients. Considering that spirometry was first reported by Hutchinson in 1846, the lag until its appearance at the bedside is over 100 years. The use of office and bedside spirometry has been encouraged by the ACCP and the ATS; both of these organizations have proposed minimum standards for instrumentation and accuracy of these measurements. The importance of objective measurements in the assessment of ventilatory capacity and the degree of airway obstruction is illustrated by a poor correlation of spirometry with clinical signs and symptoms. In most instances, the physician and patient underestimate the severity of the abnormality, which contributes to asthma mortality and morbidity. Despite these clinical deficiencies, there is still widespread under-utilization of the spirometer.

The peak flow meter, a simple and portable device, has been available since 1959. Since that time, there have been many publications pointing out its usefulness. A valid measurement of peak expiratory flow (PEF) requires a brief maximum exhalation from total lung capacity (TLC) since it is effort- and volume-dependent. Its measurement represents the maximum expiratory flow occurring within 150 msec of commencing expiration and the first few hundred ml of volume expired forcibly from TLC. Given good cooperation and patent airways, PEF may also be used to monitor the progress of thoracic neuromuscular diseases such as Guillain-Barré syndrome. Despite its limitations, PEF is a useful index of airway obstruction correlating fairly well with FEV₁.

While the minimum standards for accuracy and reliability have been suggested for spirometers, the same has not been done for peak flow meters. In this issue (see page 306) Eichenhorn and colleagues publish results of an evaluation of three different peak flow meters. Their methods allowed the absolute assessment of the accuracy of flow and eliminated errors when comparing results generated by a patient or test subject sequentially on separate instruments. One of the meters (HealthScan-Orgonon) matched the standards of flow and reproducibility for spirometers. This instrument does not measure flow greater than 520 L/min. This is a relative drawback, as our interest in identifying airflow limitation usually results in values considerably lower than this.

While the evaluation by Eichenhorn et al indicates the relative accuracy of the meters, there is no information on their longterm stability. Morrill et al tested standard and mini-Wright peak flow meters over six months and found them both to be stable. Presumably, such data could be extrapolated to the three instruments assessed by Eichenhorn et al. The importance of these studies is that we have identified an accurate PEF meter which is probably stable over time. Stability may be more desirable than absolute accuracy since most applications involve assessments of changes in airflow limitation. In addition, the portable nature of the PEF meter allows not only in-hospital but also home use for longitudinal monitoring.

Andre van As, M.D.
Albuquerque

Associate Professor of Medicine, Pulmonary Division, University of New Mexico, and Veterans Administration Medical Center.
Reprint requests: Dr. van As, Pulmonary Division 111A, VA Medical Center, Albuquerque 87108

REFERENCES

Asthma Is a Disease
A New Theory of Pathogenesis

The majority of laymen have little difficulty in knowing whether they have asthma. What is astonishing is that it is the physician who has the conflict. The main cause of this problem is the general contemporary feeling equating asthma with airway hyper-reactivity. However, there is evidence to suggest that asthma is not just hyper-reactivity, but that hyper-reactivity is a nonspecific protective-type of reflex which occurs secondary to injury of a membrane.1 We think that asthma is a disease,