

## **EDITORIAL**

# **Measurement of lung volumes in humans: review and recommendations from an ATS/ERS workshop**

J.L. Clausen, A.L. Coates\*, P.H. Quanjer\*\*

Inspired and expired lung volumes measured by spirometry have been used clinically for over one hundred years and have proved useful in the detection, characterization, and quantification of the severity of lung disease. Measurements of absolute lung volumes, residual volume (RV), functional residual capacity (FRC), and total lung capacity (TLC) have been used clinically for fewer years, are technically more challenging, and the results are more controversial regarding their clinical usefulness.

In contrast with the relative simplicity of spirometric volumes, because the measurements of absolute lung volumes include the "inaccessible" space of residual volume, a variety of techniques have been developed to make these measurements. These include gas dilution (as used in the helium or argon dilution technique), gas washout (as used in the nitrogen washout measurements), body plethysmography using a variety of specific methodologies, and radiographic imaging using standard posterior-anterior and lateral chest radiographs and computerized tomography.

As part of the ongoing efforts of the American Thoracic Society (ATS) to develop recommendations and standards regarding clinical testing, a workshop was convened and charged with developing recommendations for measuring absolute lung volumes in humans. In order to provide the diversity of expertise necessary to meet these challenges, and with the goal of developing recommendations that could be endorsed by the European Respiratory Society (ERS) as well as the ATS, many of those invited to participate in the workshop were from Europe.

It was recognized that these measurements often presented different challenges in infants and children; however, we also concluded that, in the workshop, it would be useful to integrate those with experience in making these measurements in both adult and pediatric environments, not only with the goal of developing more universally applicable recommendations and "standards", but also because we believed that exchanges of information about the measurements unique to either adult or paediatric population might be helpful for better defining optimal techniques and clinical limitations for both groups of subjects.

Optimal predictive normal values for lung volumes may be as important as optimal measurement techniques.

For this reason we also included a review of normal predictive values.

It was recognized that the clinical usefulness of measurements of absolute lung volumes is an important issue (especially in these days of limited resources for medical care), so reviews and developed conclusions regarding the pathophysiology of lung volumes and the clinical applications and usefulness of these measurements were solicited.

The scope of the resulting review was considerable. If all of the background information and recommendations developed by consensus were compressed into a single document of length suitable for publication as a Statement endorsed by the ATS and ERS, we felt that a considerable amount of valuable information would be lost. It was decided therefore, that in addition to a consensus document that will be submitted to the ATS and ERS for approval and publication, we would submit for publication the papers which were the background information that participants developed as a foundation for deliberations by workshop participants. Publication of the background information as authored papers also permitted more open presentation of speculation and opinions prior to the "homogenizing" process of integrating viewpoints into a single consensus document. The practice of publishing authored background review papers [1, 2] has also been recently used by other organizations [3, 4].

The editorial staff of the European Respiratory Journal generously offered to publish these background papers in successive issues. The paper by STOCKS and QUANJER [5] on reference values and one article in this issue [6] represent the first in this series of background papers which will be followed at a later date by the consensus document.

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