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Title: Determination of total lung capacity (TLC) without body plethysmography

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Body: We report here a new method to determine TLC that requires neither body plethysmography (PLETH), gas dilution, nor thoracic imaging. With cheeks supported, the subject breathes through a flow interruption valve downstream of a parallel chamber of known gas volume, comprising a so-called MiniBox (Fig.1 inset). The subject also performs standard spirometry. Pressure and flow metrics were derived from both these maneuvers in a training population, as well as TLC_{PLETH} measured on the same day (Platinum Elite, MGC, and ZAN 500, nSpire). Data mining methods were used to generate a formula from which we calculated TLC of any individual subject. Our population comprised 59 healthy adult women (31.5+15.5y, 23.3+4.9 BMI), 83 healthy adults men, (31.0+14.9y, 24.1+3.3 BMI), 25 patients with restrictive disease (48.8+16.4y, 29.4+6.8 BMI), and 101 patients with obstructive disease (62.9+11.9y, 27.7+4.9 BMI). Across this heterogeneous population we found $TLC_{MiniBox}=1.01TLC_{PLETH}$, r=0.91 (Pearson), CI: 0.922-0.88 (Fig.1). The coefficient of variation (CV) for repeated trials was 5.1%. These results establish a robust new method for accurate, rapid, and reproducible determination of TLC not only in healthy subjects but also in patients with a range of obstructive and restrictive disorders. Because it is compact, rapid, and accurate, this method is suitable for use in a physician office. This work was sponsored by PulmOne Ltd., Ra'anana, Israel.