Inter- and intra-device variability of pulmonary function testing across VitaloLAB® systems

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Introduction

Demand for pulmonary function testing (PFT) is increasing, and diagnostic capacity continues to be expanded through increased PFT departmental activity and the development of community diagnostic centres.

Use of multiple PFT systems across services requires confidence that patient results remain consistent between devices.

Assessment of inter- and intra-device variability is important to support reliable clinical interpretation and service standardisation.

This study evaluated variability between identical VitaloLAB PFT systems, hypothesizing that device-related variation would be low relative to expected biological variation.

Fig. 1 VitaloLAB PFT System

Disclosures

Disclosures: T.J., C.C., J.T., and L.F. are employees of Vitalograph Ltd. A.H.K. has a consultancy agreement with Vitalograph.

Methods

19 healthy participants (9 females; age 18–65 years) completed three PFT sessions on separate days.

Testing was performed using two identical Vitalograph VitaloLAB PFT systems (VitaloLAB **A** and VitaloLAB **B**).

Participants were randomised into groups to complete two sessions on one device and one session on the other (e.g. AAB or BBA).

Each session included spirometry, diffusing capacity (T_{LCO}), and lung volume measurements using multiple breath nitrogen washout (MBN_2).

Tests were conducted by respiratory physiologists in accordance with ERS/ATS standards, with inter- and intra-device variability assessed using Bland–Altman analysis.

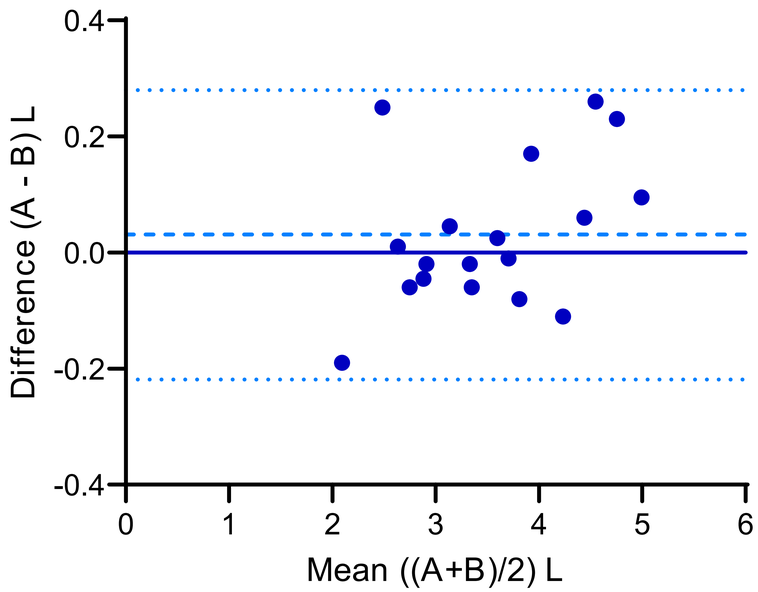

Fig. 2 Bland-Altman of FEV_1 across VitaloLAB Systems

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Results

Complete datasets were obtained for all 19 participants across spirometry, DLCO, and lung volume measurements.

Analysis demonstrated low within-subject variability across repeated sessions and small absolute differences between devices for all test types.

Mean bias (SD) between the two VitaloLAB systems was: FEV_1 0.03L (0.13), FVC 0.04L (0.12), TLCO -0.50 mmol/min/kPa (0.50), KCO -0.16 mmol/min/kPa/L (0.08), FRC -0.07L (0.41), and TLC -0.15L (0.34), consistent with expected biological and within-test variation.

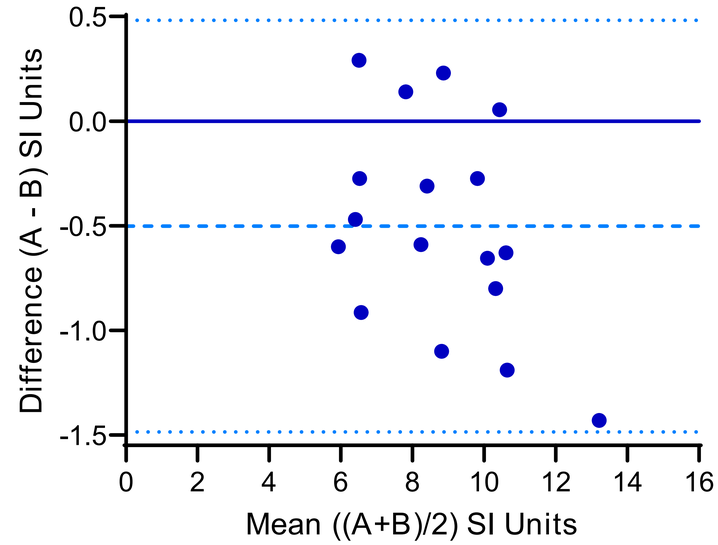

Fig. 3 Bland-Altman of T_{LCO} across both VitaloLAB systems

Conclusion

Inter- and intra-device variability for key PFT parameters met ERS/ATS guideline requirements when testing was performed using identical VitaloLAB PFT systems.

These findings support the comparability and consistency of patient results across multiple VitaloLAB systems within clinical services.

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