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Abstract Category: Acute respiratory failure and mechanical ventilation

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ABSTRACT (max 3000 characters, including spaces)

TITLE: Non-invasive monitoring of cardiopulmonary function parameters in mechanically ventilated adults

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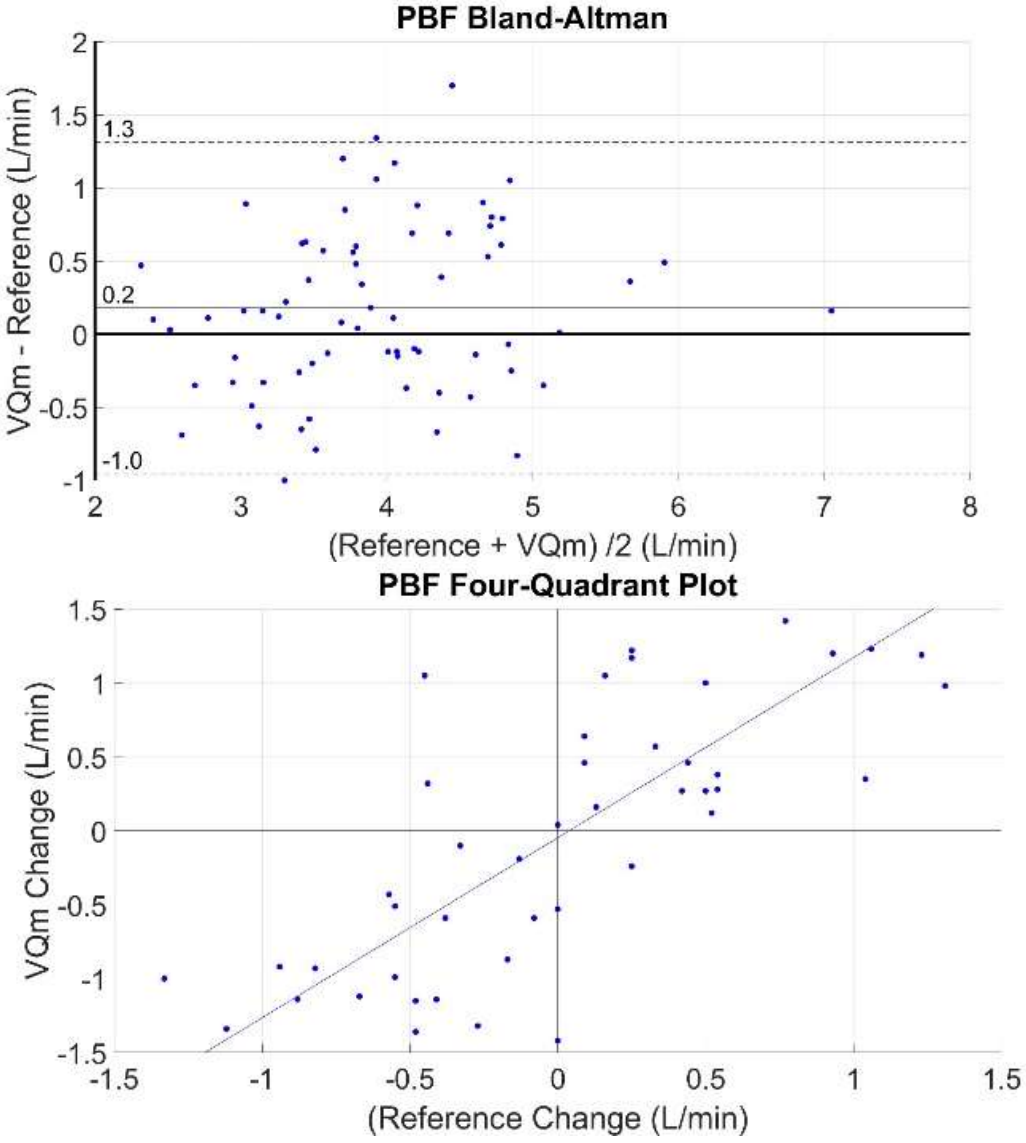
INTRODUCTION: Cardiopulmonary function parameters are critical in understanding ventilation-perfusion matching and guiding individual patient care. Pulmonary Blood Flow (PBF), Physiological Dead Space (VD), and Functional Residual Capacity (FRC) are currently measured using time-consuming and invasive methods. PBF is typically measured using thermodilution via a pulmonary catheter minus shunt fraction, VD via volumetric capnography coupled with blood-gas measurements and FRC via nitrogen washout. To overcome the limitations of these traditional methods, the non-invasive, semi-continuous VQm Pulmonary Health Monitor (PHM)™ has been developed to optimize therapy while providing near-real time data.

OBJECTIVES: The aim of this study was to evaluate the performance of the VQm PHM™, a non-invasive cardio-pulmonary health monitor, in measuring PBF, VD, and FRC in mechanically ventilated surgical patients in comparison to established gold standard measurements.

METHODS: PBF was estimated using a modified differential Fick equation and compared to the thermodilution cardiac output (TDCO). Shunt fraction was estimated from central venous and arterial blood gases measurements using the Berggren equation and the result was subtracted from TDCO to calculate the reference PBF[1]. VD was obtained using volumetric capnography and arterial blood gas values, similar to the reference measurement obtained using the GE Healthcare ventilator. FRC was compared to nitrogen washout methods also using the GE Healthcare CARESCAPE™ ventilator. Agreement was evaluated using Bland-Altman analysis and concordance was characterized using four-quadrant plot analysis.

RESULT(S): 42 patients, mean age 66.7±13.1 years, were included in this analysis. For PBF, 19 patients (17 males) produced 70 measurements. The mean difference between paired PBF values was 0.2 L/min, the 95% limits of agreement were 1.3 and -1.0 L/min (Fig. 1A) with a concordance of 93% (no exclusion zone) (Fig. 1B).



B

Figure 1: (A) Agreement between our reference PBF and values obtained using VQm PHM™ and (B) direction of change between VQm PHM™ PBF and our reference PBF

For VD, 19 patients (14 males) produced 89 paired measurements. The mean difference between paired VD values was -1%, the 95% limits of agreement were -13% to 10% (Fig. 2) with a concordance of 77% (2.5% exclusion zone).

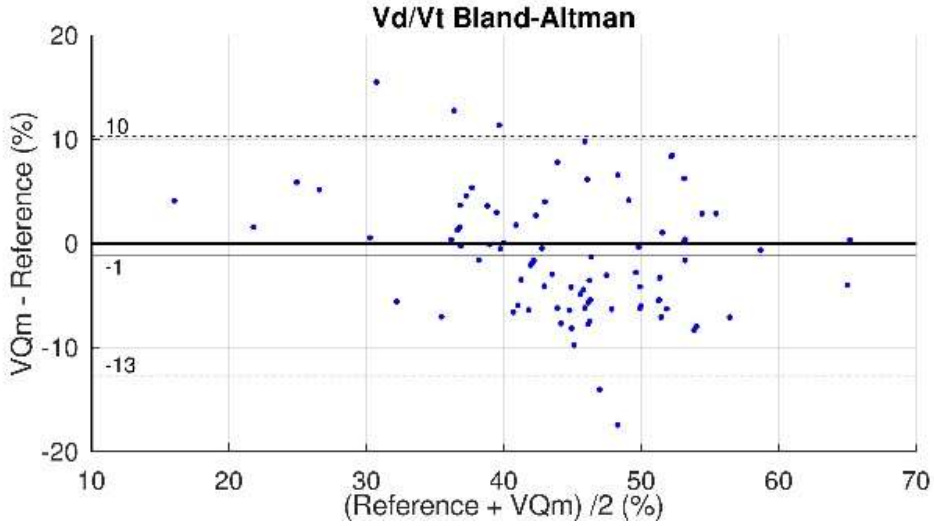


Figure 2: Agreement between our reference VD and values obtained using VQm PHM™.

For FRC, 23 patients (17 males) produced 98 paired measurements. The mean difference between the paired FRC values was -0.8L, the 95% limits of agreement were 0.4L to -2.1L with a concordance of 85% (2.5% exclusion zone) (Fig. 3).

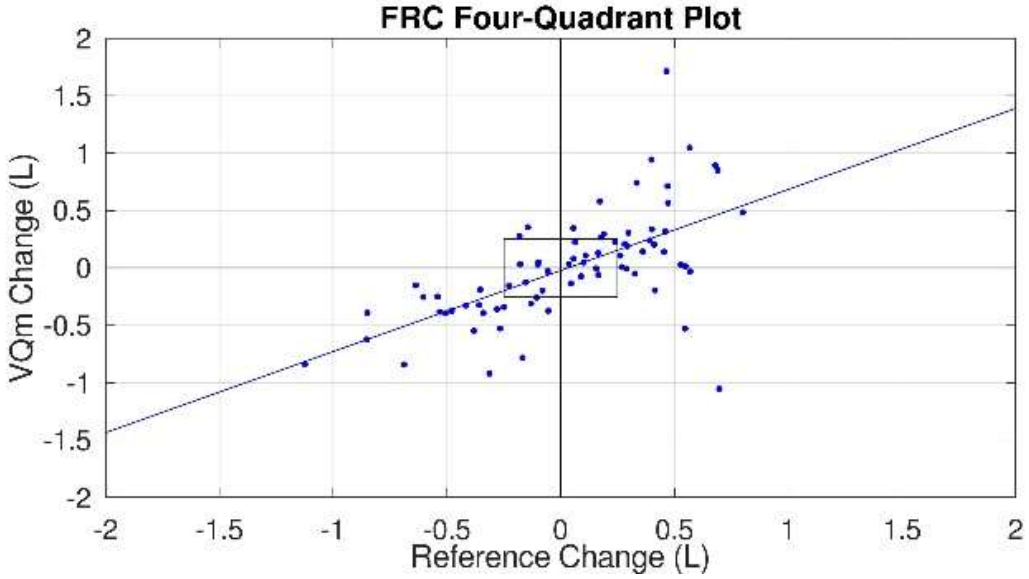


Figure 3: Direction of change between VQm PHM™ FRC and our reference FRC.

CONCLUSIONS: Our results indicate good agreement and trending for PBF and VD and good trending for FRC measured using VQm and our reference values.

REFERENCES:

1. Berggren SM. The oxygen deficit of arterial blood caused by non-ventilating parts of the lung. *Acta Physiol Scand Suppl*. 1942; 4: 1-92.

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