

**Abstract Category:** Clinical Science

**Title:** Evaluation of Cardiac/Pulmonary Measurements from a Novel Non-Invasive Health Monitor Compared to Gold Standard Methods

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**Background:** Measuring cardiopulmonary function parameters is invasive and time-consuming for mechanically ventilated patients. However, measurements of Pulmonary Blood Flow (PBF), Physiological Dead Space (VD), Functional Residual Capacity (FRC), and Shunt Fraction Index (Psi) are crucial for understanding ventilation-perfusion matching and guiding patient care. The VQm Pulmonary Health Monitor (PHM)<sup>™</sup> is a novel, non-invasive, and semi-continuous health monitor that has been developed to overcome the limitations of the current gold standard cardiopulmonary measurement methods. By using sequential gas delivery technology to deliver targeted concentrations of CO<sub>2</sub> and N<sub>2</sub>O, the VQm PHM<sup>™</sup> is able to measure PBF, VD, FRC, and Psi. A study using a porcine model demonstrated the VQm PHM<sup>™</sup> provides comparable results to gold standard methods.<sup>1</sup> The major aim of this study was to compare the VQm PHM<sup>™</sup> cardiopulmonary function parameters to gold standard methods in mechanically ventilated patients.

**Methods:** The current gold standard measurement methods for the parameters of interest are as follows: PBF measured using thermodilution via a pulmonary catheter minus shunt fraction, VD measured with volumetric capnography and blood-gas measurements, and FRC via nitrogen washout. FRC and VD reference values were obtained using the GE Healthcare CARESCAPE<sup>™</sup> ventilator. Psi does not have a current gold standard measurement method but was compared to a calculated shunt from venous and arterial blood gas measurements using the Berggren equation. With the VQm PHM<sup>™</sup>, PBF and FRC were measured via a 3-breath CO<sub>2</sub> ventilatory bolus using sequential gas delivery and a modified differential Fick equation. Additionally, the VQm PHM<sup>™</sup> determined Psi using N<sub>2</sub>O elimination, and VD was estimated by coupling volumetric capnography and arterial blood gas values. Agreement was evaluated with Bland-Altman analysis and concordance was evaluated using a four-quadrant plot analysis.

**Results:**

42 patients, mean age 66.7±13.1 years, were included in this analysis. Not all patients had all parameters measured. 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% with a concordance of 77% (2.5% exclusion zone). 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).

The results for PBF and Psi are currently being calculated.

**Conclusions:** Our results of this pilot study using the VQm PHM™ indicate good agreement and trending for VD against current gold standard methods and good trending for FRC against current gold standard methods.

References

1. *Translational medicine communications*. 2023;8(1). doi:<https://doi.org/10.1186/s41231-023-00146-8>