

Ventilatory limitations to exercise in CF are dependent on lung function and equation selection

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Objective

During cardiopulmonary exercise testing (CPET), maximal minute ventilation (VE_{max}) is closely analysed to determine if a patient is able to achieve maximal effort when ventilatory limited (VL). VL is determined if the patient's VE_{max} exceeds 85% of their predicted maximal voluntary ventilation (MVV), with a number of equations used to predict MVV based on lung function. The aim of this study was to identify how patients of differing disease severity were deemed to have VL when performing a CPET, dependent on how MVV was calculated.

Method

Eighty-seven patients (56 adults/31 paediatrics, 51 male/36 female) were categorised into severe (<40% FEV_1 %Pred, n = 5, 5 adults), moderate (40-69% FEV_1 %Pred, n = 26, 22 adults) and mild (>70% FEV_1 %Pred, n = 56, 29 adults) disease severity. All performed a CPET using a validated combined ramp and supra-maximal verification protocol. VL was determined from three different equations to predict MVV: $FEV_1 \times 35$; $FEV_1 \times 40$; and a paediatric-specific equation ($27.7(FEV_1) + 8.8(PredFEV_1)$) from Stein et al (2003).

Results

Five (100%) of the adult patients in the severe category were deemed VL using both the $FEV_1 \times 35$ (124.4 ± 12.2 %) and $FEV_1 \times 40$ (108.8 ± 10.6 %) equations. In the moderate category, 17 (81%) adult patients, were VL using the $FEV_1 \times 35$ (109.0 ± 27.5 %) compared with, 14 (69%) when using the $FEV_1 \times 40$ (95.3 ± 24.0 %) equation. In the mild category, 16 (52%) adults were VL using $FEV_1 \times 35$ (90.6 ± 19.9 %) compared with 10 (36%) when using $FEV_1 \times 40$ (79.3 ± 14.4 %). For children using the paediatric (Stein) equation, 3 (75%) of the paediatric patients were VL in the moderate category (87.2 ± 2.7 %), compared with 11 (41%) (83.4 ± 18.5 %) in the mild category.

Conclusion

When using both equations within the adult population, it is evident the results differ in determining which patients are VL during a CPET. This study shows there is a need for Standardisation when predicting MVV.