

Predicting Intravenous Antibiotic Usage with Cardiopulmonary Exercise Testing in Cystic Fibrosis

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Objectives: Cardiopulmonary exercise testing (CPET) is a fundamental component of CF care, with endorsement by the European Cystic Fibrosis Society. Aerobic fitness (VO_{2max}) is a primary outcome and has been shown to be prognostically associated with risk of mortality and hospitalisation in patients with CF. Whilst bacterial infection and antibiotic treatments are associated with decreased aerobic fitness, no study has yet analysed the relationship between baseline CPET outcomes, and subsequent days receiving intravenous antibiotics (IVAbx). This study utilised annual review and CPET outcomes to predict prospective 12 month IVAbx usage in a single CF centre in the United Kingdom.

Methods: CPET (VO_{2max} ($mL \cdot kg^{-1} \cdot min^{-1}$), peak V_E/VO_2 , peak V_E/VCO_2 , peak $P_{ET}CO_2$) and clinical (age, sex, $FEV_1\%_{predicted}$, and BMI) data was collected at annual review from 64 patients with CF (21 paediatric, mean age 26.02 ± 12.85 years). Prospective IVAbx days were collected from annual review data from the following year, and equated to 12-month scores to account for differences in time between annual reviews. All variables were individually entered into univariate regression model to predict 12 month IVAbx days. Significant variables were subsequently entered into a stepwise multiple regression model.

Results: BMI, $FEV_1\%_{predicted}$, V_E/VCO_2 , and VO_{2max} were included in the final predictive model for the entire dataset. Only CPET variables and BMI were significant predictors of IVAbx days amongst adults. $FEV_1\%_{predicted}$ was the only significant variable in the paediatric model. These models accounted for 41 (Standard Error Estimate 14.77), 49 (13.63) and 33 (16.02) % of the variance in IV days respectively.

Conclusion: This is the first study to identify the association between CPET outcomes and prospective IVAbx usage in CF, showing that an increased VO_{2max} is associated with fewer IV days.