

Abstract:

The influence of muscle mass in the assessment of lower limb strength in COPD

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Introduction and Objectives:

Lower limb muscle strength measured by Quadriceps Maximal Voluntary Contraction (QMVC) provides valuable functional and prognostic information in people with COPD. Reference equations providing normal values for QMVC have been reported, some requiring an assessment of muscle mass and others not, but it is unclear whether the inclusion of muscle mass significantly alters predicted values in COPD. We addressed this question by deriving reference equations for QMVC with and without the inclusion of whole body assessment of muscle mass in a cohort of healthy volunteers and subsequently comparing QMVC assessment in two separate cohorts of patients with COPD using these reference equations.

Methods

Prediction equations were derived through multiple linear regression in a healthy control (HC) group. Age, gender, height and weight were inputted into the first model (FFM- model) and fat-free mass added for the other (FFM+ model). The prediction equations were then applied to a Primary Care COPD (PCC) group and Complex care COPD (CCC) group of patients where percentage predicted values were calculated and weakness determined using a threshold of the lower limit of normal.

Results:

175 HC subjects (median (IQR) age: 54 (14) years, 31% male) were recruited. The PCC group comprised 87 subjects (median (IQR) age: 68 (9) years, 71% male, FEV1 62 (20)% predicted) and the CCC group 189 subjects (median (IQR) 66 (12) years, 57% male, FEV1: 29 (16)% predicted).

Prediction values for the HC and PCC were similar between the FFM- and FFM+ models as shown in the table. In the CCC percentage predicted values were lower and there were 11.9% more classed as weak by the FFM- model compared to the FFM+ model.

Conclusion:

The inclusion of fat-free mass did not significantly alter prediction values in the healthy cohort. In people with COPD, including FFM in the model altered the proportion of patients classified as having muscle weakness most notably in the CCC cohort. This is likely to be due to a higher prevalence of muscle wasting in this population which resulted in an underestimate of predicted strength when muscle mass is included in the model.

Table: QMVC values expressed as percent predicted values and number classed as weak using the FFM- and FFM+ models for the COPD cohorts

	<u>Healthy Control</u>	<u>Primary Care COPD</u>	<u>Complex Care COPD</u>
	n=175	n=87	n=189
<u>FFM- Model</u>			
%pred QMVC:	100.3 (24.1)	86.0 (22.0)	54.0 (16.4)
Number classed as weak (%):	6 (3.4%)	14 (16.3%)	101 (53.2%)
<u>FFM+ Model</u>			
%pred QMVC:	100.2 (24.1)	86.7 (20.6)	59.2 (17.8)
Number classed as weak (%):	8 (4.6%)	10 (11.6%)	78 (41.3%)

Mean (SD) values presented as a percentage of the values predicted (%pred) using the FFM- and FFM+ models. Abbreviations: FFM+: Fat-free mass included, FFM- fat-free mass not included.