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Title: Prevalence and effects of malnutrition in COPD patients referred for pulmonary rehabilitation

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Body: Background Disease-related malnutrition is common in patients with COPD and is associated with adverse prognosis. Pulmonary rehabilitation (PR) is an opportunity to identify patients at risk of malnutrition. The Malnutrition Universal Screening Tool (MUST) is a simple validated tool, but little data exists in patients with COPD. Aims To determine the prevalence of malnutrition in COPD patients referred for PR; describe lung function, fat free mass (FFM), quadriceps muscle strength, exercise capacity, and dyspnoea in patients stratified by the MUST. Methods Over 3 years, 778 COPD patients referred for PR had a MUST, FEV_1, body mass index (BMI), FFM (BodyStat1500®), quadriceps maximum voluntary contraction (QMVC), MRC and incremental shuttle walk (ISW) measured. Patients were stratified according to risk of malnutrition (MUST: 0=low risk,1=medium risk,$\geq$2=high risk), and ANOVA, Kruskal Wallis or Chi-square were used to make comparisons between groups. Results Overall prevalence of malnutrition was 11% (6% medium risk, 5% high risk).

Clinical characteristics stratified according to MUST

	MUST 0	MUST 1	MUST $\geq$2	p-value
Age	69 (9)	69 (11)	69 (11)	0.99
Sex M:F	374:320	21:23	26:15	0.34
FEV1 %	47.7 (20.3)	43.0 (19.7)	29.3 (15.8)	<0.001
BMI	27.6 (24.2, 32.0)	19.7 (18.8, 23.2)	16.4 (13.8, 17.6)	<0.001
FFM	48 (41, 56)	41 (36, 46)	37 (33, 40)	<0.001
ISW	160 (80, 280)	120 (70, 220)	120 (45, 205)	0.01

QMVC	25.1 (9.5)	20.1 (10.1)	19.0 (7.5)	0.004
MRC	4 (3, 4)	4 (3, 4)	4 (3.5, 5)	0.001

Conclusions The prevalence of malnutrition in stable COPD patients referred for PR is 11%. The MUST is a valid tool in COPD and identifies decreasing FEV_1, BMI, QMVC, FFM, worsening breathlessness and exercise capacity with increasing risk of malnutrition.