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Original Article

The scored patient-generated subjective global assessment is an effective nutrition assessment tool in subjects with chronic obstructive pulmonary disease

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SUMMARY

Background & Aims: To evaluate the scored patient-generated subjective global assessment (PG-SGA) as a nutrition assessment tool in subjects with chronic obstructive pulmonary disease.
Methods: Seventy-two participants attending a pulmonary rehabilitation program (22M, 50F; mean age 66.6 ± 8.6 y). Nutritional status was assessed using the scored PG-SGA – global categorisation and score; fat free mass index.
Results: According to the subjective global assessment, 61 participants were well-nourished and 11 were moderately malnourished. Well-nourished participants had significantly lower PG-SGA scores (5.9 ± 3.0 vs 12.1 ± 5.4), higher % oxygen saturation (94.9 ± 2.8 vs 93.6 ± 2.4) and higher BMI (27.8 ± 6.1 vs 19.5 ± 3.2) than malnourished. There was a significant correlation between PG-SGA score and % oxygen saturation ($r = -0.275$, $p = 0.026$) and 6-min walking distance ($r = -0.245$, $p = 0.044$). The PG-SGA score had an 82% sensitivity and 79% specificity of predicting the global categorisation of nutritional status.
Conclusions: The scored PG-SGA identifies malnutrition in participants with chronic obstructive pulmonary disease. The nutritional status of subjects attending pulmonary rehabilitation programs could be assessed and tracked with the scored PG-SGA.

1. Introduction

Malnutrition is common in patients with chronic obstructive pulmonary disease (COPD), with prevalence depending on the method of nutrition assessment, timing of the assessment and severity of disease.[1–5] In COPD, malnutrition has been found to be associated with increased morbidity (increased dyspnoea, decreased exercise capacity, impaired quality of life) and mortality.[2,4,6]

As there is no gold standard for the assessment of nutritional status in patients with COPD, a variety of objective nutrition parameters (anthropometric, biochemical and immunological) have been used in the literature either alone or in combination to diagnose malnutrition. The use of single objective nutrition parameters to assess nutritional status has been questioned due to lack of sensitivity and specificity as many non-nutritional factors affect the results.[7]

The scored patient-generated subjective global assessment (PG-SGA) is a method of nutrition assessment developed by Ottery.[8] In common with subjective global assessment,[9] nutritional status is determined on the basis of a combination of a medical history (weight loss, oral intake, nutrition impact symptoms, functional capacity) and physical examination (loss of subcutaneous fat, muscle wasting, oedema), which are combined subjectively into the global categories of well nourished, moderately or suspected of being malnourished or severely malnourished. The scored PG-SGA provides additional information regarding short-term weight loss, more extensive nutrition impact symptoms and a numerical score. It has been demonstrated to be a valid method of nutrition assessment in oncology, renal and stroke specialties as well as general patients in the acute care setting.[10–15] The PG-SGA score correlates with objective nutrition parameters (% weight loss, BMI), quality of life, morbidity (survival, length of stay), has a high degree of inter-rater reproducibility and a high sensitivity and

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specificity when compared with other validated nutrition assessment tools.[10–15]

The aim of this study was to assess the validity of the scored PG-SGA as a nutrition assessment tool in participants attending a pulmonary rehabilitation program.

2. Materials and methods

Subjects with COPD were recruited at the first session of a six-week pulmonary rehabilitation program over an 18-month period. The inclusion criteria for this group were as follows: age > 18 years, moderate to severe COPD based on Forced Expiratory Volume (FEV1) < 60%, cognitive function and ability to communicate adequately to provide informed consent and understand and respond to questions. Seventy-seven subjects enrolled in the pulmonary rehabilitation program and seventy-two participants participated in this study.

Nutritional status was assessed by a dietitian experienced at using the scored PG-SGA. A global rating of nutritional status (well nourished, suspected or moderately malnourished or severely malnourished) and an overall PG-SGA score was calculated. Body weight and resistance were measured in light clothing using a foot-to-foot single frequency bioelectrical impedance analyser (Tanita Inc, Tokyo, Japan, Model 300GS). Fat free mass (FFM) was estimated using a BIA prediction formula developed by Shols in patients with COPD using the deuterium oxide dilution technique as the reference method.[5] FFM index (FFMI) was calculated as FFM/height^2 and classified as low (≤15 females or ≤16 males) based on the standard criteria developed by VanItallie et al.[17] Exercise capacity was measured by a physiotherapist using a standard 6-min walk protocol which assesses the individual's capacity to cover as much distance as they can in 6-min.[18]

The multidisciplinary ethics committee of the hospital approved the conduct of this study. Voluntary signed informed consent was obtained from each subject prior to commencement of the study.

3. Statistical analysis

Statistical analysis was carried out using SPSS for Windows (Version 11.0.1, 2001, SPSS Inc., Chicago, USA) statistical software package. Continuous variables were normally distributed except % oxygen saturation, which was transformed (natural log) to improve distribution. Characteristics of well-nourished and malnourished participants were compared by independent sample *t*-tests for continuous variables and Fisher's Exact test for categorical variables. Correlation analysis was used to examine the association between PG-SGA score and % oxygen saturation and 6-min walking distance. A contingency table was used to determine the sensitivity, specificity and predictive value of the PG-SGA score compared to the global categorisation of nutritional status (well-nourished or malnourished). Statistical significance was set at the conventional $p < 0.05$ level (two-tailed), however results were also interpreted for clinical significance.

4. Results

The characteristics of participants are shown in Table 1. According to the global categorisation, 61 of 72 participants were well nourished, 11 were moderately malnourished and none were severely malnourished. The PG-SGA score, BMI, FFM, FFMI, measurement of respiratory function and exercise capacity of well-nourished and malnourished participants are shown in Table 2. Well-nourished participants had a significantly lower mean PG-SGA score and higher BMI than malnourished participants, and a trend towards lower FFMI in the malnourished group, although this did not reach statistical significance. Well-nourished participants had significantly higher % oxygen saturation but there was no difference in FEV1 or 6 min walking distance between the groups. There were significant negative correlations between nutritional status (PG-SGA score) and both % oxygen saturation ($r = -0.275$, $p = 0.026$) and 6-min walking distance ($r = -0.245$, $p = 0.044$).

In this study, six participants were underweight (BMI < 18.5), 31 within the acceptable range (BMI 18.5–24.9), 16 were overweight (BMI 25.0–29.9 kg/m^2) and 19 were obese (BMI ≥ 30 kg/m^2). There was a significant difference in FEV1% between participants with BMI < 18.5 (30.0 ± 6.6), BMI 18.5–24.9 (46.4 ± 19.1) and BMI ≥ 25 (51.4 ± 19.9) ($p = 0.041$). There was no significant difference between 6-min walking distances based on BMI categorisation. A low FFMI was found in 16 participants (15 female and 1 male), four participants with low FFMI were underweight (BMI <18.5) and 12 participants within the acceptable range (BMI 18.5–24.9), whereas 11 participants with low FFMI were classified as malnourished and 5 classified as well-nourished. There was no significant difference between FEVI, % oxygen saturation or 6-min walking distances based on FFMI categorisation.

Based on triage recommendations of Ottery[8] that a PG-SGA score ≥9 requires critical nutrition intervention, the ability of the PG-SGA score to predict the global classifications of well-nourished or malnourished was determined. Forty-eight of 72 participants were correctly classified by the PG-SGA as being well-nourished (true negatives) and 9 participants were correctly classified as being malnourished (true positives). Two participants were misclassified as being well nourished (false negatives) and 13 participants were misclassified as being malnourished (false positives). The scored PG-SGA had a sensitivity of 82% and a specificity of 79%.

Concurrent validity was determined from a Receiver Operating Characteristic (ROC) curve plotting the sensitivity and 1-specificity of the PG-SGA score against identification of malnutrition by low FFMI. The area under the curve of 63.8% (95% CI 49.1–78.4%) indicated the PG-SGA score estimates low FFMI with fair accuracy.

Table 1
Participant characteristics ($n = 72$).

Variable	Mean ± standard deviation
Gender Male: Female	22:50
Age (years)	66.4 ± 8.7
Height (cm)	166.5 ± 8.0
Weight (kg)	73.3 ± 17.4
BMI (kg/m^2)	26.5 ± 6.5
FEV_1 (%)	47.8 ± 19.7
FFM (kg)*	
Male	59.1 ± 8.5
Female	45.2 ± 6.8
FFMI (kg/m^2)*	
Male	19.4 ± 2.6
Female	16.9 ± 2.6

* $n = 63$.

Table 2
Difference in measures of nutritional status and respiratory function in COPD participants ($n = 72$).

	Well-nourished ($n = 61$)	Malnourished ($n = 11$)	*p* value
PG-SGA score	5.3 ± 3.0	12.3 ± 6.0	0.003
BMI (kg/m^2)	27.1 ± 5.1	20.4 ± 3.5	0.000
Oxygen saturation (%)	95.4 ± 2.3	93.8 ± 2.9	0.039
FEV1 (%)	51.1 ± 19.3	43.2 ± 28.6	0.078
FFM (kg)*	48.8 ± 9.8	47.3 ± 7.9	0.655
FFMI (kg/m^2)*	17.7 ± 2.8	15.9 ± 2.2	0.066
Six minute walk distance (m)	349.2 ± 122.6	346.3 ± 100.3	0.943

* $n = 63$.