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Citation for published version (APA):

Annegarn, J., Meijer, K., Passos, V. L., Stute, K., Wiechert, J., Savelberg, H. H. C. M., Schols, A. M. W. J., Wouters, E. F. M., & Spruit, M. A. (2012). Problematic Activities of Daily Life are Weakly Associated With Clinical Characteristics in COPD. *Journal of the American Medical Directors Association*, 13(3), 284-290. <https://doi.org/10.1016/j.jamda.2011.01.002>

Document status and date:

Published: 01/03/2012

DOI:

[10.1016/j.jamda.2011.01.002](https://doi.org/10.1016/j.jamda.2011.01.002)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

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Download date: 26 Apr. 2023

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Original Study

Problematic Activities of Daily Life are Weakly Associated With Clinical Characteristics in COPD

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A B S T R A C T

Keywords:

Activities of daily living
Canadian Occupational Performance Measure
chronic obstructive pulmonary disease
performance
satisfaction

Background: Problematic activities of daily life (ADLs) can be the main reason to refer patients with chronic obstructive pulmonary disease (COPD) for pulmonary rehabilitation. To date, information on problematic ADLs and their clinical correlates in COPD remain scarce. This retrospective chart review aimed to identify the most prevalent self-reported problematic ADLs in COPD patients, determine performance and satisfaction scores of these problematic ADLs, and explore the association between 13 clinical determinants and 4 problematic ADL domains.

Methods: A total of 820 COPD patients entering pulmonary rehabilitation assessment were included in this retrospective study. Self-reported problematic ADLs were assessed using the Canadian Occupational Performance Measure, administered by occupational therapists in the form of a semistructured interview.

Results: COPD patients (59% male, age 63.6 ± 9.3 years, FEV₁ (%pred): 46.4 ± 18.4) reported 2999 problematic ADLs. The most prevalent problematic ADLs were walking (68%), stair climbing (35%), and cycling (30%). Moreover, 30% of the patients reported “not able to do any of the scored problematic ADL” and 44% were “not satisfied at all with the performance of any of the scored problematic ADL.” Significant but weak associations were found between clinical determinants (eg, physical and psychosocial) and problematic ADLs.

Conclusions: The lack of a strong association between problematic ADLs and clinical determinants emphasizes the need for individualized assessment of these ADLs to allow tailored intervention.

Published by Elsevier Inc. on behalf of the American Medical Directors Association, Inc.

Self-reported function meaningfully reflects physiology in moderately to severely disabled older adults.¹ Patients with chronic obstructive pulmonary disease (COPD) experience a progressive reduction in the ability to perform activities of daily living (ADLs)

during the course of their disease.² Patients who are dissatisfied with the ability to perform ADLs are often the ones referred to pulmonary rehabilitation.²

Patients' self-perceived performance and satisfaction of problematic ADLs can be measured using patient-reported questionnaires. Patient-reported questionnaires show good validity for measuring general problematic ADLs, but poorly identify patients' individual needs.³ An alternative approach is offered by interviews. Although these can be time consuming, they enable an exploration of the individual problematic ADLs.^{4,5} The Canadian Occupational Performance Measure (COPM) is such an individualized outcome measure,⁶ which can be used reliably in patients with activity limitations and participation restrictions (eg, COPD, chronic pain, hand injury, multiple sclerosis, diabetes mellitus).^{7,8} Indeed the COPM has been recommended for use during the

The Ciro+ Rehabilitation Network consists of Ciro+, Horn (NL), St. Laurentius Hospital, Roermond (NL), St. Jans gasthuis, Weert (NL), St Anna Hospital, Geldrop (NL), Elkerliek Hospital, Helmond (NL), Maxima Medical Centre, Veldhoven (NL), and Maastricht University Medical Centre, Maastricht (NL).

The authors report no conflicts of interest.

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assessment of pulmonary rehabilitation programs for patients with COPD.^{9,10} However, an overview of the distribution of problematic ADLs in a large cohort of COPD patients is currently lacking.

The World Health Organization has developed the framework International Classification of Functioning, Disability and Health to describe and analyze the functional consequences of various health conditions.¹¹ International Classification of Functioning, Disability and Health does not take into account that the importance and satisfaction attributed to the ability to perform various ADLs may vary among patients. There is limited information on whether and to what extent objective clinical determinants are associated with the subjective functional consequences of COPD. For example, it has been reported that female COPD patients perceive more loss of functional performance within “home management” compared with male COPD patients.¹² Moreover, given previous reports, it seems reasonable to hypothesize that also living alone,^{13,14} being younger,^{15,16} having a higher degree of airflow limitation,¹⁶ receiving long-term oxygen therapy,^{5,17} having a poor functional exercise performance (lower 6-minute walking distance),^{12,18} not using a walking aid (eg, rollator or cane),¹⁹ depletion of fat-free mass,²⁰ increased fat mass,²¹ and lower scores on variables reflecting dyspnea,^{18,22} psychological status,^{14,18} and/or health status^{18,23} may decrease performance and satisfaction of problematic ADLs in COPD. Unfortunately, available studies are limited by sample size and/or focused on prespecified ADLs. Nevertheless, the identification of clinical determinants of problematic ADLs may allow clinicians to better monitor and restore the impaired functional performance and/or satisfaction in patients with COPD.

Therefore, the aim of the current study was threefold: (1) to identify the most prevalent problematic ADLs in patients with COPD, (2) to determine performance and satisfaction scores for these ADLs, and (3) to explore the association between clinical determinants and problematic ADLs.

Methods

Participants

Data were extracted from the records of 1102 clinically stable patients with the diagnosis of “COPD” who were evaluated at CIRO+, a center of excellence for chronic organ failure in Horn (the Netherlands), for rehabilitation eligibility between January 1, 2005, and April 1, 2009. Of these records, 820 met the following inclusion criteria: all necessary data present, a forced expiratory (FEV₁)/forced vital capacity (FVC) ratio of 0.7 or less, and not representing a repeat admission for the same patient. These retrospective analyses are institutional review board exempt because of the use of de-identified, preexisting data.

Measures

As part of routine assessment for rehabilitation eligibility, patients underwent a 6-minute walking test in accordance with the guidelines of the American Thoracic Society,²⁴ including a practice walk. The best 6-minute walk distance was expressed as a percentage of the predicted values.²⁵ Patients also underwent routine postbronchodilator spirometry, physical examination, and medical history assessment.²⁶ Length and weight were assessed to obtain the body mass index (body weight in kg/m²), and a bioelectrical impedance analysis was used (Bodystat 1500, Euro-medix, Leuven) to determine the fat-free mass index and the fat mass index using disease-specific equations.²⁷ Patients were identified as current smokers when arterial HbCO was 2% or higher.

All patients completed the Medical Research Council (MRC) dyspnea scale, the St. George's Respiratory Questionnaire (SGRQ), and the Hospital Anxiety and Depression Scale.²⁸ Moreover, patients underwent an intake by an occupational therapist, including the COPM.⁷

The COPM is administered in the form of a semistructured interview, in which the patient is encouraged to identify and discuss specific problematic ADLs. Previous to quantitative analyses,^{29,30} problematic ADLs were simplified and categorized into 4 COPM domains: “self-care,” “productivity,” “leisure,” and “mobility.”⁶ Mobility-related problematic ADLs are usually part of the COPM domain “self-care.”³¹ However, in COPD patients, mobility-related problematic ADLs were expected to be highly prevalent¹² and therefore analyzed separately. Next, patients identified their perception of how well they were performing the problematic ADL (performance score) and how satisfied they were with this level of performance (satisfaction score). These scores were ascertained by using the cue cards to identify a score between 1 (“not able to do it” or “not at all satisfied,” respectively) to 10 points (“able to do it extremely well” or “extremely satisfied”).

Statistics

Mean and SD are displayed for quantitative variables with symmetric distributions and percentages for categorical variables. A limited number of patients with Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage 1 (*n* = 48) and MRC dyspnea grade 1 (*n* = 20) were evaluated at CIRO+. Therefore, GOLD stages 1 and 2 were combined for the analyses. The same was done for MRC dyspnea grades 1 and 2. The comparisons were conducted with 1-way analysis of variance or chi-square tests as appropriate. Adjustment for multiple testing was conducted via False Discovery Rate. Results were considered statistically significant when False Discovery Rate *P* value was less than .05. The 10 most prevalent problematic ADLs were described for the whole group and after stratification for sex, age (<65 or ≥65 years), and GOLD stage. Age was dichotomized according to the mean age as reported in the Cochrane review of Lacasse and colleagues.³²

Logistic regression analyses were conducted to test whether reporting (yes/no) any of the 4 identified problematic COPM domains (“self-care”, “productivity”, “leisure”, and “mobility”) was associated with the following clinical determinants previously reported to affect ADLs in COPD patients: age (years), sex, living status (alone/together), FEV₁ (% predicted), fat-free mass index (kg/m²), fat mass index (kg/m²), 6-minute walk distance (% predicted), walking aid use (yes/no), receiving long-term oxygen therapy (yes/no), MRC dyspnea grade, SGRQ_{total} score, and anxiety score and depression score (both Hospital Anxiety and Depression Scales). Logistic models were fitted for each of the 4 COPM domains separately. The area under the curve (AUC) of the receiver operating characteristic (ROC) curve was calculated as a measure of the final models' predictive values. This same set of predictors was tested in their association with performance and satisfaction scores via multiple ordinary least squares (OLS) regression models. Performance and satisfaction scores were averaged over repeated measures per patient within each COPM domain separately. These mean scores were used as outcome variables in the OLS regression models. For both OLS and logistic regression analyses, multicollinearity tests were carried out in advance and the variables were retained in the models, if the variance inflation factor was smaller than 3.0. A top-down procedure was handled for the selection of the final model variables. For all tests, a statistical significance level of 5% or less was handled. Data analyses were performed with Statistical Package for Social Sciences (SPSS) 15.0 for Windows (SPSS Inc., Chicago, IL).

Table 1
Patients' Characteristics

	Total (N = 820)	GOLD 1/2 (n = 289)	GOLD 3 (n = 234)	GOLD 4 (n = 297)	FDR P Value
Sex, % male	59.0	51.2	65.4*	61.6*	.0034
Age, y	63.6 ± 9.3	63.8 ± 9.5	63.0 ± 9.5	63.8 ± 9.0	.5710
FEV ₁ , L	1.3 ± 0.6	1.75 ± 0.53	1.1 ± 0.3*	0.86 ± 0.3* [†]	<.0001
FEV ₁ , %pred	46.4 ± 18.4	65.9 ± 12.5	40.1 ± 5.7*	32.3 ± 12.4* [†]	<.0001
Tiffeneau index, %	39.6 ± 11.7	49.2 ± 9.4	36.9 ± 7.8*	32.4 ± 10.0* [†]	<.0001
pO ₂ , kPa	9.4 ± 1.5	9.8 ± 1.4	9.6 ± 1.1	8.8 ± 1.8* [†]	<.0001
pCO ₂ , kPa	5.4 ± 0.9	5.0 ± 0.6	5.2 ± 0.5*	5.9 ± 1.2* [†]	<.0001
Current smoker, %	41.8	43.6	43.6	38.7	.4148
LTOT, %	21.7	0.0	0.0	59.9* [†]	<.0001
Charlson score, points	1.7 ± 1.2	1.6 ± 1.0	1.7 ± 1.1	1.8 ± 1.4*	.0700
MRC dyspnea grade	3.4 ± 1.1	2.9 ± 1.1	3.4 ± 1.1*	4.0 ± 1.04* [†]	<.0001
BMI, kg/m ²	25.2 ± 5.0	25.9 ± 4.7	24.7 ± 4.8*	25.0 ± 5.3*	.0115
FFMI, kg/m ²	16.3 ± 2.2	16.5 ± 2.1	16.3 ± 2.1	16.2 ± 2.3	.1956
FMI, kg/m ²	8.9 ± 3.4	9.4 ± 3.2	8.4 ± 3.4*	8.8 ± 3.6*	.0032
Living alone, %	23.9	22.8	21.4	26.9	.3119
6MWD, m	431.7 ± 125.3	487.3 ± 105.0	451.9 ± 113.7*	361.7 ± 119.4* [†]	<.0001
6MWD, %pred	79.8 ± 21.9	91.9 ± 17.5	81.4 ± 18.0*	66.9 ± 21.5* [†]	<.0001
Walking aid, %	29.3	9.3	12.4	62.0* [†]	<.0001
SGRQ _{Impact} , points	43.8 ± 18.6	38.3 ± 17.9	43.4 ± 17.9*	49.5 ± 18.2* [†]	<.0001
SGRQ _{Activity} , points	72.1 ± 18.7	65.1 ± 19.4	70.0 ± 17.9*	80.4 ± 14.9* [†]	<.0001
SGRQ _{Symptom} , points	60.1 ± 20.5	56.2 ± 21.6	61.1 ± 20.2*	63.2 ± 19.1*	.0003
SGRQ _{Total} , points	55.1 ± 16.2	49.4 ± 16.2	54.4 ± 15.6*	61.1 ± 14.4* [†]	<.0001
Anxiety score, points	7.6 ± 4.4	7.2 ± 3.9	7.4 ± 4.4	8.0 ± 4.8*	.0579
Depression score, points	6.9 ± 4.0	6.4 ± 3.8	6.7 ± 3.8	7.6 ± 4.2* [†]	.0006

BMI, body mass index; FDR, False Discovery Rate; FEV₁, forced expiratory volume in 1 second; FFMI, fat-free mass index; FMI, fat mass index; GOLD, Global Initiative for Chronic Obstructive Lung Disease; LTOT, long-term oxygen therapy; SGRQ, St. George's Respiratory Questionnaire; 6MWD, 6-minute walk distance.

*Different from GOLD 1+2.

[†]Different from GOLD 3.

Results

Patients' Characteristics

The current cohort consisted mostly of elderly male COPD patients, with generally a normal body composition, and a poor functional exercise performance. About one-third of the patients used a walking aid. As expected, patients in GOLD stage 4 had the worst mean 6-minute walking distance, also after correction for confounding variables, like height, body weight, age, and sex.²⁵ Furthermore, mean SGRQ_{total} scores were significantly higher (= worse) among GOLD 4 patients (Table 1).

Problematic ADLs

A total of 820 patients reported 2999 problematic ADLs; 743 patients scored 2 or more problematic ADLs. The COPM domain "mobility" was most frequently scored (86%) (performance score: 4.2 ± 1.7 points, satisfaction score: 3.5 ± 2.0 points) followed by "productivity" (56%) (performance score: 4.3 ± 1.8 points, satisfaction score: 3.7 ± 2.0 points), "self-care" (55%) (performance score: 4.8 ± 1.6 points, satisfaction score: 4.2 ± 2.1 points), and "leisure" (46%) (performance score: 3.9 ± 2.0 points, satisfaction score: 3.3 ± 2.2 points).

Top-10 Problematic ADLs

The 3 most prevalent problematic ADLs were walking, stair climbing and cycling (Table 2). Walking remained the most prevalent problematic ADL after stratification for sex, age (<65 versus ≥65 years) and/or GOLD stage (shown in e-Table 1, e-Table 2, and e-Table 3 available at www.jamda.com).

A higher proportion of GOLD stage 4 patients scored problematic ADLs within the COPM domain "self-care" compared with GOLD stages 1/2 and 3 ($P < .001$). In contrast, the proportion of GOLD stage 4 patients with problematic ADLs within the COPM

domain "productivity" was significantly lower ($P = .037$; Figure 1A). No significant differences were found for the COPM domains "leisure" ($P = .485$) and "mobility" ($P = .060$).

Eighty percent of the patients with MRC grade 5 scored 1 or more problematic ADLs on the COPM domain "self-care," although this was significantly lower in the patients with MRC grade 1 or 2 (26%; $P < .001$). Moreover, the proportion of patients with 1 or more problematic ADLs within the COPM domain "mobility" was lowest in patients with MRC grade 1 or 2, but was still highly prevalent (77%) ($P = .001$; Figure 1B). The COPM domains "productivity" ($P = .389$) and "leisure" ($P = .741$) were not different among MRC dyspnea grades.

Performance and Satisfaction Scores

The frequency distributions of performance and satisfaction points for each COPM domain after stratification for GOLD are summarized in Figure 2. The proportion of patients scoring 1 point for performance or satisfaction was 6.5% and 22.5% for the COPM domain "self-care," respectively; 14.1% and 27.9% for "productivity"; 27.1% and 39.1% for "leisure"; and 17.7% and 33.6% for "mobility."

Table 2
Top 10 Problematic ADLs for All Patients

All Patients (N = 820)				
	Activity	%	P	S
1	Walking	68.3	4.25	3.60
2	Stair climbing	35.0	4.28	3.47
3	Cycling	30.0	3.83	3.42
4	Showering	20.1	4.90	4.25
5	Gardening	17.6	4.16	3.73
6	Cleaning the floor	12.2	4.62	4.05
7	Dress and undress	11.0	4.94	4.39
8	Sports	8.9	3.03	3.08
9	Social activities	7.8	3.66	2.94
10	Activities with (grand) children	7.4	4.05	3.30

P, mean performance score (points); S, mean satisfaction score (points).

Fig. 1. (A) Percentage of patients who scored within a specific COPM domain stratified for GOLD stage 1/2 (gray, $n = 289$), 3 (white, $n = 234$), and 4 (black, $n = 297$). (B) Percentage of patients who scored within a specific COPM domain stratified for MRC dyspnea grade 1/2 (gray, $n = 190$), 3 (white, $n = 277$), 4 (checked, $n = 150$), and 5 (black, $n = 203$). * $P < .05$.

Logistic Regression Analyses

Several clinical determinants were observed to significantly affect the odds of reporting problematic ADLs in any of the COPM domains. However, no uniform pattern of association was found across the COPM domains. The identified predictors were poor to moderate in discriminating between COPD patients with and without 1 or more problematic ADLs in the 4 COPD domains (ROC_{AUC} : 0.571–0.754, Table 3).

Patients with a lower 6-minute walk distance, a higher MRC dyspnea grade, or a higher total score on the SGRQ had higher odds to score 1 or more problematic ADLs within the COPM domain “self-care.” Patients who were younger, who were women, with a higher FEV_1 or a higher total score on the SGRQ had higher odds to score 1 or more problematic ADLs within the COPM domain “productivity.” Patients who were men or scored higher on depression had higher odds of scoring 1 or more problematic ADLs within the COPM domain “leisure.” Patients with a higher MRC dyspnea grade had higher odds of scoring 1 or more problematic ADLs within the COPM domain “mobility” (Table 3).

OLS Regression Analyses

The results of the OLS regression models used to test for associations between clinical outcomes and the mean scores for performance and satisfaction for each COPM domain are summarized in Table 4. Similar to the logistic analysis, the OLS analysis revealed that performance and satisfaction scores among different COPM domains are complex and cannot be predicted from the same set of predictors. No major predictor was found to influence all domain scores simultaneously. Despite significant associations, the models’ goodness of fit was poor (R^2 7.5 to 14.6).

Discussion

This is the most comprehensive evaluation of problematic ADLs in COPD patients to date, in which a staggering range of 2999 problematic ADLs were reported. Walking was the most prevalent problematic ADL independent of age, sex, or GOLD stage. Moreover, a huge proportion of patients were not satisfied at all with 1 or more problematic ADLs. Known clinical determinants of ADLs in

Fig. 2. Proportion of patients after stratification for GOLD stages (GOLD stage 1/2 = black, 3 = gray, and 4 = white). As 743 patients scored >1 problematic ADL, the sum of % per GOLD stage was $>100\%$. (A) Proportion of patients scoring self-care performance (1 to 10 points). (B) Proportion of patients scoring self-care satisfaction (1 to 10 points). (C) Proportion of patients scoring productivity performance. (D) Proportion of patients scoring productivity satisfaction. (E) Proportion of patients scoring leisure performance. (F) Proportion of patients scoring leisure satisfaction. (G) Proportion of patients scoring mobility performance. (H) Proportion of patients scoring mobility satisfaction.

Table 3
Odds Ratios (OR) of the Model Variables Influencing Reporting (Yes, No) Any of the 4 Canadian Occupational Performance Measure Domains—Logistic Regression

	Self-care		Productivity		Leisure		Mobility	
	OR	Sig.	OR	Sig.	OR	Sig.	OR	Sig.
Age			0.975					
(years)				.000				
95% CI: L			0.941					
U			0.973					
Sex			1.586		0.646			
(Men=ref)				.003		.003		
95% CI: L			1.174		0.486			
U			2.142		0.858			
6MWD	0.990							
(%pred)		.028						
95% CI: L	0.981							
U	0.999							
FEV₁			1.013					
(%pred)				.003				
95% CI: L			1.004					
U			1.021					
MRC	1.603						1.308	
(grade)		.000						.003
95% CI: L	1.340						1.096	
U	1.918						1.562	
SGRQ_{total}	1.028		1.011					
(points)		.000		.021				
95% CI: L	1.016		1.002					
U	1.041		1.020					
Depression					1.037			
(points)						.040		
95% CI: L					1.002			
U					1.074			
Model AUC	0.754		0.652		0.571		0.587	
95% CI: L	0.721		0.641		0.532		0.528	
U	0.788		0.689		0.610		0.646	

ORs are presented per unit increase of the independent variable. Effects of the following variables were also tested, but no statistical significance was detected: Living status, FFMI, FMI, anxiety score, receiving LTOT and using a walking aid. AUC, area under the curve; CI, confidence interval; FEV₁, forced expiratory volume in 1 second; FFMI, fat-free mass index; FMI, fat mass index; L, lower; LTOT, long-term oxygen therapy; ref, reference value; SGRQ, St. George's Respiratory Questionnaire; Sig., significance; U, upper; 6MWD, 6-minute walk distance.

COPD patients were only weakly associated with performance and satisfaction scores of problematic ADLs in the current analyses. Taken together, the wide range of problematic ADLs and the absence of strong association with clinical determinants emphasize the need for using interview-based performance measures for identification of ADLs that an individual perceives as problematic to perform to allow tailored interventions.

The strength of this study lies in the inclusion of a large sample of COPD patients with different levels of disease severity. The individual problematic ADLs were assessed using a semistructured interview measure, which is beneficial over standardized questionnaires as it does not focus on specific ADLs that may not be most important to the patient. Moreover, this study analyzed 13 clinical determinants previously reported to affect ADLs in COPD patients.

Problematic ADLs

Walking is most frequently reported to be problematic in daily life, which is in general agreement with small-sized studies that have described the importance of daily walking for COPD patients.^{4,5,33} In addition, 6 of the current top 10 problematic ADLs correspond with previous findings.³⁴ All 4 COPM domains are represented in the top 10 of problematic activities, showing the diversity of the problematic ADLs that appear in COPD patients.

Clinical Correlates of Problematic ADLs

Identifying clinical determinants of problematic ADLs may allow clinicians to better monitor and restore the impaired functional performance and/or satisfaction in patients with COPD. In the present study, the degree of airflow was not associated with performance or satisfaction scores at all. This study is in alignment with previous findings showing that also patients with moderate COPD have significant impairment in ADLs.²² Even though MRC dyspnea grade appeared to be somewhat more associated with problematic ADLs, both GOLD classification and MRC dyspnea grade are not discriminative enough to be used as clinical tools for evaluating problematic ADLs of the individual patient.

Better functional exercise performance, lower MRC dyspnea grade, lower SGRQ_{total}, and lower depression score are associated with higher average performance and satisfaction scores in 2 or more COPM domains. In line with this, the same clinical values were previously also found to be associated with the London Chest ADL scale.¹⁸ Additionally, Katz et al¹⁴ found a positive association between the level of psychological distress and difficulty with ADLs.

Women have fewer problematic ADLs within the COPM domain “leisure,” whereas the opposite applies for the COPM domain “productivity.” This corresponds to previous results on sex differences.¹² Age was negatively associated with scoring 1 or more problematic ADLs within the COPM domain “productivity,” which is probably a result of older patients being more frequently retired.

Although several clinical determinants were shown to significantly affect the odds of reporting any of the 4 COPM domains, the models' predictive power was limited. Likewise, weak correlations were observed between clinical determinants and their identified perception of how well they are performing the problematic ADLs and how satisfied they are with this level of performance. Therefore, it may be speculated that some other factors not included in our models could improve their discriminative power (eg, personal assistance⁵ and self-esteem³³). Most likely, the COPM provides additional clinical relevant information that cannot be predicted from other clinical determinants. Either way, it highlights the importance of assessing the problematic ADLs of individual patients.

Methodological Considerations

This retrospective chart review focused on clinically stable COPD patients entering pulmonary rehabilitation, which might limit the external validity of the present findings. Statistical analyses were conducted only for patients with complete data ($n = 820$), as missing values were assumed to be at random. In this study, a total of 2999 problematic ADLs were reported. Similar problematic ADLs were reported by the patients in many different ways. In the process of summarizing the overall picture by stipulating major general categories, we noticed some difficulties. For example, some patients reported their ADLs very specifically (eg, problems with showering, taking a bath, dressing, combing hair, or using the toilet), whereas others reported their problematic ADLs more generically (eg, problems with bathroom activities). Therefore, specific self-care ADLs like showering may perhaps even be underestimated.

Occupational Therapy

COPD patients entering pulmonary rehabilitation experience clear difficulties with a variety of ADLs, which cannot be explained confidently by clinical determinants. Therefore, an intake by an occupational therapist, including a semistructured interview, like

Table 4
Betas (β) of the Model Variables Influencing Performance (P) and Satisfaction (S) of Any of the 4 Canadian Occupational Performance Measure domains—Linear Regression

	Self-care β		Productivity β		Leisure β		Mobility β	
	P	S	P	S	P	S	P	S
Age				0.026				0.037
(years) 95% CI: L				0.007				0.021
U				0.045				0.052
Sex		−0.532				−0.782		
1=m, 2=w 95% CI: L		−0.927				−1.216		
U		−0.138				−0.347		
6MWD	0.009	0.014			0.016	0.017	0.010	
(%pred) 95% CI: L	0.001	0.003			0.006	0.006	0.003	
U	0.016	0.025			0.026	0.028	0.016	
FMI		−0.063						
(kg/m ²) 95% CI: L		−0.119						
U		−0.007						
LTOT			−0.522					
(1=no, 2=yes) 95% CI: L			−0.925					
U			−0.120					
Walking aid		0.504						
(1=no, 2=yes) 95% CI: L		0.038						
U		0.970						
MRC			−0.192	−0.259			−0.281	−0.385
(grade) 95% CI: L			−0.362	−0.451			−0.411	−0.514
U			−0.023	−0.067			−0.150	−0.256
SGRQ_{total}	−0.024	−0.024	−0.027	−0.027	−0.028	−0.019		
(points) 95% CI: L	−0.035	−0.041	−0.040	−0.041	−0.042	−0.034		
U	−0.013	−0.008	−0.014	−0.013	−0.014	−0.003		
Anxiety					−0.079			
(points) 95% CI: L					−0.126			
U					−0.032			
Depression		−0.058				−0.077	−0.039	−0.059
(points) 95% CI: L		−0.113				−0.133	−0.070	−0.096
U		−0.003				−0.020	−0.007	−0.022
Model R ²	0.076	0.098	0.124	0.104	0.183	0.147	0.102	0.103

β s represent an average increase in the scores per unit increase in the independent variable. No statistical significance was detected for Living status, FEV₁, and FFMI. CI, confidence interval; FEV₁, forced expiratory volume in 1 second; FFMI, fat-free mass index; FMI, fat mass index; L, lower; LTOT, long-term oxygen therapy; ref, reference value; m, men; SGRQ, St. George's Respiratory Questionnaire; U, upper; w, women; 6MWD, 6-minute walk distance.

the COPM, seems necessary to develop a patient-tailored pulmonary rehabilitation program. Moreover, the current data clearly provide a rationale to assess the additional effects of occupational therapy on the functional performance of patients with COPD as part of a comprehensive pulmonary rehabilitation program. Indeed, energy conservation techniques in COPD patients during ADL reduces energy cost and dyspnea perception.³⁵ Reduced energy cost and dyspnea perception during ADLs may well increase performance and satisfaction scores of problematic ADLs. This warrants future randomized controlled trials.

To conclude, COPD patients have an enormous variety of problematic ADLs. Clinical determinants are weakly associated with problematic ADLs, which emphasize the need for assessing problematic ADLs within the individual patient so as to plan tailored interventions.

Acknowledgments

Paul Willems of Human Movement Science, NUTRIM School for Nutrition, Toxicology and Metabolism, and Suzanne Goossens, Mieke Kersten, Michelle van Mook and Malou Lammers of the Department of Occupational Therapy, Zuyd University, Heerlen, Netherlands, are gratefully acknowledged for their help with electronic data processing.

Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jamda.2011.01.002

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