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Research Article

Functional Performance in Patients with Chronic Obstructive Pulmonary Disease

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Abstract: ***Objectives:*** Improvement of symptoms and activities is one of the major treatment goals for patients with Chronic Obstructive Pulmonary Disease (COPD). The COPD guidelines recognise the need to address the effect of the disease on the patient's daily life and reduce the risk of future exacerbations. This study aimed to explore the level of functional performance among patients with all stages of COPD. ***Methods*** **:**A cross-sectional survey design was conducted with a non-probability convenience sample of 214 patients with COPD. The sample was recruited from patients attending the respiratory outpatient clinic of one of the major teaching hospitals in Dublin, Ireland. Functional performance was measured using the Functional Performance Inventory- short form (FPI-SF). ***Results*** **:**The mean age was 68.1 years (SD=8.1), with the youngest participant aged 49 years and the oldest aged 90 years. Overall, over half of the participants were female (56%, n=120). Total functional performance scores ranged from 0.14 to 2.83, with a mean (SD) of 1.13(0.68), indicating that across all participant, functional performance was low. The mean subscale score was highest for the Body Care subscale, indicating that this was the domain that the participants had least difficulty with. In contrast, the mean subscale score was lowest for the Physical Exercise subscale, indicating that this was the domain that the participants didn't partake in or had the most difficulty with. For overall functional performance, participants with mild COPD had the highest median functional performance, followed by those with moderate COPD, very severe COPD, and severe COPD. ***Conclusion*** **:** Knowledge about the functional performance of each stage of COPD is lacking. To the best of the author's knowledge, this is the first study to explore the functional performance for each stage of COPD. The total functional performance score was low and suggests that management of functions in all patients with COPD such as regular visits and early assessment for those living in the community are essential. Early assessment helps to identify the candidate patients who require home or personal care support.

Keywords: chronic obstructive pulmonary disease, COPD, function, activities of daily livings, ADLs, functional performance

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic, potentially fatal progressive condition of the lungs. COPD defined as "a common preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lungs to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients (Global Initiative for Chronic Obstructive Disease. 2011). COPD is a leading disease burden worldwide, and by 2025, it is expected to become the leading cause of death worldwide (World health organization. 2010) Improvement of daily activities is one of the major treatment goals for patients with COPD (Global Initiative for Chronic Obstructive Disease. 2011). However, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines and all other COPD guidelines do not define or assess "functional performance". The GOLD (Global Initiative for Chronic Obstructive Disease. 2011). guidelines recognise the need to address the effect of the disease on the patient's daily life and reduce the risk of future exacerbations.

Researchers have used different terms to describe individuals' functional status, such as functional performance, functional capacity, physical functioning, activities of daily living, quality of life, and health status. These terms are often used interchangeably (Kocks, J. W. *et al.*, 2011) as an

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outcome measure in COPD research. Furthermore, functional status and quality of life are terms which are often used interchangeably. The theoretical framework of functional status proposed by Leidy (Leidy, N. K. 1994) provides clarity and gives a full description of functional status. Leidy (Leidy, N. K. 1994) defined functional status as a "multidimensional concept characterising one's ability to provide for the necessities of life; that is, those activities people do in the normal course of their lives to meet basic needs, fulfil usual roles, and maintain their health and well-being." All dimensions of functional status must be considered simultaneously in order that it be fully analysed and understood. Individual elements of functional status may be evaluated and studied separately (Leidy, N. K. 1994).However, this should be clarified through the appropriate use of terminology. Functional performance is defined as the physical, psychological, social, occupational or spiritual activities that people actually do in the normal course of their lives to meet basic needs, fulfil usual roles, and maintain their health and well-being (Leidy, N. K. 1994).

Patients with COPD reported being chair bound and dependent on others for their daily activities, which makes them socially isolated and neglected by family members (Avsar, G., & Kasikci, M. 201; Ek, K., & Ternestedt, B. M. 2008; Elofsson, L. C., & Öhlén, J. 2004). With severe COPD individuals come to terms with their diminishing ability to care for themselves, and finding the basic tasks such as showering and dressing difficult making them feel useless and dependent on others (Avsar, G., & Kasikci, M. 2010; & Barnett M**.** 2005). The present study examined the functional performance among patients with all stages of COPD using a descriptive cross sectional design.

METHODS

A convenience sample of patients with COPD fulfilling the inclusion criteria were eligible to participate. Patients with a diagnosis of COPD in any of the following GOLD classifications (GOLD 2014): mild COPD (Forced Expiratory Volume in the one second (FEV1) >=80%), moderate COPD (FEV1 50-80%), severe COPD (FEV1 30-50%), very severe COPD (FEV1 <30%), patients living in the community in their own home, patients able to speak and read English to allow self-completion of the questionnaire were included in the study. Hospitalized inpatients with COPD or patients with COPD residing in long term care facilities or respite care; patients with a history of cognitive impairment which would prevent their ability to give informed consent were excluded. The sample was recruited from patients attending the respiratory outpatient clinic, either at the clinic or at home. Participants at home included in this study were those under the care of the COPD outreach team. Study approval was granted from the Clinical Research Ethics Committee. The revised Declaration of Helsinki was performed during all procedures of the study. Informed consent was obtained from all participants and informed about al details regarding the study and its intended purpose.

Functional performance was measured using the Functional Performance Inventory-Short Form (FPI-SF). The FPI is a self-administered questionnaire developed to capture patient self-report of functional performance (Leidy, N. K. 1999). The FPI is based on an analytical framework that defines functional status as a multidimensional concept characterising the activities people do to meet basic needs, fulfil usual roles, and maintain their health and well-being (Leidy, N. 1994; &Leidy, N. K. 1999). The original, long form of the tool comprising 65 items, was developed based on in-depth qualitative interviews with men and women with COPD (Leidy, N. K., & Haase, J. E. 1996). The 32-item short form was designed as a parsimonious version of the 65-item long form, with representative content and the same psychometric performance properties but reduced burden on the patient. The FPI-SF is a patient-reported outcome measure developed to quantify daily activities for patients with COPD (Leidy, N. K., & Knebel, A. 2010). The FPI-SF is a 32-item instrument with 6 subscales: body care (5 items), household maintenance (8 items), physical exercise (5 items), recreation (5 items), spiritual activities (4 items) and social activities (5 items).

Participants score 0 points for activities they do not perform in the last week, whether for health or other reasons. If the participants are able to do an activity in the last week, they are asked to indicate how difficult the activity is for them to perform on a scale of 3 "no difficulty", 2 "some difficulty", to 1 "much difficulty". If respondents do not perform an activity, they are asked if this is an activity they don't do because of "health reasons" or "choose not to". The total score was computed by taking the mean across all subscale scores. The total FPI is 0 to 3, with higher scores reflecting higher levels of functional performance (Leidy, N. K., & Knebel, A. 2010). Data were collected daily (except weekends) at the respiratory outpatients' clinic or at patients' homes over a three month period from December 3rd, 2014 to March 10th, 2015. For the participants in the outpatient clinic, prior to each clinic, the Respiratory Nurse Specialist (RNS) reviewed the scheduled patient's medical notes to identify those who met the inclusion and exclusion criteria. Potentially eligible participants were informed by the RNS about the study and invited them to meet the researcher to complete the questionnaire. A stamped return envelope with the researcher's address was provided for participants who were not able to complete the questionnaire at the clinic but willing to complete the questionnaire at a different time in their homes. For participants at home, prior to her visit, the COPD outreach nurse reviewed the scheduled patients and

identified those who met the inclusion and exclusion criteria. Eligible participants were informed by the COPD outreach nurse about the study and invited them to participate. For patients who agreed to participate in the study, the COPD outreach nurse gave them a stamped addressed for return to the researcher contains the information leaflet of the study, consent form and a copy of the FPI-SF to complete and posted.

A sample size of 200 was deemed sufficient to detect a medium effect (f2=0.15) in a multiple linear regression with up to 20 predictor variables, with a power of 80% and a level of significance of 0.05 in a 2-tailed test. Data collected were stored and analysed using Predictive Analytics Software (PASW). A data – coding framework was developed prior to data collection. After screening and cleaning of the data file, data were analysed using descriptive and inferential statistics. Descriptive statistics were used to examine the clinical and demographic characteristics of the participants.

Descriptive statistics were used to describe the demographic characteristics and functional performance. Inferential statistics were conducted to compare functional performance between COPD stages. For comparisons between COPD stages, Fisher's exact test was used for categorical variables and if a statistically significant difference was found, pairwise comparisons were performed using Fisher's exact test, with Bonferroni correction for multiple testing. The Kruskal-Wallis test was used for the comparison of continuous variables between COPD stages.

RESULTS

A sample of 214 patients with COPD participated in this study. The mean age was 68.1 years (SD=8.1), with the youngest participant aged 49 years and the oldest aged 90 years. Overall, over half of the participants were female (56%, n=120). More than half of the participants (56.1%, n=120) were unable to work. A minority (5.1%, n=11) were employed with wages or were self-employed (3.3%, n=7). With regard to living arrangements, over half of the participants were living with their family members (57.9%, n=124) (Table 1). Of the 214 participants, 20.1% (n=43) had mild COPD, 26.2% (n=56) had moderate COPD, 33.2% (n=71) had severe COPD, and 20.5% (n=44) had very severe COPD. Participants experienced comorbid conditions. The most frequent were hypertension, ischaemic heart disease (IHD), atrial fibrillation (A.Fib), and chronic cardiac failure (CCF). The socio-demographic and clinical characteristics of the patients overall and by COPD stage are presented in Table (1).

For each participant, subscale scores were calculated by averaging the items within the subscale. Subscale scores could range from 0 to 3 with higher scores reflecting greater functional performance. Missing values for items within the subscale were replaced with the mean of the items within that subscale to which the patients had responded if the patient had answered at least 80% of the items within the subscale. The total score was calculated by taking the average across all subscale scores. Total scores could range from 0 to 3 with higher scores reflecting greater functional performance. For a participant, all subscale scores had to be present in order to calculate.

Overall, total functional performance scores ranged from 0.14 to 2.83, with a mean (SD) of 1.13(0.68), indicating that across all participant, functional performance was low. The mean subscale score was highest for the Body Care subscale (mean (SD): 2.00(0.88)), indicating that this was the domain that the participants had least difficulty with. In contrast, the mean subscale score was lowest for the Physical Exercise subscale (mean (SD): 0.75(0.89), indicating that this was the domain that the participants didn't partake in or had the most difficulty with. The distribution of scores for the overall scale and subscales are presented graphically in Figure 1.

Table 1: Socio-demographic and clinical characteristics of patients, overall and by COPD stage

	Overall (n=214)	COPD Stages			
Characteristic		**Mild (n=43)**	**Moderate (n=56)**	**Severe (n=71)**	**Very severe(n=44)**
Age (years): Mean(SD)	68.1 (8.1)	61.5 (8.1)	69.2 (8.4)	70.7 (6.4)	68.9 (6.7)
Range	49 to 90	49 to 85	49 to 90	56 to 81	60 to 87
	% (n)	% (n)	% (n)	% (n)	% (n)
Gender					
Male	43.9 (94)	34.9 (15)	32.1 (18)	64.8 (46)	34.1 (15)
Female	56.1 (120)	65.1 (28)	67.9 (38)	35.2 (25)	65.9 (29)
Marital status					
Single	4.2 (9)	0.0 (0)	3.6 (2)	9.9 (7)	0.0 (0)
Married	37.4 (80)	41.9 (18)	28.6 (16)	38.0 (27)	43.2 (19)
Separated	23.8 (51)	34.9 (15)	46.4 (26)	11.3 (8)	4.5 (2)
Divorced	11.7 (25)	2.3 (1)	8.9 (5)	2.8 (2)	38.6 (17)
Widowed	22.9 (49)	20.9 (9)	12.5 (7)	38.0 (27)	13.6 (6)
Employment status					
Employed with wages	5.1 (11)	23.3 (10)	1.8 (1)	0.0 (0)	0.0 (0)
Self employed	3.3 (7)	2.3 (1)	1.8 (1)	7.0 (5)	0.0 (0)
Unemployed	6.1 (13)	20.9 (9)	5.4 (3)	1.4 (1)	0.0 (0)
Retired	29.4 (63)	11.6 (5)	32.1 (18)	25.4 (18)	50.0 (22)
Unable to work	56.1 (120)	41.9 (18)	58.9 (33)	66.2 (47)	50.0 (22)
Living arrangements					
Alone	22.9 (49)	14.0 (6)	3.6 (2)	42.3 (30)	25.0 (11)
With family member	57.9 (124)	79.1 (34)	66.1 (37)	38.0 (27)	59.1 (26)
Shared accommodation	19.2 (41)	7.0 (3)	30.4 (17)	19.7 (14)	15.9 (7)
Currently using oxygen therapy					
No	52.8 (113)	79.1 (34)	62.5 (35)	26.8 (19)	56.8 (25)
Intermittent oxygen	31.3 (67)	20.9 (9)	19.6 (11)	40.8 (29)	40.9 (18)
Permanent oxygen	15.9 (34)	0.0 (0)	17.9 (10)	32.4 (23)	2.3 (1)
Current medication use					
Inhalers	39.7 (85)	53.5 (23)	42.9 (24)	35.2 (25)	29.5 (13)
Nebulizers	16.4 (35)	23.3 (10)	21.4 (12)	16.9 (12)	2.3 (1)
Both inhalers and nebulizers	43.9 (94)	23.3 (10)	35.7 (20)	47.9 (34)	68.2 (30)
Smoking status					
Currently not smoking	84.1 -180	76.7 -33	80.4 -45	88.7 -63	88.6 -39
Currently smoking	15.9 (34)	23.3 (10)	19.6 (11)	11.3 (8)	11.4 (5)
Smoked in the past	68.7 (147)	69.8 (30)	62.5 (35)	78.9 (56)	59.1 (26)
Never smoked	3.3 (7)	0.0 (0)	3.6 (2)	7.0 (5)	0.0 (0)
Hospital admission in the last 6 months					
None	21.0 (45)	51.2 (22)	28.6 (16)	9.9 (7)	0.0 (0)
Once	39.3 (84)	48.8 (21)	50.0 (28)	29.6 (21)	31.8 (14)
Two times	23.8 (51)	0.0 (0)	12.5 (7)	31.0 (22)	50.0 (22)
Three times or more	15.9 (34)	0.0 (0)	8.9 (5)	29.6 (21)	18.2 (8)

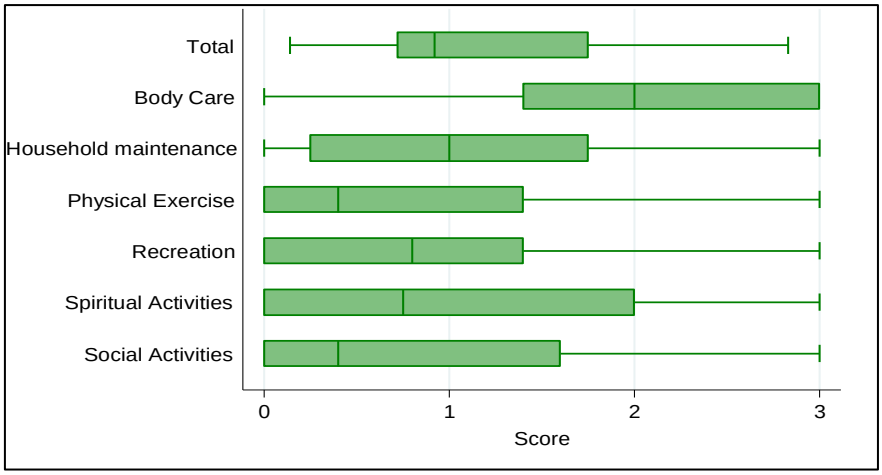

Figure (1) Scores on the FPI-SF scale and subscales

For overall functional performance, participants with mild COPD had the highest median functional performance (median (IQR): 2.02 (0.98 to 2.45)), followed by those with moderate COPD (median (IQR): 1.16 (0.86 to 1.84)), very severe COPD (median (IQR): 0.85(0.56 to 0.87)), and severe COPD (median (IQR): 0.74 (0.45 to 1.14)). Based on the average ranks, the highest ranking was for the mild group, followed by the moderate group, severe group and very severe group. The difference between groups was statistically significant ($p<0.001$). Post-hoc pairwise comparisons using Bonferroni correction indicated significant differences in overall functional performance between participants with very severe COPD and those with moderate or mild COPD and between participants with severe COPD and those with moderate or mild COPD (Figure 2).

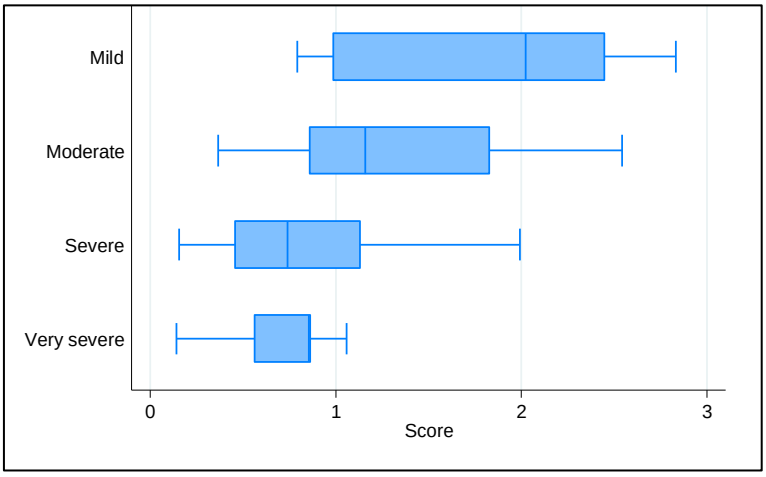

Figure (2) Scores on the FPI-SF scale by COPD stage

Similarly, significant differences were found between the COPD stages for the Body Care subscale ($p<0.001$), and the Household Maintenance subscale ($p<0.001$) with the mild and moderate groups having significantly higher functioning compared to the severe and very severe groups. The mild group were also found to have significantly higher functioning on the Household Maintenance subscale compared to the moderate group. For the Physical Exercise subscale, the mild group had significantly higher functioning than the very severe group. The severe group had the lowest functioning on the Recreation subscale and had significantly lower functioning than the mild or very severe groups.

Based on the average ranks, the mild group had the highest functioning on the Spiritual Activities subscale, followed by the moderate group, severe group and very severe group. The difference between groups was statistically significant ($p<0.001$). Post-hoc pairwise comparisons using Bonferroni correction indicated significant difference between all groups except the moderate and severe groups. However, no differences in the distribution of scores for the Social Activities subscale were found between the stages of COPD ($p=0.375$). The summary statistics for the scale and subscales split by COPD stage are presented in Table 2.

Table 2: Comparison of total functional performance and subscales by COPD stage

	n	observed range	mean (SD)	median (IQR)	p-value[1]
Total functional performance (FPI-SF)					**<0.001**
Mild COPD	36	0.79 to 2.83	1.75 (0.75)	2.02 (0.98 to 2.45)	
Moderate COPD	56	0.37 to 2.54	1.33 (0.61)	1.16 (0.86 to 1.84)	
Severe COPD	62	0.15 to 1.99	0.85 (0.53)	0.74 (0.45 to 1.14)	
Very severe COPD	36	0.14 to 1.06	0.71 (0.28)	0.85 (0.56 to 0.87)	
Subscales					
Body Care					**<0.001**
Mild COPD	43	0.75 to 3	2.41 (0.47)	2.40 (2.20 to 2.60)	
Moderate COPD	56	0 to 3	2.42 (0.88)	3.00 (2.00 to 3.00)	
Severe COPD	71	0 to 3	1.52 (0.78)	1.20 (1.00 to 2.00)	
Very severe COPD	44	0 to 3	1.83 (0.93)	1.80 (1.60 to 2.60)	
Household maintenance					**<0.001**
Mild COPD	43	0 to 3	1.99 (0.81)	2.00 (1.25 to 2.50)	
Moderate COPD	56	0 to 3	1.49 (1.00)	1.54 (0.81 to 2.22)	
Severe COPD	71	0 to 2	0.56 (0.53)	0.50 (0.00 to 1.00)	
Very severe COPD	44	0 to 1.14	0.57 (0.35)	0.40 (0.38 to 1.00)	
Physical Exercise					0.006
Mild COPD	40	0 to 3	1.26 (1.17)	1.60 (0.00 to 2.20)	
Moderate COPD	56	0 to 3	0.86 (0.94)	0.40 (0.00 to 1.80)	
Severe COPD	67	0 to 2.4	0.64 (0.73)	0.40 (0.00 to 1.20)	
Very severe COPD	41	0 to 0.8	0.27 (0.29)	0.20 (0.00 to 0.50)	
Recreation					**0.001**
Mild COPD	43	0 to 3	1.52 (1.31)	1.80 (0.00 to 3.00)	
Moderate COPD	56	0 to 3	1.02 (0.94)	0.78 (0.20 to 1.80)	
Severe COPD	71	0 to 3	0.63 (0.80)	0.40 (0.00 to 0.80)	
Very severe COPD	43	0 to 1.40	0.90 (0.45)	0.80 (0.75 to 1.40)	
Spiritual Activities					**<0.001**
Mild COPD	39	0 to 3	1.91 (1.16)	2.00 (1.00 to 3.00)	
Moderate COPD	56	0 to 3	1.23 (1.18)	0.75 (0.00 to 2.81)	
Severe COPD	66	0 to 3	0.97 (0.92)	1.00 (0.00 to 1.50)	
Very severe COPD	41	0 to 1	0.35 (0.38)	0.25 (0.00 to 0.75)	
Social Activities					0.375
Mild COPD	43	0 to 3	1.15 (1.41)	0.00 (0.00 to 3.00)	
Moderate COPD	56	0 to 3	0.94 (1.11)	0.40 (0.00 to 1.95)	
Severe COPD	71	0 to 2.6	0.69 (0.93)	0.00 (0.00 to 1.60)	
Very severe COPD	43	0 to 0.6	0.38 (0.23)	0.40 (0.20 to 0.60)	

DISCUSSION

Functional performance in COPD was measured in this study. Among the six subscales, participants had the lowest mean functional performance score for the physical exercise scale, indicating that patients with COPD had the most difficulty with this domain. Unsurprisingly, physical exercises such as regular stretching, moving or lifting, walking for short distances or exercising a long walk, and engaging in activities such as swimming or bicycling were reported as the most difficult activities. Participants with mild and moderate COPD had similar physical activity levels, whereas participants with severe and very severe COPD differed markedly from those with mild or moderate COPD.

The second lowest functional performance domain found was recreation such as taking vacations and engaging in activities. This was followed by social activities, household maintenance, and spiritual activities such as attending religious services and going to religious ceremonies. Participants in this study had least difficulty with the body care domain. Body care includes dressing, showering, and washing hair. The total functional performance score was 1.13, indicating that functional performance was low for overall participants. Participants experienced lower levels of functional performance compared to previous research (Park, S. K. *et al.*, 2012; Kapella, M. C. *et al.*, 2006; Reishtein, J. L. 2005; & Yeh, M. L. *et al.*, 2004). The low level of functional performance is due to the high symptom burden experienced and the severity of COPD; this will be discussed in detail later in this section.

The experience of functional impairment and disability has been described in previous qualitative literature. Patients with COPD described themselves as being physically and functionally disabled, and dependent on others. For example, social isolation and loss of employment was attributed to being restricted at home due to the disease (Avsar, G., & Kasilkci, M. 2011; Gysels, M., & Higginson, I. J. 2010; & Booth, S. *et al.*, 2003). Furthermore, the impairment of functional performance was found to be a strong predictor of survival in patients with COPD (Bowen, J. B. *et al.*, 2000) and difficulties in performing daily activities have been associated with low physical and mental scores that lead to low quality of life (Garcia-Aymerich, J. *et al.*, 2003). However, daily activities were compared between patients with COPD and lung cancer (Gore, J. M. *et al.*, 2000), and found that patients with COPD had significantly worse activities of daily living

scores compared with those with lung cancer. Although both groups of patients had similar palliative care needs, patients with COPD had a significantly lower quality of life scoring than those with cancer. Previous research noted the unmet needs and lack of service, particularly in the late stages of COPD (Gysels, M. H., & Higginson, I. J. 2009). The internationally recognised COPD guidelines such as GOLD, recommend rehabilitation and exercise training for patients with COPD. The literature shows good evidence of the effectiveness of pulmonary rehabilitation in improving physical activity, dyspnoea, fatigue, and overall quality of life for patients with COPD (Gysels, M. H., & Higginson, I. J. 2009; & Williams, V. *et al.*, 2010). The present study, supported by previous research suggests that the low functional performance in patients with COPD needs to be addressed and managed. Low functional performance could be eased, alongside pharmacological and oxygen therapy, through interventions such as rehabilitation, behavioural and exercise programmes which will increase the level of physical activity and reduce the difficulties with daily activities. Furthermore, regular visits and assessment for patients with COPD living in the community are essential to identify the candidate patients for home or personal care support.

An important finding of this study is that most participants with COPD experienced a low functional performance. Although assessing health-related quality of life (HRQOL) was not the focus of this study, functional performance is an important components of HRQOL in patients with COPD (Reardon, J. Z. *et al.*, 2006). Current guidelines of management of COPD such as GOLD have focused only on improving pathological and pathophysiological parameters such as inflammation and narrowing airways (Global Initiative for Chronic Obstructive Disease. 2014). The present study suggests that assessment of functional performance among patients with COPD is necessary. Evidence from literature on cancer indicated that a palliative care approach to cancer patients increases the quality of life. For patients with advanced COPD with low functional performance, a palliative care approach should be used as there is no cure for COPD. Patients with COPD were reported to be the least likely to use palliative care resources provided in the hospital or home care setting (Goodridge, D. *et al.*, 2008), and the majority of patients with advanced COPD do not offer palliative care to manage their illness (Elkington, H. *et al.*, 2005). Health care professionals have a duty also to have open communication with patients, especially with those with severe and very severe COPD, and discuss the palliative care approach.

CONCLUSION

This study demonstrated that the total functional performance score was low. The mean subscale score was highest for the Body Care subscale, suggesting that this was the subscale that the participants had least difficulty with. Participants with mild COPD had the highest median overall functional performance, followed by those with moderate, very severe, and severe COPD. Because of the low functional performance found in the present study, regular visits and assessment for patients with COPD living in the community by their own general practitioner, public health nurse, and COPD outreach nurse, if available, are essential to identify the candidate patients for home or personal care support. Furthermore, it is important to educate patients on how to adapt their daily activities in accordance with their conditions. Findings from this study and previous research revealed that poor functional performance and palliative care needs in patients with severe and very severe COPD seem to be very similar to patients with cancer. Therefore, there is a need for palliative care model for patients with advanced COPD. To the best of the researchers' knowledge, this is the first study exploring functional performance in all stages of COPD. Participants with mild, moderate, severe, and very severe COPD have been represented in the study. However, some limitations were recognised. The study design was descriptive, cross-sectional and correlational, based on a nonprobability convenience sample consisting of patients with COPD. The cross-sectional design used in this study did not allow the researcher to determine whether functional performance change over time, particularly as a disease progresses. Therefore, future longitudinal study would be beneficial to understand the pattern of functional performance changes over time.

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Declaration of Interest

No potential conflict of interest was reported by the authors.

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