

Improving the process of care in chronic obstructive pulmonary disease: The COPD Assessment Test (CAT) in the armature of the tools assessing COPD

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SUMMARY. Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality. A major goal of treatment is to ensure optimization of the level of health of the patient, i.e., health status as good as possible for the individual level of disease severity. For a number of reasons, patients with COPD tend to underestimate the overall severity of their condition, and the ways in which it impacts on their life. This underestimation and/or understatement of the impact of COPD can contribute to sub-optimal management of COPD, by making it difficult for healthcare professionals to assess the full impact of the condition on their patients' lives accurately and to assign treatment appropriately. There is a need for a tool that is short and simple, self-administered by the patients, suitable for routine use in clinical practice and a reliable and valid measure of the impact of COPD on the life and health status of the patient. It should ensure that patients and healthcare professionals have a common understanding of the impact of the illness, and that their priorities with regard to management are in agreement. When used in conjunction with measurements of lung function, the tool should enable healthcare professionals to optimize the management of each individual patient. The COPD Assessment Test (CAT) was developed to facilitate a meaningful discussion between healthcare professionals and patients and provide a reliable measure of the impact of COPD on the patient's life. As a result of this enhanced communication, the CAT is expected to contribute to improvements in the management of COPD and in the quality of life of the patients. The development and assessment of CAT was supported by the pharmaceutical company GlaxoSmithKline. *Pneumon* 2011, 24(3):286-291.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality, affecting 9–10% of all adults over the age of 40

years.^{1,2} COPD is not fully reversible with treatment and is usually progressive. A major goal of treatment is to ensure optimization of the patient's level of health, i.e., that the health status is as good as possible for the level of disease severity of the individual. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) and organizations such as the American Thoracic Society (ATS) and the European Respiratory Society (ERS) have all published recommendations for facilitating COPD diagnosis and guiding the management of the disease.^{3,4} Despite the introduction of these guidelines, evidence suggests that a substantial proportion of patients are not achieving the level of treatment success that may be feasible. In addition, many patients continue to experience medical emergencies and

hospitalization, work absenteeism and limitation of their activities⁵, all of which may have a significant physical and emotional impact on themselves and their carers and result in a high economic burden on society.^{6,7}

FACTORS CONTRIBUTING TO SUB-OPTIMAL MANAGEMENT OF COPD

Patients with COPD understate the impact of their disease

For a number of reasons, patients with COPD tend to understate the overall severity of their condition and the ways in which it impacts on their life.

A survey covering 3,265 patients with COPD, conducted in Europe and North America, revealed that there is a significant disparity between the subjects' perception of disease severity and the degree of severity indicated by a standardized scale of breathlessness.¹

This disparity may reflect a tendency for patients to accept their disease status as the best that can be expected and to underestimate the degree to which their COPD can be improved. This underestimation and/or understatement of the impact of COPD can contribute to sub-optimal management of COPD, making it difficult for healthcare professionals to assess with accuracy the impact of the condition on the lives of their patients and to assign treatment appropriately.

There is a difference between the priorities of the doctors managing COPD and the priorities of the patients coping with it

A disparity can be observed between the priorities of COPD management as expressed in the guidelines and the priorities of the patients who are living with the

disease. Patients tend to focus on their inability to "do things" and on the social and psychological consequences of the disease, while management guidelines (and, consequently, healthcare professionals) concentrate on the clinical measures of disease severity.^{8,9}

This may be, in part, because patients tend to be poor at expressing the social and psychological impact of their condition to those responsible for their treatment, and also because these dimensions are less amenable to measurement than, for example, lung function. This phenomenon can contribute to the sub-optimal management of COPD, as those components of the illness that are most important to the patient are sometimes not addressed.

Current Assessment

Current guidelines define the severity of COPD in terms of the level of forced expiratory volume in one second (FEV1)³, but correlation between health status and airways obstruction is poor; for example, even patients with only mild obstruction of the airways can have a very poor health status.⁸

Optimal management of COPD might be better achieved if the impact of the disease on a patient's life were measured and taken into consideration. This cannot be achieved with measurements of lung function alone. The quality of life and health status of persons with COPD are determined by a significant number of factors, the strongest of which are dyspnoea, depression, anxiety, and exercise tolerance. This was highlighted in a recent meta-analysis of the factors that influence disease-specific quality of life or health status in patients with COPD, which showed that the health status of patients with COPD is only weakly associated with spirometric values.¹⁰ The results of this meta-analysis strongly support the need to measure health status in addition to spirometry in order for the clinicians to be better informed about the influence of the disease on health status issues such as symptoms, impairment, and mental state. In recent years there has been increasing focus on the need for a patient-reported instrument to measure the impact of COPD on the patient's life, to be used in addition to the traditional measurements of lung function. The currently available assessment instruments, however, have limitations.

An instrument is needed that has specific characteristics. It should be short and simple, self-administered by patients, suitable for routine use in clinical practice, and a reliable and valid measure of the impact of COPD on the patient's life and health status. It should ensure that patients and healthcare professionals have a common

understanding of the impact of the illness, and that their priorities with regard to management are in agreement. When used in conjunction with measurements of lung function, the tool should enable healthcare professionals to optimize individual management.

QUESTIONNAIRES USED TO ASSESS COPD

A number of validated questionnaires are currently used to assess the status of patients with COPD; these include:

- St George's Respiratory Questionnaire (SGRQ).¹¹
- Clinical COPD Questionnaire (CCQ).¹²
- The Medical Research Council (MRC) Dyspnoea Questionnaire.¹³

The SGRQ, while being useful for clinical trials, is complex to administer and score, it requires computer analysis and is not appropriate for use in routine clinical practice. The CCQ and the MRC dyspnoea questionnaire are intended to be used routinely in clinical practice, but:

- the CCQ measures clinical disease control, but largely from the perspective of the clinician
- the MRC dyspnoea questionnaire measures only dyspnoea.

WHAT IS THE COPD ASSESSMENT TEST (CAT)?

The CAT is a short, simple, validated assessment instrument, which measures the impact of COPD on the patient's life in an objective manner

The CAT was developed to provide a reliable measure of the impact of COPD on the life of patients and to facilitate a meaningful discussion between healthcare professionals and patients. It is hoped that, as a result of this enhanced communication, the CAT will improve the management of COPD and, in turn, the quality of life of the patients.

WHAT ARE THE CAT QUESTIONS?

There are 8 items in the CAT (Figure 1).

The patients read the two statements for each item, which describe the best and worst scenario, and decide where on the intervening scale of 0 to 5 they fit. This system was chosen because it is reliable and simple to use. Scores for each of the 8 items are summed to give single, final score (minimum 0, maximum 40), which is a measure of the overall impact of the condition on the patient's life.^{14,15}

The scores for the individual items within the questionnaire will provide insight into the relative influence that the different components of COPD have on its overall impact on the patient's life. In this way the problematic areas will be highlighted, which can then be explored further during consultation and ultimately addressed through planned intervention.^{14,15} Due to the strong correlation observed between the CAT and the SGRQ (Figure 2)¹⁴ it is possible to trace CAT scores to specific SGRQ items.

OVERALL SCORE

The CAT score of a patient needs to be considered in the context of other information such as the FEV1, exacerbation frequency, and the presence of co-morbidities. Patients with more severe airway obstruction and more frequent exacerbations would generally be expected to have higher CAT scores than patients with milder disease.

The experts involved in the development of the CAT suggest that a change of 2 or more units may indicate a clinically significant change in health status, but further clinical investigation is needed to confirm this. Following an exacerbation during which the CAT scores were lowered, they may subsequently improve by an average of 5 units over 2-3 months, compared with the score at the time of the exacerbation.^{15,16}

WHAT ARE THE BENEFITS OF THE CAT?

The CAT aims to benefit both patients with COPD and healthcare professionals.

The CAT was designed to provide a standardized structure to patient consultation and monitoring, with the aim of improving the effectiveness of these processes. In addition, the use of the CAT should help patients to express themselves more meaningfully, enabling them and their healthcare professionals to gain a common understanding of the impact that COPD has on the patient lives. With this understanding, healthcare professionals should be better equipped to plan individualized treatment of COPD appropriately. Overall, the CAT aims to help healthcare professionals reduce the impact of COPD on patients, and so to improve their health-related quality of life.

The CAT can also provide useful information when used in an ongoing manner. A patient's first CAT score will give a baseline measure of the impact of COPD on his/her life, and comparing consecutive scores for a patient can reveal whether the impact has changed over time.

I never cough	0 1 2 3 4 5	I cough all the time	
I have no phlegm(mucus) in my chest at all	0 1 2 3 4 5	My chest is full of phlegm(mucus)	
My chest does not feel tight at all	0 1 2 3 4 5	My chest feels very tight	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless	
I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition	
I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition	
I have lots of energy	0 1 2 3 4 5	I have no energy at all	

FIGURE 1. The COPD Assessment Test (CAT).

In a recent pan-European cross-sectional study¹⁷ it was shown that in between periods of exacerbation, patients with severely impaired lung function often perceived both daily and weekly variability in their COPD symptoms, and that the morning is usually the most troublesome time of day. Variability in the degree of breathlessness was observed to be associated with more severe dyspnoea and increased frequency of exacerbation. Only a minority of patients appeared to adapt their treatment in response to worsening of symptoms. The observations recorded during this study have important implications for patients with severe COPD and may lead to improvements in the ways in which their condition is managed, both

day-to-day and over the long term. This study shows that specific attention should also be paid to the variability of symptoms. The CAT could possibly serve as a tool for monitoring the impact of symptom variability on the lives of patients with COPD.

In a study assessing patients with COPD participating in rehabilitation programmes, the CAT was shown to detect COPD health status gains resulting from rehabilitative intervention¹⁸. Changes in CAT scores following rehabilitation correlated well with changes in health-related quality of life as assessed by CRQ-SAS, but not with changes in measurements obtained during exercise, such as Borg, RPE, or 6MWD.¹⁸ In a very recent study by Dodd et al¹⁹

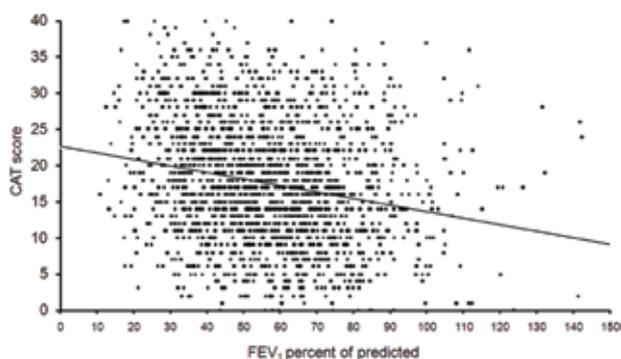


FIGURE 2. Scatter plot of correlation between FEV1 percent predicted and CAT score in patients with chronic obstructive pulmonary disease (adapted from reference 16).
CAT = Chronic Obstructive Lung Disease Test
FEV1 = forced expiratory volume in one second

the CAT was used in a COPD rehabilitation programme alongside other measures including the SGRQ, the Chronic Respiratory Disease Questionnaire, the Clinical COPD Questionnaire, the Hospital Anxiety and Depression score, the MRC dyspnoea score and a range of different walking tests. Patients completed a 5-point anchor question used to assess overall response to pulmonary rehabilitation, ranging from "I feel much better" to "I feel much worse". The mean change in the CAT score after pulmonary rehabilitation was 2.9 points, improving by 3.8 points in those rating themselves as "much better" ($n=162$), and by 1.3 in those who felt "a little better" ($n=88$) ($p=0.002$). Only 8 individuals reported no difference after pulmonary rehabilitation and 3 reported feeling "a little worse", so comparison with these smaller groups was not possible. The authors concluded that the CAT score is simple to implement as an outcome measure and that it improves in response to pulmonary rehabilitation and can distinguish categories of response.

Important information about the use of the CAT in the primary healthcare setting comes from Jones et al¹⁶ who administered the CAT questionnaire to a large population of 1,817 patients with COPD in primary care across all severities of airway obstruction, in 7 European countries. CAT scores showed relatively little variability across countries (within $\pm 12\%$ of the mean across all countries). Significant impairment in health status was recorded that was related to COPD severity (Figure 3), whether based on GOLD spirometric staging, clinician-judged severity, the MRC dyspnoea score, or disease-specific or generic health status scores. Scores were significantly better in patients

who were stable at the time of testing (17.2 ± 8.3) than in those suffering an exacerbation (21.3 ± 8.4) ($p<0.0001$), and in patients with no comorbidity (17.3 ± 8.1) or 1-2 comorbid conditions (16.6 ± 8.2) than in those with ≥ 3 comorbid conditions (19.7 ± 8.5) ($p<0.0001$ for both). The CAT distinguished between classes of other impairment measures and was strongly correlated with the SGRQ ($r=0.8$, $p<0.0001$) (Figure 4).

The study also confirmed an observation made in a much smaller number of patients in secondary care, that patients consulting their primary care physician with an exacerbation have worse health scores than those who are stable.

The proportion of patients presenting with an exacerbation, and the relative frequency of severe exacerbations in those patients was higher in patients with higher CAT scores.

In conclusion the CAT was designed to:

- provide a simple and reliable measure of the impact of COPD on the patient's health status,
- enable patients and healthcare professionals to gain a common understanding of the impact that COPD has on the patient's life,
- complement traditional measurements of lung function, to give a more complete picture of the diseases status and of the impact of COPD on the patient's life,
- provide a framework for discussion between patients and healthcare professionals about the important aspects of the impact of COPD,

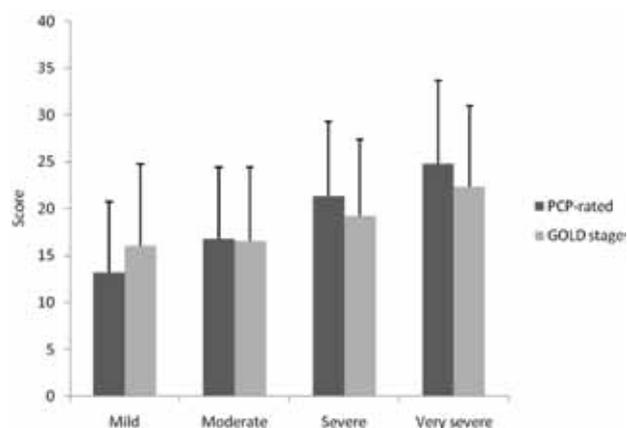


FIGURE 3. CAT score by PCP-rated COPD severity and GOLD Staging (adapted from reference 16).
CAT = Chronic Obstructive Lung Disease Test
GOLD = Global Initiative for Chronic Obstructive Lung Disease scale

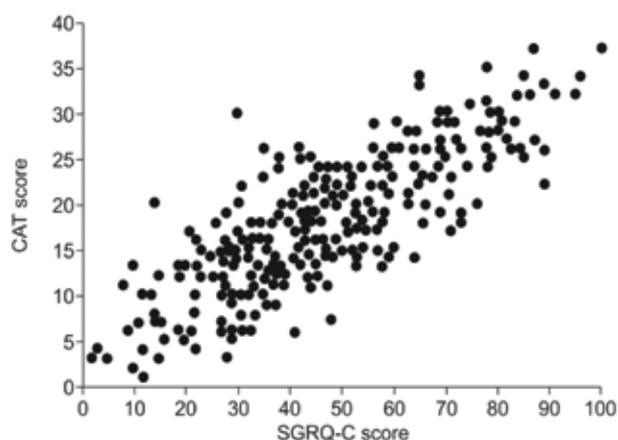


FIGURE 4. Pearson correlation between scores in the chronic obstructive pulmonary disease (COPD)-specific version of the St George's Respiratory Questionnaire (SGRQ-C) and the COPD Assessment Test (CAT) in 229 stable patients ($r=0.80$, $p<0.0001$) (adapted from reference 14).

- help to “optimize” the management of COPD, in order to improve the quality of life of patients,
- improve the effectiveness of patient monitoring and consultation,
- provide insight into disease progression and the benefits of intervention.

The CAT was designed to complement current COPD assessment tools, not to replace them. The CAT was not designed to diagnose COPD or replace measurements of lung function, but to measure the “control” or overall “status” of the patients with COPD, and to guide health-care professionals in making specific management and treatment decisions.

In contrast to the clinician's judgement of clinical severity, the CAT provides a standardized assessment with a numerical estimate of the disease impact. It is, however, only one part of the clinician's toolkit, to be used alongside spirometry, exacerbation history and assessment of comorbidity. Just as with any clinical assessment technique, its utility will only become fully apparent with use and time, but studies so far provide adequate evidence that the CAT will provide the practising physician with a reliable instrument with which to measure the impact of COPD on their patients.

ΒΙΒΛΙΟΓΡΑΦΙΑ

1. WHO COPD: Burden. World Health Organization [Online] <http://www.who.int/respiratory/copd/burden/en/index.html>
2. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: Global Burden of Disease Study. *Lancet* 1997;349:1498–504. [http://dx.doi.org/10.1016/S0140-6736\(96\)07492-2](http://dx.doi.org/10.1016/S0140-6736(96)07492-2)
3. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. 2007:1–30. <http://www.goldcopd.com/GuidelinesResources.asp>
4. Siafakas NM, Vermeire P, Price NB, et al. Optimal assessment and management of chronic obstructive pulmonary disease (COPD): The European Respiratory Society Task Force. *Eur Respir J* 1995;8:1398–420.
5. Rennard S, Decramer M, Calverley PMS, et al. Impact of COPD in North America and Europe in 2000: subjects' perspective of Confronting COPD International Survey. *Eur Respir J* 2002;20:799–805. <http://dx.doi.org/10.1183/09031936.02.03242002>
6. Celli BR, MacNee W. Standards for the diagnosis and treatment of patients with COPD: a summary of the ATS/ERS position paper. *Eur Respir J* 2004;23:932–46. <http://dx.doi.org/10.1183/09031936.04.00014304>
7. Jansson SA, Andersson F, Borg S, et al. Costs of COPD in Sweden according to disease severity. *Chest* 2002;122:1994–2002. <http://dx.doi.org/10.1378/>
8. Jones PW. Health status measurement in chronic obstructive pulmonary disease. *Thorax* 2001;56:880–7
9. Loukides S, Bakakos P, Kostikas K. Revisiting the COPD megatrials in the new decade: The end of the road or just a new beginning? *Pneumon* 2011;24:27–29
10. Tsiligianni I, Kocks J, Tzanakis N, et al. Factors that influence disease-specific quality of life or health status in patients with COPD: a review and meta-analysis of Pearson correlations. *Primary Care Respiratory Journal* 2011; in print.
11. van der Molen T, Willemse WMB, Schokker S, ten Hacken HTN, Postma SD, Juniper FE. Development, validity and responsiveness of the Clinical COPD Questionnaire. *Health and Quality of Life Outcomes* 2003;1:13–27
12. Bestall J, Paul E, Garrod R, Garnham R, Jones P, Wedzicha J. Usefulness of the Medical Research Council (MRC) dyspnoea scale as a measure of disability in patients with chronic obstructive pulmonary disease. *Thorax* 1999;54:581–586
13. Jones PW, Harding G, Berry P, et al. Development and first validation of the COPD Assessment Test. *Eur Respir J* 2009;34:648–54
14. Jones PW, Harding G, Wiklund I, et al. Improving the process and outcome of care in COPD: development of a standardised assessment tool. *Prim Care Respir J* 2009;18:208–15
15. Jones PW, Brusselle G, Dal Negro RW, et al. Properties of the COPD Assessment Test (CAT) in a cross-sectional European study. *ERJ* 2011;doi: 10.1183/09031936.00177210
16. Kessler R, Partridge MR, Miravittles M, et al. Symptom variability in patients with severe COPD: a pan-European cross-sectional study. *Eur Respir J* 2011;37:264–272
17. Jones P, Harding G, Wiklund I, et al. The COPD Assessment Test™ (CAT) is responsive to pulmonary rehabilitation. *ATS* 2010.
18. Dodd JW, Hogg L, Nolan J, et al. The COPD assessment test (CAT): response to pulmonary rehabilitation. A multicentre, prospective study. *Thorax* 2011;66:425–9.