# Final report

## 1. General information

### 1.1 Coordinating investigator 1

<table>
<thead>
<tr>
<th>Institute</th>
<th>Martijn A. Spruit, PhD</th>
</tr>
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<tbody>
<tr>
<td>Section</td>
<td>Research &amp; Education</td>
</tr>
<tr>
<td>Postal address</td>
<td>Hornerheide 1</td>
</tr>
<tr>
<td>Zipcode + city</td>
<td>6085 NM, Horn</td>
</tr>
<tr>
<td>Telephone</td>
<td>+31 475 58 76 00</td>
</tr>
<tr>
<td>Telefax</td>
<td>+31 475 58 75 92</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:martijnspruit@ciro-horn.nl">martijnspruit@ciro-horn.nl</a></td>
</tr>
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<tr>
<th>Coordinating investigator 2</th>
<th>Frits M.E. Franssen, MD, PhD</th>
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<tr>
<td>Institute</td>
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<td>Section</td>
<td>Respiratory Medicine</td>
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<tr>
<td>Postal address</td>
<td>Hornerheide 1</td>
</tr>
<tr>
<td>Zipcode + city</td>
<td>6085 NM, Horn</td>
</tr>
<tr>
<td>Telephone</td>
<td>+31 475 58 76 40</td>
</tr>
<tr>
<td>Telefax</td>
<td>+31 475 58 76 66</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:fritsfranssen@ciro-horn.nl">fritsfranssen@ciro-horn.nl</a></td>
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<tr>
<th>Coordinating investigator 3</th>
<th>Prof. Emiel F.M. Wouters, MD, PhD</th>
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<tr>
<td>Institute</td>
<td>Maastricht University Medical Centre (MUMC+)</td>
</tr>
<tr>
<td>Section</td>
<td>Respiratory Medicine</td>
</tr>
<tr>
<td>Postal address</td>
<td>P. Debyelaan 25</td>
</tr>
<tr>
<td>Zipcode + city</td>
<td>6202 AZ Maastricht</td>
</tr>
<tr>
<td>Telephone</td>
<td>+31 43 387 50 44</td>
</tr>
<tr>
<td>Telefax</td>
<td>+31 43 387 50 51</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:e.wouters@mumc.nl">e.wouters@mumc.nl</a></td>
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### 1.2 Financial administr.

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<tr>
<td>Position</td>
<td>Head Financial Control</td>
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<tr>
<td>Postal address</td>
<td>Hornerheide 1</td>
</tr>
<tr>
<td>Zipcode + city</td>
<td>6085 NM, Horn</td>
</tr>
<tr>
<td>Telephone</td>
<td>+31 475 587 654</td>
</tr>
<tr>
<td>Telefax</td>
<td>+31 475 587 666</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:jeroenbeerens@ciro-horn.nl">jeroenbeerens@ciro-horn.nl</a></td>
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1.3 Title of project:

**English**  Correlates of the COPD Assessment Test (CAT) after stratification for GOLD stages and its response to pulmonary rehabilitation in patients with moderate to very severe COPD  

**Dutch**  Correlaten van de COPD Assessment Test (CAT) na stratificatie voor GOLD stadia en de veranderingen in CAT-scores na revalidatie bij patiënten met matig tot zeer ernstig COPD

1.4 Time schedule:

<table>
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<th>Start of project</th>
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<td>23-04-2012 (dd-mm-yyyy)</td>
<td>48 (months)</td>
<td>from 01-09-2011 (dd-mm-yyyy) till 30-04-2016 (dd-mm-yyyy)</td>
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1.5 Grant  € 250000

1.6 Short description of the project for public information (in Dutch, see guidelines) (250 / 250 words):

Chronisch obstructieve longziekten (COPD) komt frequent voor in Nederland. De gezondheidsstatus van deze patiënten is vaak beperkt als gevolg van de aandoening, maar mogelijk ook als gevolg van bijkomende aandoeningen, zoals chronisch hartfalen.

Het verbeteren van de gezondheidsstatus van patiënten met COPD is een belangrijke doelstelling binnen de behandeling van deze patiënten. Echter, de huidige vragenlijsten die de gezondheidsstatus in kaart brengen zijn lang en soms door de patiënten moeilijk te begrijpen. Daarnaast is het voor de zorgverlener vaak ingewikkeld om de scores te berekenen.

Een nieuwe korte en eenvoudige vragenlijst (COPD Assessment Test; CAT) lijkt een goede vervanger te zijn van bestaande vragenlijsten. We dienen echter eerst aan te tonen of de CAT geschikt is om gezondheidsstatus te meten bij Nederlandse patiënten met COPD. Daarnaast moeten we beter in kaart brengen welke patiëntkarakteristieken de gezondheidsstatus kunnen bepalen en of we met behulp van longrevalidatie de gezondheidsstatus (gemeten met CAT) kunnen verbeteren.

Daarom gaan we in dit project de CAT valideren in Nederland. We zullen resultaten van bestaande vragenlijsten gaan vergelijken met de scores op de CAT. Daarnaast zullen we de CAT afnemen bij gezonde ouderen om een referentiekader te schetsen voor de COPD patiënten.

Verder zullen we nagaan welke patiëntkarakteristieken mede bepalend zijn voor de verminderde gezondheidsstatus bij patiënten met COPD. Speciale aandacht zal hierbij uitgaan naar de bijkomende aandoeningen van het hart. Eenslotte zullen we gaan bestuderen of de positieve effecten van longrevalidatie op de gezondheidsstatus bij patiënten met COPD ook vast te leggen zijn met de CAT.
2. Report

2.1 Summary:

<table>
<thead>
<tr>
<th>Title</th>
<th>Correlates of the COPD assessment test (CAT) after stratification for GOLD stages and its response to pulmonary rehabilitation in patients with moderate to very severe COPD</th>
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<tbody>
<tr>
<td>Authors</td>
<td>Spruit(^1), Franssen(^1,2), Wouters(^1,3), Donkers(^4), Muris(^5), Gijsen(^6), Van der Molen(^7), Jones(^8), Uszko-Lencen(^9)</td>
</tr>
</tbody>
</table>
| Dept./Institute(s) | 1 Dept. of Research & Education, CIRO in Horn (the Netherlands)  
2 Dept. of Respiratory Medicine, CIRO in Horn (the Netherlands)  
3 Dept. of Respiratory Medicine, MUMC+ in Maastricht (the Netherlands)  
4 Client with COPD, Chair of the Client Council of CIRO in Horn (the Netherlands)  
5 Dept. of Psychosocial Care, CIRO in horn (the Netherlands)  
6 Dept. of General Practice, UMCG in Groningen (the Netherlands)  
7 Division of Cardiac and Vascular Science, St. George’s University of London (United Kingdom)  
8 Department of Cardiology, MUMC+ in Maastricht (the Netherlands) |
| Keywords (max. 6) | COPD, health status, questionnaire, pulmonary rehabilitation, MCID |

Abstract (250 / 250 words):

Chronic obstructive pulmonary disease (COPD) is a highly prevalent disease in the Netherlands. Health status of patients with COPD is impaired and is probably worsened by co-morbidities like chronic heart failure.

The international GOLD guidelines recommend improvement of health status as an important aim in the management of patients with COPD. Nevertheless, current health status questionnaires are time-consuming to complete, sometimes difficult to understand by patients and have scoring algorithms that are too complex for routine use in clinical practice.

A new short and simple questionnaire (COPD Assessment Test; CAT) seems to be a good replacement of the current questionnaires to assess health status in patients with COPD. However, we have to determine whether the CAT is suitable for Dutch COPD patients. In addition, we need to get a better understanding of correlates of patients’ health status and determine whether and to what extent pulmonary rehabilitation can improve health status as assessed by CAT.

Therefore, we first need to validate the CAT in a Dutch sample of patients with COPD and will compare currently used health status questionnaires with the CAT. In addition, we will ask healthy elderly to score their health status on the CAT to develop reference values.

Furthermore, we will assess which patient characteristics may determine the impaired health status in patients with COPD with special focus on cardiac co-morbidities. Finally, we will assess whether and to what extent the positive effects of pulmonary rehabilitation on health status in patients with COPD can be assessed by CAT.
2.2 Description of original question/aim (max. 70 / 150 words):

We aim to
(1) formulate normative values for CAT using Dutch healthy elderly subjects;
(2) validate CAT in a Dutch cohort of COPD patients;
(3) determine the correlates (including co-morbid conditions) of CAT scores in patients with COPD after stratification for GOLD stages;
(4) assess the effects of pulmonary rehabilitation on CAT scores in patients with moderate to very severe COPD;
(5) estimate the MCID of CAT in COPD patients.

2.3 Results (2349 / 2500 words, please submit a maximum of 4 figures and diagrams separately):

1. Results related to the current study, data and/or study objectives:


- Beyond respiratory impairment, patients with COPD often suffer from multiple comorbidities which substantially contribute to the burden of the disease. We studied the impact of symptoms of anxiety and depression on health status in patients with COPD referred for pulmonary rehabilitation (n=307). Patients without symptoms of anxiety and/or depression have a better health status than patients with symptoms of anxiety, symptoms of depression or both symptoms. Furthermore, symptoms of anxiety and depression are equally distributed across the updated GOLD groups. Accordingly, the assessment of psychological symptoms in patients entering pulmonary rehabilitation, irrespective of the GOLD group, is important (Hilmarsen, Wilke et al. Eur Resp J 2014).

- Although COPD is a heterogeneous multisystem disease, it is still primarily diagnosed by the degree of airflow obstruction. However, this parameter is only poorly-to-moderately associated with disease activity and progression, extrapulmonary features, comorbidities and prognosis in patients with COPD. Given the importance of health status in COPD, the GOLD document (Global initiative for chronic Obstructive Lung Disease) started to include the assessment of health status as an objective in disease diagnosis and follow-up. We aimed to study the impact of the GOLD-recommended symptom measures and the two measures for exacerbation risk on the frequency distribution of GOLD group A to D, and their clinical characteristics in patients with COPD (n=542). Choice of symptom measure impacts GOLD groups more than choice of exacerbation risk assessment. Health status and psychological symptoms differs between different symptom measures used to identify high and low symptom patients, in particular in GOLD groups A and B. Healthcare professionals should be aware that patients are heterogeneous in terms of health status and symptoms of anxiety and depression based on the outcome measures used (Wilke, Smid et al. J COPD F 2014).

- We aimed to investigate the construct validity of the Timed Up & Go (TUG) test in chronic obstructive pulmonary disease (COPD), to identify characteristics related to an abnormal TUG time and to examine the responsiveness of the TUG to pulmonary rehabilitation (PR). TUG time was assessed before and after comprehensive PR in 500 COPD patients, and compared cross-sectionally in 100 non-COPD subjects. The TUG is valid and responsive in COPD. An abnormal result is indicative of poor health outcomes. This simple test provides valuable information and can be adopted in clinical and research settings. (Mesquita et al. Chron Respir Dis. 2016)
- We further aimed to explore care dependency before and after pulmonary rehabilitation (PR) in patients with COPD (n=331) and to compare the response to PR between care dependent and care independent patients. A quarter of the patients referred for PR are considered as care dependent. Care dependency of these patients improved after PR. Further, PR can also improve health status, symptoms of anxiety and depression and exercise capacity in care dependent patients to the same degree as in care independent patients. Assessment of care dependency as part of PR should be considered. (Janssen et al. Thorax 2016)

- Care for patients with COPD can be provided in primary, secondary or tertiary care. A comparison was made in daily symptoms, functional mobility, mood status, health status and healthcare utilization between COPD patients in various care settings (n=836). The burden of disease significantly increased from primary care to tertiary care. However, in all three healthcare settings, a high percentage of patients with an impaired health status was observed (i.e. CAT ≥ 10 points, 68.0% vs. 91.0% vs. 94.5%, respectively). Furthermore, many patients treated in secondary care remain highly symptomatic despite treatment, while others with low burden of disease would allow for de-intensification of care. This emphasizes the need for detailed patient characterization and more individualized treatment, independent of the healthcare setting. (Smid et al. Resp Med, in press.)

- Pulmonary rehabilitation enhances health status and mood status in patients with COPD. Therefore, the responsiveness of the SGRQ, CAT, CCQ and HADS to pulmonary rehabilitation in patients with COPD (n=419) was determined. Additionally, MCIDs for CAT, CCQ and HADS were estimated. Newly estimated MCIDs were compared to known MCID estimates from a systematic literature search. The SGRQ, CAT, CCQ, HADS-Anxiety, and HADS-Depression improved significantly after pulmonary rehabilitation. We propose MCID estimates ranging between -3.0 to -2.0 points for CAT; -0.5 to -0.3 points for CCQ, -1.8 to -1.3 points for HADS-A, and -1.7 to -1.5 points for HADS-D. (Smid et al. JAMDA, in press)

- Probably due to shared pathophysiological mechanisms, cardiac diseases often remain unrecognized in patients with COPD. The frequency of cardiac diseases as objectively assessed by echocardiography in patients referred for a comprehensive pulmonary rehabilitation (PR) program and the impact on health status is currently unknown. We investigated echocardiographic abnormalities and their impact on disease-specific health status in a large cohort of patients with COPD referred for PR (n=514). More than half of the patients referred to PR have echocardiographic abnormalities of which two third did not have such abnormalities in their medical history. Most prevalent are left ventricular hypertrophy, increased right ventricular systolic pressure and impaired left ventricular ejection fraction. Although the impact on disease-specific health status in our population is only limited, early identification and treatment are important to understand the effects of concurrent cardiac diseases and may consequently affect the course of the disease (Wilke et al. Respirology, major revision).

- COPD is associated with a significantly impaired health status, manifesting as a high burden of symptoms, across all COPD severities. Therefore, the impact of COPD on a population with and without COPD was measured (n=810, Longitudinal Aging Study Amsterdam [LASA]). Significant higher CAT scores were observed in COPD subjects compared to non-COPD subjects. Additionally, higher CAT scores were seen in female non-COPD subjects compared to males. The 95th percentile of CAT was observed at 18 points in non-COPD subjects. As approximately 20% of the non-COPD subjects had an impaired health status according to the current cut-off suggested by GOLD (CAT ≥10 points), we suggest CAT cut-point of >18 points to indicate an impaired health status in COPD (Smid et al. under review).
- It remains unknown whether and to what extent impaired cardiac output affects physical and psychological status in COPD. Therefore, we aimed to compare health outcome measures between COPD patients with and without impaired left ventricular ejection fraction (LVEF). We demonstrated that COPD patients with impaired LVEF have worse exercise capacity, quadriceps muscle function, functional mobility and more symptoms of anxiety and depression than matched COPD patients with normal LVEF. These findings reinforce the importance of assessing and treating cardiac problems in COPD (Mesquita et al. Submitted).

- Spontaneous sputum production occurs in a subset of COPD patients although its clinical relevance has not been established. Differences in health status and clinical outcomes between patients with and without positive sputum cultures are unknown. Compare clinical characteristics and health status of spontaneous sputum producers with a positive culture, negative culture and non-sputum producers in a cohort of COPD patients referred for pulmonary rehabilitation (n=518). Spontaneous sputum production is common in COPD. Particularly patients with positive cultures have worse health status and more symptoms of depression. Impact on disease progression and long-term outcomes remain to be established. (Braeken et al. submitted)

- Dropout or lack of response is an important issue in pulmonary rehabilitation (PR), which underlines the need to identify predictors of dropout and response. Acute exacerbations (AEs) of COPD may influence dropout rates and PR response. We aimed to assess differences in dropout and outcomes of PR between COPD with and without AEs (n=518). While mild-to-moderate acute exacerbations do not affect dropout or outcomes of PR, severe exacerbations are associated with increased dropout. However, AEs should not lead to discontinuation of PR, as response is generally not affected. (Braeken et al. submitted)

- Patients with Chronic Obstructive Pulmonary Disease (COPD) are classified into groups A/C or B/D based on their level of symptoms (low/high). The threshold values of the different symptom questionnaires recommended by GOLD (mMRC, CAT, CCQ and SGRQ) can result in different patient classification (hence treatment recommendation). So, a comparison was made in patient classification using CAT, CCQ and SGRQ vs. mMRC as a reference (patient-level pooled analysis with more than 18,000 patients). The best calibration threshold for CAT total score was found at 18 points, for CCQ total score at 1.9 points, and for SGRQ total score at 46.0 points. The application of these new cut-points will re-classify a proportion of COPD patients and thus will impact on individual disease management. (Smid et al. in preparation)

2. Results not directly related to the current study, data and/or study objectives:

- Numerous questionnaires have been developed in order to assess health status in COPD. We aimed to determine whether and to what extent one disease-specific health status questionnaire correlates with several generic health status questionnaires in patients with advanced COPD. Cross-sectional analyses at baseline, four, eight and 12 months after baseline reveal a moderate to strong correlation between these measures. The correlations between changes over time are weak or even absent which might be explained by the poor or absent agreement in the direction of changes in the different health status questionnaires. This manuscript suggests that health care professionals should use disease-specific as well as generic instruments to gain insight into the disease-specific and general impact of the disease (Wilke et al. Health Qual Life Outcomes 2012 - data from Longfonds project 3.4.06.082)
- Knowledge about determinants of change in health status is scarce. Understanding determinants of change in health status in patients with COPD is crucial to successfully manage COPD and consequently improve health status. Baseline and longitudinal determinants of change in disease-specific health status in patients with advanced COPD and shows that better health status, higher depression scores and worse physical mobility at baseline, as well as a worsening in physical mobility and an increase in dyspnoea during one-year follow-up are predictors of deterioration in disease-specific health status. These results reinforce the stimulation of physical mobility and targeting dyspnoea as components for treatment programs to optimize disease-specific health status in patients with advanced COPD (Wilke et al. Int J Nurs Pract 2014 - data from Longfonds project 3.4.06.082)

- Since the impact of changes in health status on outcomes remains unknown, we aimed to explore the relationship of clinically relevant changes in health status with exacerbation, hospitalization or death in a large cohort of patients with COPD (n=1,832). Patients with stable or improved health status during year 1 have a lower 182 likelihood of exacerbation, hospitalization or dying during 2-year follow-up. The current study supports the concept of routine monitoring health and reinforces the clinical importance of improving or at least stabilizing health status in patients with COPD. (Wilke et al. Thorax 2015)

- Because of their direct impact on survival, vascular and cardiovascular diseases are probably the most important coexisting diseases which occur frequently in COPD. We aimed to assess the prevalence of PAD in patients with COPD compared to distinct control groups and to study the association between PAD and functional status as well as health status in a large cohort of patients with COPD (n=2,088). PAD was objectively assessed using the ankle-brachial index (ABI). Around 9% of the patients are objectively diagnosed with PAD which is higher than the prevalence in non-COPD controls. Of note, more than two third of these patients did not report PAD in their medical history. PAD was associated with a clinically relevant reduction in functional capacity and health status. This study suggests that clinicians should actively look for PAD inpatients with COPD to identify patients at risk for vascular events and to fully understand their impairments. Early diagnoses and treatment of PAD in patients with COPD may improve morbidity and mortality which should be investigated in the future. (Wilke et al. Am J Respir Crit Care Med. In press)

- COPD is a multicomponent disease, affecting physical, psychological and social status. General characteristics of patients with COPD were studied and physical status, psychological status, and social status were compared in a population-based sample with COPD and non-COPD subjects (n=810, Longitudinal Aging Study Amsterdam [LASA]). It appears that patients with mild-to-moderate COPD already showed to have some significant impairments in measures of physical, psychological and social status compared to non-COPD subjects. These impairments need to be taken into consideration when setting up an individualized COPD management program and monitoring disease progression. (Smid et al. Under review)

Summary

- This study and related manuscripts demonstrate various concepts of health status in patients with COPD: comprehensive health status measurement is challenging, but important and necessary to understand the overall effects and the impact of the disease. It appears that the CAT is a valid questionnaire to use in Dutch clinical practice. The CAT has also proven to be responsive to pulmonary rehabilitation in patients with
COPD. Based on the above mentioned results, we have to be critical with regarding the use of cut-points indicating an impaired health status. Furthermore, health status (measured with CAT) significantly increased from primary care to tertiary care. Moreover, we showed that comorbidities, e.g. symptoms of anxiety and depression, PAD as well as cardiac diseases, even worsen patients' health status. In addition, health status measurement might play an important role in COPD prognosis. Finally, the results of above mentioned studies reveal important shortcomings and challenges which are further described and discussed in the implementation section of this report (please see below, 4. Implementation).

2.4 Did the study solve the original question? yes/ne (explain) (max. 250 words):

The respective publication(s) has (have) been added to the corresponding research question, see below. Please see 2.3 for a comprehensive summary of the study and 3.1 as well as 3.2 for detailed information for the publication.

(1) formulate normative values for CAT using Dutch healthy elderly subjects

(2) validate CAT in a Dutch cohort of COPD patients

(3) determine the correlates (including co-morbid conditions) of CAT scores in patients with COPD after stratification for GOLD stages

(4) assess the effects of pulmonary rehabilitation on CAT scores in patients with moderate to very severe COPD
- Smid et al. Responsiveness and minimal clinically important difference estimates for CAT, CCQ and HADS in patients with COPD: a prospective analysis. JAMDA in press.

(5) estimate the MCID of CAT in COPD patients
- Smid et al. Responsiveness and minimal clinically important difference estimates for CAT, CCQ and HADS in patients with COPD: a prospective analysis. JAMDA in press.

3 Papers (see instructions)

3.1 All publications (published or submitted peer-reviewed manuscripts):

PUBLISHED


**SUBMITTED**


IN PREPARATION


3.2 All publications (not peer-reviewed like abstracts, newspapers, websites, etc.):

ABSTRACTS


10. Smid DE, Franssen F, Wilke S, Muris JWM, Rohde GGU, Jones PW, Wouters EFM, Spruit MA. Characterization of patients with COPD GOLD stage I and II referred for pulmonary rehabilitation. European Respiratory Society Congress (Amsterdam), European Respiratory Journal, 2015; 46: PA3696;


- The PhD-thesis of Sarah Wilke is online available via the University Library of Maastricht: [http://pub.maastrichtuniversity.nl/2c6e7262-419a-4ada-8154-2d7cd717c3c1](http://pub.maastrichtuniversity.nl/2c6e7262-419a-4ada-8154-2d7cd717c3c1)

- A Dutch summary of the most important findings of this PhD-thesis has been published on [www.3ml.nl](http://www.3ml.nl) at the beginning of February.

- The PhD-thesis of Dionne Smid will be submitted to the PhD thesis committee by mid of September 2016.

4. **Implementation (see instructions):**

**RELEVANCE AND INNOVATION**

This study highlighted the importance of health status as an outcome parameter and a target for interventions in patients suffering from the multisystemic, progressive, incurable lung disease COPD. Indeed, as defined in the Global initiative for chronic Obstructive Pulmonary Disease (GOLD) strategy document, one of the goals of COPD management is the enhancement of health status. Furthermore, measuring health status has recently
been added to the integrated assessment of COPD, highlighting the importance of understanding this complex concept. This study confirms that health status provides important insights for burden, management and prognosis of COPD. Clear outcomes and hard facts (e.g. lung function, biomarkers, etc.) often play a superior role in COPD diagnosis and treatment, however "health status measurement is a means of quantifying, in a standardized and objective manner, the impact of disease on patients’ daily life, health, and wellbeing. It is a process that is essentially similar to a highly structured clinical history [...] It is no more "soft" [...] than any well taken clinical history” (Jones Thorax 2001). Of course, it is difficult to make the concept of health status concrete or tangible in clinical practice, but – paying attention to it is a first step in the right direction.

As a MCID can vary due to type of intervention, baseline characteristics, statistical methods or population characteristics, it may not be reliable to determine one single MCID value, e.g. we propose that the estimated CAT MCID ranges between -3.0 to -2.0 points. Furthermore, to define a symptom burden score for the CAT, for instance, equivalent to a mMRC dyspnea grade of two or higher, a CAT total score of 18 points or higher should be used. Committees might consider to adapting the recommended cut-points of the measures. Applying these newly-derived cut-points may (1) correct existing inconsistencies in COPD patient classifications; (2) enable more uniform pharmacologic treatment, independently of the choice of symptom measure; (3) facilitate the inclusion of more homogeneous patient populations in future observational and intervention COPD trials; and (4) demonstrate that a substantial proportion of COPD patients classified as highly symptomatic can be re-classified in the low symptom groups requiring less treatment and improving value for healthcare systems.

TARGET GROUPS
Health status can be defined as "the impact of health on a person’s ability to perform and derive fulfillment from the activities of daily life” (Curtis & Patrick ERJ 2003). The key word here is "health"; health has been defined as “the ability to adapt and manage one’s own wellbeing, in light of the physical, emotional and social challenges of life” (Huber et al. BMJ 2011). Promoting patients’ health, preventing risk and reducing symptoms are key concepts for COPD management and play an important role for future health care.

Health care professionals
Given the fact that both health as well as health status are multidimensional, health care professionals from several disciplines are involved in the appropriate diagnoses and treatment of COPD. Pulmonary rehabilitation, as an individualized, interdisciplinary, cost-effective approach, has been shown to positively impact patients’ health. Pulmonary rehabilitation aims "to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors” (Spruit et al. Am J Respir Crit Care Med 2013). Health care professionals are encouraged to assess health status as an important part for COPD diagnoses and patient classification. However, there is one important condition which needs to be fulfilled: providing time for it. A real challenge in times of time efficiency and cost cuts – but crucial for personalized medicine and understanding the patient and the patient's health status which may allow establishing the right treatment for the best outcome. Furthermore, health care professionals should trust the patients’ perception and knowledge; patients are able to identify exacerbations based on several visible as well as invisible symptoms and are able to apply self-management strategies to manage their disease. This facilitates early awareness as well as timely treatment. This study also underlines the importance of objectively assessing cardiovascular comorbidities in COPD. Echocardiography as well as the Ankle-Brachial-Index as non-invasive methods to assess cardiac and peripheral vascular diseases, respectively, should be considered as efficient measures to evaluate the complexity of the disease while timely and appropriate treatment can further improve the course of the disease. Echocardiography as well as the Ankle-Brachial-Index might be considered as clinically meaningful instruments for COPD screening and/or pre-rehabilitation assessment.
Current COPD management is mostly symptom driven, while a proactive approach has proven to reduce the burden of chronic diseases (Cramm, N Engl J Med 2003). Focused on primary care, we would recommend that GPs should (be able to) refer patients with high disease burden for non-pharmacologic treatments or pulmonary rehabilitation. Additionally, the absence of recent exacerbations and a low burden of disease should be included as reason for referral back to primary care. Concerning the overall COPD healthcare, we advise that guidelines should be constructed for all three healthcare settings. The most optimal approach would be to perform a complete assessment of every COPD patient during their first consultation. Following, a patient should be referred to the most suitable type of healthcare, based on the comprehensive diagnostic assessment and needs of the individual. To be able to construct a protocol and optimize individual healthcare, it is necessary to measure exacerbation and hospitalization history, daily symptoms, functional status, mood status and health status in all three healthcare settings (for diagnostic purposes, possible referral and/or merely as monitoring).

**Patients with COPD**
The patient is currently – and will be in the future – an important member of the interdisciplinary treatment team. Therefore, patients are encouraged to express their health status and to be involved in the process of active information seeking. They are encouraged to be conscious about their feelings, perceptions and symptoms. In this context, self-awareness and self-evaluation are important aspects which may lead to self-control, one of the key concepts of future health care: encouraging the patients' functionality and independency, adaptability and flexibility as well as control, autonomy and self-management. Finally, patients are stimulated to be open for multidisciplinary disease management strategies as well as new diagnostic and treatment opportunities.

Given the publicity of the results (see 3.1 and 3.2), the current findings have been distributed and are basis and inspiration for future research questions. The current findings may further provoke discussion about the use of questionnaires and if existing instruments can even be replaced with new and/or alternative ones.

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**Ondertekening**

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