Health status in COPD cannot be measured by the St George’s Respiratory Questionnaire alone: an evaluation of the underlying concepts of this questionnaire

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Abstract

Background: Improving patients’ health status is one of the major goals in COPD treatment. Questionnaires could facilitate the guidance of patient-tailored disease management by exploring which aspects of health status are problematic, and which aspects are not. Health status consists of four main domains (physiological functioning, symptoms, functional impairment, and quality of life), and at least sixteen sub-domains. A prerequisite for patient-tailored treatment is a detailed assessment of all these sub-domains. Most questionnaires developed to measure health status consist of one or a few subscales and measure merely some aspects of health status. The question then arises which aspects of health status are measured by these instruments, and which aspects are not covered. As it is one of the most frequently used questionnaires in COPD, we evaluated which aspects of health status are measured and which aspects are not measured by the St George’s Respiratory Questionnaire (SGRQ).

Methods: One hundred and forty-six outpatients with COPD participated. Correlations were calculated between the three sections of the SGRQ and ten sub-domains of the Nijmegen Integral Assessment Framework, covering Symptoms, Functional Impairment, and Quality of Life. As the SGRQ was not expected to measure physiological functioning, we did not include this main domain in the statistical analyses. Pearson’s r ≥ 0.70 was used as criterion for conceptual similarity.

Results: The SGRQ sections Symptoms and Total showed conceptual similarity with the sub-domain Subjective Symptoms (main domain Symptoms). The sections Activity, Impacts and Total were conceptual similar to Subjective Impairment (main domain Functional Impairment). The SGRQ sections were not conceptual similar to other sub-domains of Symptoms, Functional Impairment, nor to any sub-domain of Quality of Life.

Conclusions: The SGRQ could facilitate the guidance of disease management in COPD only partially. The SGRQ is appropriately only for measuring problems in the sub-domains Subjective Symptoms and Subjective Impairment, and not for measuring problems in other sub-domains of health status, such as Quality of Life.

Background

COPD is a chronic and debilitating disease and a leading cause of morbidity and mortality worldwide [1]. According to the latest estimates of the World Health Organization (WHO), 210 million people have COPD and 3 million people died of COPD in 2005 [2].

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definition of health status, by defining health status as ‘a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity’. Similarly, others [5,6] define health status as an overall concept covering physiological functioning, symptoms, functional impairment, quality of life, and social functioning as important main domains. These main domains were empirically found to be further divided into sixteen sub-domains [7,8], each sub-domain representing a unique aspect of health status. Despite differences in definitions found in the literature it has become clear that a patient’s functioning consists of many conceptually distinct sub-domains. Patient-tailored treatment then requires assessment of all these sub-domains.

Questionnaires could facilitate the guidance of patient-tailored disease management by exploring which aspects of health status are problematic and which aspects are not. The past decade many questionnaires have been developed to measure health status. However, most of these instruments consists of only one or a few sub-scales and thus measure merely some aspects of health status. The question then rises which aspects of health status are measured by these instruments, and which aspects are not covered.

The St George’s Respiratory Questionnaire (SGRQ), for instance, is one of the most frequently used and translated disease specific health status instruments in COPD [9-11]. A recent Pubmed search gave 555 hits (date 06/03/2010; terms SGRQ and St George’s Respiratory Questionnaire). The SGRQ has been developed to allow comparative measurement of health between patient populations and to quantify changes in health following therapy [12]. The SGRQ consists of three sections and a total score: Symptoms, measuring the frequency and severity of respiratory symptoms; Activity, measuring limitation of activities by breathlessness and activities that cause breathlessness; Impacts, measuring disturbances in social and psychological functioning due to airway disease; Total score summarizes the impact of the disease on overall health status [12-14]. The SGRQ thus measures maximally three of the sixteen aspects of health status. It is not clear which aspects of health status are measured, and which aspects of health status are not measured by the SGRQ. This question is all the important to unravel, because the SGRQ, as many other questionnaires, is subject to conceptual confusion. The SGRQ originally was conceived as a standardized self-completed questionnaire for measuring health and perceived well-being (‘QoL’) in airways diseases [12]. In the literature, however, the SGRQ is interchangeably referred to as a measure of quality of life [15], health-related quality of life [16], health status [17], a measure for impaired health [18], or a measure of overall impact of the disease [19]. Different terms are used for the concept(s) the SGRQ measures. Additionally, since the SGRQ is often used as a criterion in validity testing of other instruments [20,21], it is essential to clarify which aspects of health status the SGRQ measures.

In the present study, we tested which aspects of health status are measured by the SGRQ in COPD, by comparing the SGRQ sections Symptoms, Activity and Impacts with multiple aspects of the health status domains Symptoms, Functional Impairment and Quality of Life.

Material and methods

Subjects

The 146 subjects took part on a longitudinal study on health status in COPD. Patients were recruited from three different outpatient centres in the Netherlands: Radboud University Nijmegen Medical Centre, Maas Hospital Boxmeer, and Rijnstate Hospital Arnhem. Patients had to fulfil the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria of a post-bronchodilator FEV1% predicted between 30 and 80 percent with a reversibility of obstruction of less than 12% [1]. Patients suffering from primary co-morbidity or co-morbidity that prevented full adherence to the research protocol were excluded, as well as patients with an acute exacerbation, recent (<6 months) participation in a rehabilitation program, or who were not able to speak or read Dutch. One-hundred-and-sixty-eight patients participated in this study. After one year, the assessments were repeated in 146 patients (87% of included patients in first part). Reasons for dropout were diverse: passed away (N = 5), co-morbidity (N = 3), participation in a rehabilitation programme between the first and second assessments (N = 2), being too busy (N = 4), found participation too exhausting (N = 3), or no transportation (N = 2). For three patients the reasons for dropout were unknown. Data of these 146 patients were used in the present study. The inclusion procedure is described in more detail elsewhere [7]. The study was approved by the Medical Ethics Committee CMO Region Arnhem-Nijmegen (P02.1411L; CMO-nr 2002/047). Subjects gave informed consent.

Procedures

Subjects visited the Department of Pulmonary Diseases twice. Physiological assessments were performed and subjects received the Aktometer (accelerometer measuring actual physical activity) [22]. Two weeks later subjects completed questionnaires by the TestOrganiser, a computer program developed by the Department of Medical Psychology and the Department of Instrumental Services of the Radboud University Nijmegen Medical Centre [7]. Questionnaires were presented in the same layout as the paper-and-pencil versions, and a simple
response board enabled subjects with no prior computer experience to operate the TestOrganiser easily.

**Measurements**

Demographic data were recorded. Pulmonary function tests were performed, including transfer capacity for carbon monoxide using the Jaeger masterlab-spirometer according to ERS-criteria [23], and indices of body composition (BodyStat 1997).

**St George’s Respiratory Questionnaire (SGRQ)**

The SGRQ consists of 50 items with weighted responses divided in three sections - Symptoms, Activity, and Impacts - and a Total score [12-14]. Scores are expressed as percentages of the maximally possible sum of weights. A score of zero represents no health impairment, a score of 100 means maximal health impairment.

**Health status main domains Symptoms, Functional Impairment, and Quality of Life**

Health status was measured by the Nijmegen Integral Assessment Framework (NIAF) [7]. The NIAF provides a detailed and empirical definition of health status and covers the domains Physiological Functioning, Symptoms, Functional Impairment, and Quality of Life. These four main domains were found to be subdivided into 15 distinct sub-domains [7]. In another study [8], we found that fatigue was an additional sub-domain. Factor analyses were used to identify underlying concepts in the data. Social Functioning did not emerge as a separate factor, aspects of social functioning were part of the main domains Quality of Life and Functional Impairment. The sub-domains are measured by different existing instruments, and for each sub-domain a Sub-domain Total Score (STS) was calculated. As the SGRQ was not expected to measure physiological functioning, in this study we only evaluated the ten sub-domains of the main domains Symptoms, Functional Impairment, and Quality of Life. See Table 1 for definitions of the sub-domains and corresponding instruments.

**Statistical Analyses**

The relationships between the sections of the SGRQ and the sub-domains of the NIAF, as well as the intercorrelations of the SGRQ sections, were analyzed by Pearson correlation coefficients. To avoid Type I error due to multiple testing P was set at 0.01. A Pearson’s r ≥ 0.70 was used as criterion for conceptual similarity between the sections of the SGRQ and the sub-domains of the NIAF [24].

**Results**

**Subjects**

The study sample could be characterized as predominantly male, low educated, and living with a partner (Table 2). Most subjects were GOLD II/III patients. Some subjects were classified in GOLD I or IV, due to normal variation in FEV1 between the time of the first assessment and second assessment one year later.

**Conceptual similarity between sections of the SGRQ and sub-domains of the NIAF**

The SGRQ sections were significantly correlated to many health status aspects, however conceptual similarity (r ≥ 0.70) was only reached for two sub-domains of the NIAF (Table 3). The SGRQ sections Symptoms and Total were conceptual similar to the NIAF sub-domain Subjective Symptoms (main domain Symptoms). The SGRQ sections Activity, Impacts, and Total were conceptually similar to the NIAF sub-domain Subjective Impairment (main domain Functional Impairment).

**Intercorrelations of the SGRQ sections**

Intercorrelations between the SGRQ sections were moderate to high (Table 4). The SGRQ section Total exceeded the criterion of conceptual similarity with all SGRQ sections (r ≥ 0.70, p < 0.01). The correlation between the sections Impacts and Activity almost reached the criterion of conceptual similarity (r = 0.69, p < 0.01).

**Discussion**

The present study evaluated which aspects of health status are measured by the sections of the SGRQ, and which aspects of health status are not covered by the SGRQ.

The sections of the SGRQ correlated significantly with most sub-domains of the NIAF, indicating that the SGRQ was related to many health status aspects. However, most correlations were low to moderate and well below 0.70, indicating that shared variance was too low to conclude that sections of the SGRQ were conceptually similar to these sub-domains.

Applying the criterion of conceptual similarity, the SGRQ measured two of the ten evaluated sub-domains of health status. The SGRQ sections Symptoms and Total showed conceptual similarity with the sub-domain Subjective Symptoms (main domain Symptoms), the SGRQ sections Activity, Impacts, and Total showed conceptual similarity with the sub-domain Subjective Impairment (main domain Functional Impairment).

In a previous study [7] we found a high correlation between the sub-domains Subjective Impairment and Subjective Symptoms. The instruments included in these sub-domains were different with respect to the content of the items, but had in common that the item-and-response format required highly subjective and general interpretations by the patient. It was argued that both sub-domains measured highly subjective notions of
Table 1 Main domains Symptoms, Functional Impairment and Quality of Life of the Nijmegen Integral Assessment Framework

| Sub-domain | Definition | Instrument (subscales) |
|------------|------------|------------------------|
| **Symptoms** | | |
| Subjective Symptoms | The patient's overall burden of pulmonary symptoms | PARS-D: Global Dyspnea Activity, Global Dyspnea Burden, Dyspnea Activity [7]; QoLRiQ: Breathing Problems [33] |
| Dyspnea Emotions | The level of frustration, depressive feelings, and anxiety a person experiences when dyspnoeic | DEQ: Frustration, Mood, Anxiety [7] |
| Expected Dyspnea | The level of dyspnea that a patient expects to experience during specific activities no longer performed | PARS-D: Expected Dyspnea [7] |
| Fatigue | The level of experienced fatigue | CIS: Subjective fatigue [34] |
| **Functional Impairment** | | |
| Actual Physical Activity | The actual physical activity a patient performs during two weeks | Aktometer (electronic accelerometer) [22] |
| Behavioral Impairment | The extent to which a person cannot perform specific and concrete activities as a result of having the disease | SIP: Body Care & Movement, Home Management, Mobility, Ambulation [35] |
| Subjective Impairment | The experienced degree of impairment in general, and in social functioning | QoLRiQ: General Activities, Social Activities [33]; Global Impairment [7]; SIP: Social Interaction, Burden [35] |
| **Quality of Life** | | |
| General Quality of Life | Mood, anxiety, and the satisfaction of a person with his/her life as a whole | Satisfaction With Life Scale [36]; Symptom Check List: Anxiety [37]; BDI: Primary Care [38] |
| Health-related Quality of Life | Satisfaction related to physiological functioning and the future | Satisfaction Physiological Functioning, Satisfaction Future [7] |
| Satisfaction Relations | Satisfaction with the (absent) relationships with spouse and others | Satisfaction Spouse, Satisfaction Social [7] |

PARS-D: Physical Activity Rating Scale-Dyspnea; QoLRiQ: Quality of Life for Respiratory Illness Questionnaire; DEQ: Dyspnea Emotions Questionnaire; CIS: Checklist Individual Strength; SIP: Sickness Impact Profile; BDI, Beck Depression Inventory

\'being ill\', also referred to as illness perceptions [25]. As the SGRQ reached the criterion for conceptual similarity with these two sub-domains, this would imply that the SGRQ in fact measures illness perceptions, related to symptoms (section Symptoms and Total) and functional impairment (sections Activity and Impacts). This conclusion is underlined by the high intercorrelations between the SGRQ sections, some correlations even exceeding the criterion for conceptual similarity.

Although illness perceptions related to symptoms and functional impairment are very relevant concepts, many other important aspects of health status are not covered by the SGRQ. With respect to the SGRQ as a measure of aspects of symptoms, these are restricted to the subjectively experienced severity of pulmonary symptoms. Other important aspects of symptoms, such as dyspneic-related emotions, are not measured specifically. With respect to functional impairment, only the subjectively experienced impairments are measured by the SGRQ. Impairment on the behavioural level or actual physical activity level is not measured by the SGRQ sections. Furthermore, the present study showed that the SGRQ does not measure any of the three sub-domains of quality of life evaluated in this study (General Quality of Life, Health-related Quality of Life, and Satisfaction Relation). Finally, since the SGRQ measures merely two sub-domains of the ten evaluated sub-domains, the SGRQ does not provide a detailed measurement of health status. Similarly, present data show that the SGRQ should be considered a valid measure of impaired health in COPD, as the SGRQ originally was conceived. However, the SGRQ measures only two aspects of impaired health (subjective symptoms and subjective impairment). To measure all aspects of impaired health, and thereby allowing patient-tailored treatment, other instruments need to be included as well.

Some methodological issues need to be addressed. First, the NIAF is not the definite answer to the problem of conceptual confusion in current health status instruments. Other aspects of health status not included in the framework may be relevant to COPD patients. This needs to be addressed in future studies, in which patient feedback should be incorporated. Nevertheless, this framework does provide a much more detailed definition of health status, as expressed by the many sub-domains, and is much more formulated in terms of empirical observations than found in the literature. Each sub-domain represents a (conceptually) unique health status aspect. At least 16 sub-domains are measured to
Table 2 Demographic, clinical data, and data of the St George's Respiratory Questionnaire of participating COPD patients

| Variable               | Mean ± SD  |
|------------------------|------------|
| Male sex %             | 76.7       |
| Age (years)            | 65.8 ± 9.0 |
| Education %            |            |
| Low                    | 48.6       |
| Middle                 | 29.5       |
| High                   | 19.9       |
| Personal situation %   |            |
| Partner                | 77.8       |
| Divorced               | 6.3        |
| Widowhood              | 8.3        |
| Single                 | 7.6        |
| Cigarette smoking %    |            |
| Current                | 41.8       |
| Former                 | 45.9       |
| Never                  | 11.0       |
| BMI (kg/m²)            | 25.9 ± 4.1 |
| FEV₁ (L)               | 1.6 ± 0.3  |
| FEV₁ % predicted       | 53.6 ± 13.9|
| FEV₁/FVC %             | 44.0 ± 11.4|
| TLC % predicted        | 103.7 ± 14.6|
| RV % predicted         | 1283 ± 303 |
| TLCO % predicted       | 62.3 ± 21.5|
| GOLD %                 |            |
| I                      | 2.7        |
| II                     | 58.9       |
| III                    | 34.2       |
| IV                     | 4.8        |
| SGRQ section           |            |
| Symptoms               | 40.9 ± 24.8|
| Activity               | 40.9 ± 21.8|
| Impacts                | 20.2 ± 13.5|
| Total                  | 30.2 ± 15.4|

Data are presented as mean ± SD unless otherwise indicated. Percentages may not add up to 100 due to missing data (three patients with no specified education, two patients with no specified smoking habits). BMI: body mass index; FEV₁ % predicted: forced expiratory volume in one second as percentage predicted; FEV₁/FVC %: forced expiratory volume/forced vital capacity; TLC: total lung capacity; TLCO % predicted: transfer capacity of lung for carbon monoxide as percentage predicted; GOLD: Global Initiative for Chronic Obstructive Lung Disease; SGRQ: St George’s Respiratory Questionnaire.

provide a detailed picture of the health status of a COPD patient.

Second, using the criterion of conceptual similarity (r ≥ 0.70) as a standard for validity seems a very strict criterion. However, considering the conceptual confusion in health status, one must be carefully interpreting results of earlier validity studies. Often, much lower correlations are accepted as evidence for the validity of the instrument under scrutiny. For example, a correlation between two instruments of 0.40 may be statistically significant, but it indicates only 16% of shared variance. Unambiguous conclusions concerning conceptual similarity between two instruments can only be drawn from the results using a strict approach.

The present study focuses on the relationships between the SGRQ sections and the main domains Symptoms, Functional Impairment, and Quality of Life. Therefore, the conclusions of the present study are not applicable with respect to physiological functioning. However, from a theoretical point of view it is unlikely that a questionnaire will provide a direct measure of physiological processes. For example, studies to date [26,27] often show a relationship between FEV₁ and the SGRQ. However, these correlations are low to moderate and do not exceed the criterion of conceptual similarity.

With respect to generalizability of the present study, we believe that the present sample may be an adequate reflection of the Dutch population of patients with COPD seen in an outpatient clinic. This sample may however not be representative for subgroups of COPD such as patients in pulmonary rehabilitation or patients with primary co-morbidity, which were two major exclusion criteria.

An important clinical implication of the present study is that the SGRQ could facilitate the guidance of disease management only partially. The SGRQ can only be used appropriately for exploring problems in the sub-domains Subjective Symptoms and Subjective Impairment, and not for exploring problems in other sub-domains of health status, such as aspects of quality of life.

Most instruments claiming to measure specific aspects of health status contain only two to five subscales. Thus, at best only some aspects of health status are measured by a specific instrument. This not only has implications for clinical practice, but also for research purposes. In pharmacological trials, the drug under study may have beneficial effects on some aspects of health status, but not on other aspects. If the instruments used measure only few aspects of health status beneficial effects may be missed. With respect to the use of instruments in clinical practice, the present results indicate that one single instrument cannot provide sufficient information on a patient’s health status to effectively tailor treatment to the needs of the individual patient, since measuring all aspects of health status is a prerequisite for patient-tailored treatment. This requires combining different instruments into a battery of instruments measuring multiple aspects of health status. However, implementing instruments in daily practice to facilitate disease management requires that instruments are not too time consuming. The past decade a few short instruments have been developed specifically to allow measurement of health status aspects in routine care, such as the...
Clinical COPD Questionnaire [28], the Respiratory Illness Questionnaire-monitoring 10 [29], and the Euro-QoL [30]. None of these instruments provide a detailed picture of a patient’s health status. Recently, we developed the Nijmegen Clinical Screening Instrument (NCSI), an instrument which can be used in routine care [31]. The NCSI is based on the NIAF and measures eleven sub-domains of physiological functioning, symptoms, functional impairment, and quality of life. The NCSI enables a quick (15-25 minutes) and detailed assessment of health status. Also, the COPD Assessment Test (CAT) was developed [32], ‘a validated short and simple instrument for assessing the impact of COPD on health status’. The CAT is constructed as a uni-dimensional instrument, i.e. measuring one single concept, as expressed in a single score. In addition, the correlation between the CAT and the SGRQ-C was well above the criterion for conceptual similarity \( (r = 0.80) \) [32]. Taken together, it is very likely that the CAT, like the SGRQ, measures illness perceptions. How important illness perceptions may be, patient-tailored treatment requires a detailed assessment of many aspects of health status. Therefore, the CAT also will have limited value in patient-tailored treatment.

### Conclusions

Detailed measurement of health status in patients with COPD is a prerequisite for patient-tailored treatment. However, carefulness should be noted when selecting instruments to measure health status, because most instruments measure only a few aspects of health status. The SGRQ can only be used appropriately for measuring problems in the sub-domains Subjective Symptoms and Subjective Impairment, and not for measuring problems in other sub-domains of health status, such as aspects of Quality of Life. Different instruments should be combined to provide a detailed picture of a patient’s health status.

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### Authors’ contributions

LD participated in the design of the study, the acquisition of the data, performed statistical analyses and interpreted the data, and drafted the manuscript. JBPJ participated in the acquisition of the data, and in the critical revision of the manuscript for important intellectual content. JM participated in the design of the study, the acquisition of the data, and in the critical revision of the manuscript for important intellectual content. PNRD participated in the critical revision of the manuscript for important intellectual content.
intelectual content. JHPr participated in the critical revision of the manuscript for important intellectual content. YFH participated in the acquisition of the data, and the critical revision of the manuscript for important intellectual content. JHV conceived the study, participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

Competing Interests

The authors declare that they have no competing interests.

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References

1. 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, 23:952-966.

2. World Health Organization. [http://www.who.int/respiratory/copd/en/].

3. Vicaut E, Aubry M, Massion Y, Le Mesurier J, Broche J, Bouyer J, Perng I, Pauwels RA, Kerrebijn J, Champion V, Silvestri S, McNamara D, Juniper E, Jadari J, LeMoult J, Kang K, Emmerson D, van den Abeele J, and the French COPD Improvement Program (FCIP) Study Group: A systematic review of the literature on the diagnosis, management, and prevention of chronic obstructive pulmonary disease - Update December 2009. [http://www.goldcopd.org/Guidelineitem.asp? IID=282&l=1&nid=2180].

4. Smith KW, Avis NE, Assmann SF: Distinguishing between quality of life and health status in quality of life research: a meta-analysis. Qual Life Res 1999, 8:647-659.

5. Wilson IB, Cleary PD: Linking clinical variables with health-related quality of life: A conceptual model of patient outcomes. JAMA 1995, 273:59-65.

6. Taillefer M, Dupuis G, Roberge M, Le May S: Health-related quality of life assessment: a tool for daily practice. J Fam Pract 2004, 53:648-654.

7. MacLennan G, Boffa D, Klaber Moffett J, Hays RD, Wang C, Haynes RB, Avis NE: Measuring health-related quality of life: an integrative framework. Med Care 2008, 46:160-219.

8. Peters JR, Heijdra YF, Daudey L, Molema J, Delhuijzen PN, Vercoulen JH: Prevalence and severity of fatigue and its relationships with dyspnea and health status in COPD patients (abstract). Am J Respir Crit Care Med 2007, 175:A642.

9. Buir JF, Schumacher GE, Freeman S, LeMaire M, Balcet AW, Jones PW: American translation, modification, and validation of the St. George’s Respiratory Questionnaire. Clin Ther 2000, 22:1121-1145.

10. Chan SL, Chan-Young MM, Choi GC, Lam CL, Cheung TF, Lam WK, Tsang KW: Validation of the Hong Kong Chinese version of the St. George Respiratory Questionnaire in patients with bronchiectasis. Chest 2002, 122:2030-2037.

11. Bourbeau J, Malo L, Rousseau M, Guimont C: French-Canadian version of the Chronic Respiratory and St George’s Respiratory questionnaires: an assessment of their psychometric properties in patients with chronic obstructive pulmonary disease. Can Respir J 2004, 11:80-86.

12. Jones PW, Quirk FH, Baveystock CM: The St-George Respiratory Questionnaire. Respiratory Medicine 1991, 85:25-31.

13. Jones PW, Quirk FH, Baveystock CM, Littlejohns P: A self-complete measure of health status for chronic airflow limitation. The St. George’s Respiratory Questionnaire. Am Rev Respir Dis 1992, 145:1321-1327.

14. Jones PW, Spencer S, Adde S: The St George’s Respiratory Questionnaire Manual. London 2003.

15. Khalkhali R, Paul EA, Jones PW, Wedderburn J: Does long-term oxygen therapy affect quality of life in patients with chronic obstructive pulmonary disease and severe hypoxaemia? Eur Respir J 1996, 9:2335-2339.

16. Nishiya Y, Teraguchi H, Kondoh Y, Ninohara K, Suzuki R, Takagi K, Yonoi K: The effectiveness of the visual analogue scale 8 in measuring health-related quality of life for COPD patients. Respir Med 2000, 94:1192-1199.

17. Vestbo J, Sotolito JB, Anderson JA, Calverley PA, Postma DS, Milroy SJ, Wedderburn J, Jones PW, Goldin BR, Meade TW, Juniper E, Higenbottam T, Villanueva M, and the COPAX: Development and validation of a disease-specific quality-of-life questionnaire for patients with moderate to severe COPD. Thorax 2001, 56:568-577.

18. Beck AT, Deig AS, Steer RA, Ball RA: Screening for major depression disorders in medical inpatients with the Beck Depression Inventory for Primary Care. Behav Res Ther 1997, 35:785-791.

19. daudey et al. Respiratory Research 2010, 11:98 http://respiratory-research.com/content/11/1/98

20. Schulz-1, Nohel M, Ehs P, Hjermdal P, Wilkson JE: Validation of the Clinical COPD Questionnaire in primary care. Health Qual Life Outcomes 2009, 7:26.

21. Casalis A, Rose JW, Jones PW, Jadari J: A Brazilian version of the St George’s Respiratory Questionnaire. Respir Med 2005, 99:602-606.

22. Vercoulen JH, Bazemans E, Swainnik CMA, Fennis JM, Galama JMD, Jorgens P, Hammons OR, van der Meet JW, Bijl-Kneuberg G: Physical activity in chronic fatigue syndrome: assessment and its role in fatigue. J Psychosom Res 1997, 43:661-673.

23. Juniper E, Quirk FH: Standardized lung function testing. Eur Respir J 1993, 6:33.

24. Onglen J: Theory and measurement: conceptualisation, operationalisation, and the example of health status. Assessment in Behavioural Medicine East Sussex: Brunner-RoutledgeVingerhoets A 2001, 73-90.

25. Schorlo M, Kaptein AA, Weinman J, Hazines JM, Williams LN, Bergman W, Rijndijk Fr: Illness perceptions, coping and functioning in patients with rheumatoid arthritis, chronic obstructive pulmonary disease and psoriasis. J Psychosom Res 1998, 45:573-585.

26. Madueza A, Martin A, Pucela J, Acuberta L, Paredes I, Aguilar A, Leon A: Usefulness of respiratory capacity measurement in COPD patients in the primary care setting. J Gen Intern Med 2009, 24:139-145.

27. Pereira ED, Pinheiro R, Alcântara M, Medeiros M, Mota RM: Influence of respiratory function parameters on the quality of life of COPD patients. J Bras Pneumol 2004, 30:790-796.

28. Van Der Molen T, Willemsen BI, Scholker S, Ten Hocken NH, Postma DS, Juniper EJ: Development, validity and responsiveness of the Clinical COPD Questionnaire. Health Qual Life Outcomes 2003, 1:13.

29. Jacobs JS, Molle AE, Abkenmans RP, van Weel C, Gro FRT: Assessing the quality of life of adults with chronic respiratory diseases in routine primary care: Construction and first validation of the 10-Item Respiratory Illness Questionnaire-monitoring 10 (RIQ-MON10). Qual Life Res 2004, 13:1117-1127.

30. EuroQol–a new facility for the measurement of health-related quality of life. The EuroQol Group. Health Policy 1990, 16:193-208.

31. Peters JS, Daudey L, Heijdra YF, Molema J, Delhuijzen PN, Vercoulen JH: Development of a battery of instruments for detailed measurement of health status in patients with COPD in routine care: the Nijmegen Clinical Screening Instrument. Qual Life Res 2009, 18:901-912.

32. Jones PW, Harding G, Berry P, Williand J, Chen YH, Kline LN: Development and first validation of the COPD Assessment Test. Eur Respir J 2009, 34:648-654.

33. Maillé AR, Koning CJ, Zwinderman AH, Willemsen LN, Postma DS: Influence of respiratory function parameters on the quality of life of COPD patients. J Psychosom Res 1998, 44:573-585.

34. Beck AT, Guth DS, Steer RA, Ball RA: Screening for major depression disorders in medical inpatients with the Beck Depression Inventory for Primary Care. Behav Res Ther 1997, 35:785-791.