Comparison of outcome measures for patients with chronic obstructive pulmonary disease (COPD) in an outpatient setting

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Abstract

Background – To assist clinicians and researchers in choosing outcome measures for patients with chronic obstructive pulmonary disease attending routine outpatient clinics, a comparative assessment was undertaken of four questionnaires designed to reflect the patients’ perception of their physical and emotional health in terms of their feasibility, validity, reliability, and responsiveness to health change.

Methods – Two condition specific questionnaires, the St George’s Respiratory Questionnaire (SGRQ) and Guyatt’s Chronic Respiratory Questionnaire (CRQ), and two generic questionnaires, the Short Form-36 Health Survey (SF-36) and Euroqol (EQ), were compared for their discriminative and evaluative properties. Spirometric tests and a walking test were also performed. One hundred and fifty six adults who were clinically judged to have COPD and who attended an outpatient chest clinic were assessed at recruitment and six and 12 months later. Patients were also asked whether their health had changed since their last assessment.

Results – Completion rates and consistency between items for dimensions of the SGRQ were lower than for dimensions of the other questionnaires. The distributions of responses were skewed for certain dimensions in all questionnaires except the CRQ. Validity was supported for all instruments insofar as patients’ scores were associated with differences in disease severity. The generic questionnaires better reflected other health problems. All instruments were reliable over time. The condition specific questionnaires were more responsive between baseline and first follow up visit but this difference did not persist. While certain dimensions of the SF-36 were responsive to patient perceived changes, this did not apply to the derived single index of the EQ. The rating scale of the EQ, however, provided a quick and easy indicator of change.

Conclusions – Evidence from this study supports the CRQ and the SF-36 as comprehensive outcome measures for patients with longstanding COPD.

Keywords: chronic obstructive pulmonary disease, quality of life, questionnaires.

The treatment of patients with chronic obstructive pulmonary disease (COPD) is mainly palliative, aimed at relieving symptoms and enhancing quality of life. Despite this, routine outcome measurement for these patients tends to be limited to pathophysiological measures or survival. Methods for assessing health related quality of life are therefore required for two purposes: to enable discrimination between the degrees of severity in a condition, and to evaluate responsiveness to treatment. So far there are few instruments for measuring health related quality of life in patients with chronic bronchitis and emphysema, and none which is satisfactory for use in routine clinical practice. This is surprising since patients experience marked deterioration in their quality of life to the extent that even a limited amount of physical activity results in breathlessness which is debilitating and disturbing.

The problem for the clinician and the researcher is the choice of appropriate instruments. The Chronic Respiratory Questionnaire comprises items drawn from problem areas which have been identified by patients and their relatives, combined into three standardized dimensions – emotional function, fatigue, and mastery – with items for a fourth dimension (dyspnoea) being generated individually by each patient. The St George’s Respiratory Questionnaire, another standardized condition specific instrument, covers symptoms, activities and the impact of disease, but without the patient generated items. Both instruments have been designed for a wide range of patients with respiratory disorders and independent validation has been recommended by their respective developers.

In addition to condition specific measures, there is a case for general measures of health status since there may be side effects of treatment which are missed by condition specific instruments. Furthermore, patients with respiratory disease commonly experience comorbidity such as cardiac and musculoskeletal problems, the symptoms of which will not be covered by COPD specific questions. The Short Form-36 Health Survey is a recent generic health status questionnaire which has been shown to be reliable and sensitive to low levels of morbidity. In work with its predecessor, the SF-20, Stewart et al. demonstrated significantly different profiles of scores for patients with COPD compared with the general population, but the SF-36 has not yet been examined for this group of patients. Finally, given limited health care resources, it is necessary to dem-
onstrate cost effectiveness both within and be-
tween disease groups, and for this a single
index value for health is required. The Euroqol
instrument is a recent example which is easy
to use and brief, but has yet to be tested on
this patient group.7

It is possible to use a transition question
which asks patients to compare their health
"now" with that on a specified earlier occasion
in order to assess outcomes. This is well es-

tablished in the field of arthritis8±11 where they
have been found to correlate with objective
clinical variables. The transition question
seems particularly relevant to COPD where
conventional respiratory measures convey little
about the patient’s experience.

In order to assist clinicians and researchers
in choosing suitable instruments for dis-


criminative and evaluative purposes in patients
with COPD, we have undertaken a comparative
assessment of the feasibility of using ques-


tionnaires in a routine outpatient clinic
environment and have examined their psycho-
metric properties of validity, reliability, and
responsiveness to health change. It has been
argued that questionnaires are more responsive
to health change if they are condition specific,
and especially if they are patient generated.
This property has also been tested in this study.

Methods

RECRUITMENT
This observational study, for which ethical ap-


proval was granted, was carried out in the chest
clinic of a city teaching hospital. Native English
speaking patients aged 35 years and over and
clinically judged to have COPD were recruited
over a four month period. Patients with a clin-

cial diagnosis of asthma, occupational and non-
occupational lung fibrosis, and pulmonary
malignancy were excluded, as were those whose
spirometric tests gave FEV1 >70% FVC or
FEV1 <70% FVC but with demonstrable re-


versibility. Main diagnosis and comorbidity to-

gether with sociodemographic information were
obtained from medical records. Routine spi-

rometric and pulse oximetry measures were ob-

tained on the day of assessment for all patients
and a subsample of patients was invited to
undertake the six minute walking test (6MWT).

QUESTIONNAIRES
Patient perceived health was assessed using two
condition specific and two generic question-


naires. Of the two condition specific ques-
tionnaires, the interviewer administered Chronic
Respiratory Questionnaire (CRQ) examines four
dimensions, with the items relating to the di-
mension of dyspnoea being identified by each
patient individually. Using a seven point scale for
responses, the scores for each question for each
dimension are simply added together. The self
administered St George’s Respiratory Questi-
nnaire (SGRQ) employed in this study com-


prises 50 items, using weights derived by its
developer from a patient population, and from
which three dimension scores and a total score
may be calculated. The Short-Form-36 Health


Survey (SF-36) is a self administered general
health questionnaire of 36 items which generates
a profile of scores across eight dimensions of
health. Scores are transformed to range from 0
to 100, where 100 indicates good health on each
dimension. The Euroqol Classification of Health
(EQ) is a recently developed self administered
instrument in two sections, the first measuring
five dimensions of health from which a single
index can be derived (EQ-5D), and the second
a visual analogue rating scale measuring global
health (EQ rating scale). In addition, patients
provided information regarding recent treatments
and their use of health and social services.

DATA COLLECTION
Three booklets of questionnaires for self ad-


ministration were prepared – the first with the
SF-36, the second with the SGRQ, and the third
with the EQ. As a measure of disease severity,
the MRC Respiratory Questionnaire12 was in-
cluded in the third booklet as were items on
recent treatments and the use of resources. These
booklets were handed to the patient after their
consent to participate in the study had been
obtained. Patients completed the booklets while
waiting in the clinic, took uncompleted sections
home to return promptly, or declined to attempt
any further responses. A researcher was on hand
in the clinic to answer queries about the ques-
tionnaires. The CRQ was administered by in-
terview to a subsample obtained opportunistically
in the clinic or at home within a few days of their
clinic appointment.

Subsequent follow up assessments of all ques-
tionnaires were made after approximately six and
12 months during the patients’ routine ap-

clinic or at home within a few days of their clin-

ic appointment. To examine re-


sponsiveness at each follow up the transition
question (a modification of item 2 in the SF-36)
was used which asked patients to compare their
health “now” with that “six months earlier”.

STATISTICAL ANALYSIS
The primary purpose of the analysis was to com-
pare the discriminative and evaluative properties
of the four instruments employed in this study.
These were assessed, in the baseline and follow
up periods respectively, using descriptive statistics
as well as more rigorously for completion, internal
consistency, validity, reliability, and responsive-
ness. All dimensions with missing items have
been excluded from further analysis except for
the CRQ where the recommended substitution
procedure was used.

Internal consistency, the relationship between
items within a dimension, was examined using
the non-parametric correlation coefficient for
item-to-dimension score, corrected for overlap,
in addition to Cronbach’s alpha.

It is generally recognised that for outcome
measures of health there is no “gold standard”
for testing validity. However, one method is to
examine construct validity where hypotheses or
constructs concerning the expected distribution
of health between groups may be examined by the
measures being validated, with the significance of
these differences being tested statistically using
standard t tests. The importance of the differences may then be investigated by calculating their effect size, which is the mean difference between groups divided by the pooled standard deviation. This is an indicator of the ability of a measure to discriminate the “signal” from the overall “noise” or variance. In the present analysis the magnitude of effect sizes has been judged against the criteria recommended by Cohen where \( \geq 0.2 \) to \(<0.5\), \( \geq 0.5 \) to \(<0.8\), and \( \geq 0.8 \) represent small, moderate, and large changes, respectively. Test-retest reliability in patients who said their health had not changed was examined by intra-class correlations as a measure of agreement, with the mean differences between assessments and their confidence intervals inspected for possible bias.

Responsiveness has been measured in terms of the mean changes in scores between assessments in those who responded to the transition question by saying that their health had improved, worsened, or stayed the same. In order to understand statistical comparisons of responsiveness, standardised response means (SRMs) have been estimated for each dimension score by dividing the mean change between assessments by the standard deviation of these changes in scores.

**Results**

**RESPONSE**

During the four month period 172 patients were invited to participate in the study. One hundred and sixty one patients signed consent forms and 11 patients (six men), who were not significantly older, refused. After signing consent forms five patients failed to answer any questionnaires, leaving a sample of 156 patients. At the initial assessment 152 patients returned the SF-36, 138 the SGRQ, 142 the EQ, and of the 68 patients who were approached all agreed to the administration of the CRQ by interview; 58 patients attempted all four quality of life questionnaires at the initial assessment, and 143 completed the MRC Respiratory Questionnaire.

During the follow up periods 128 patients returned questionnaires at the second follow up visit after six months, 53 of whom attempted all four quality of life questionnaires, and 100 at the second follow up visit after 12 months, 47 of whom attempted all four questionnaires. Patients were lost to follow up because of death, being too ill, or being discharged from the chest clinic.

**SAMPLE**

The sample comprised 76 men and 80 women whose mean (SD) ages were 67 (10.4) years and 62 (10.3) years, respectively. The mean FEV\(_1\) for the sample was 47% of the predicted value for their age, height, and sex. Substantial morbidity was demonstrated, with 77% having to pause for breath when walking at their own pace on level ground, 83% with persistent coughing and 74% with persistent phlegm. Comorbidity was recorded in the medical records of 47% of cases, of which half was cardiac and a fifth musculoskeletal. Practically all patients used inhalers while 15% of patients were on oxygen therapy. In spite of their health problems, they received little support in their homes from health and social service workers, but made considerable use of health services such as GP consultations and hospital outpatient visits. Seventy seven per cent were retired or permanently unable to work and, compared with the population of the area, they were more likely to be in semi-skilled and less likely to be in professional or managerial occupations.

**COMPLETION OF QUESTIONNAIRES**

The numbers of items completed varied considerably between instruments and between dimensions within each instrument. Completion rates of 98% were achieved for the administered CRQ except for the patient generated dimension of Dyspnoea (87%). Of the self completed questionnaires completion rates for dimensions varied from 92–96% (EQ) to 30–76% for the SGRQ. Completion of the Impact dimension of the SGRQ, and consequently the Total which is a composite of three dimensions, was the lowest (43% and 30%, respectively). Two items

### Table 1 Descriptive statistics: dimension scores for patients at initial assessment

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>n</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>% patients on “floor” (worst health score)</th>
<th>% patients at “ceiling” (best health score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36</td>
<td>124</td>
<td>29.0 (25.0)</td>
<td>25.0</td>
<td>14.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>139</td>
<td>45.0 (27.5)</td>
<td>44.4</td>
<td>5.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Social functioning</td>
<td>127</td>
<td>18.1 (32.8)</td>
<td>00.0</td>
<td>68.7</td>
<td>11.5</td>
</tr>
<tr>
<td>Role limitations (physical)</td>
<td>122</td>
<td>44.8 (43.9)</td>
<td>33.3</td>
<td>40.9</td>
<td>34.1</td>
</tr>
<tr>
<td>Role limitations (emotional)</td>
<td>138</td>
<td>53.1 (28.3)</td>
<td>55.6</td>
<td>4.3</td>
<td>13.5</td>
</tr>
<tr>
<td>Pain</td>
<td>138</td>
<td>64.7 (21.0)</td>
<td>68.0</td>
<td>1.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Mental health</td>
<td>138</td>
<td>34.5 (20.1)</td>
<td>35.0</td>
<td>6.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Vitality</td>
<td>133</td>
<td>29.2 (18.4)</td>
<td>25.0</td>
<td>6.1</td>
<td>0.0</td>
</tr>
<tr>
<td>General health perception</td>
<td>127</td>
<td>77.7 (17.1)</td>
<td>80.2</td>
<td>7.4</td>
<td>0.0</td>
</tr>
<tr>
<td>SGRQ(^1)</td>
<td>105</td>
<td>80.9 (18.9)</td>
<td>86.5</td>
<td>25.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Activity</td>
<td>79</td>
<td>52.5 (18.5)</td>
<td>52.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Impact</td>
<td>60</td>
<td>65.4 (15.9)</td>
<td>64.8</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>77.7 (17.1)</td>
<td>80.2</td>
<td>7.4</td>
<td>0.0</td>
</tr>
<tr>
<td>CRQ(^1)</td>
<td>60</td>
<td>14.5 (4.5)</td>
<td>14.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>68</td>
<td>13.0 (4.3)</td>
<td>13.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Fatigue</td>
<td>68</td>
<td>29.2 (7.5)</td>
<td>29.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Emotional function</td>
<td>68</td>
<td>17.9 (4.9)</td>
<td>19.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mastery</td>
<td>68</td>
<td>52.4 (15.7)</td>
<td>53.1</td>
<td>0.0</td>
<td>3.2</td>
</tr>
<tr>
<td>EQ-5D</td>
<td>125</td>
<td>50.9 (16.4)</td>
<td>50.0</td>
<td>0.8</td>
<td>0.0</td>
</tr>
</tbody>
</table>

\(^1\) For SF-36 and EQ: dimensions range from 0 (worst health) to 100 (best health).
\(^2\) For SGRQ: dimensions range from 100 (worst health) to 0 (best health).
\(^3\) For CRQ: each dimension has its own range.
between patients who completed or did not complete the Impact dimension, which was the most incomplete, were small and not consistent.\textsuperscript{15} Completion rates for the SGRQ were found to be slightly higher in the clinic than at home but they were still substantially below those of the SF-36 or EQ.\textsuperscript{15} Completion rates for the SF-36 varied from 80\% for the Role limitations (emotional) and 82\% for Physical functioning to 91\% for Pain, Mental health, and Social functioning.

**INTERNAL CONSISTENCY**

By design, all items addressing a dimension of a questionnaire will be reasonably well correlated. Items were found to correlate with their hypothesised dimensions by 0.4 or more in 33 of 35 (94\%) SF-36 items, 17 of 20 (85\%) CRQ items, and 27 of 50 (54\%) SGRQ items. Calculations of Cronbach’s alpha statistic ranged from 0.75 to 0.99 for the SF-36, 0.71 to 0.84 for SGRQ, and 0.80 to 0.85 for three dimensions of the CRQ, with the dimension measuring Dyspnoea reaching 0.64. This statistic is not relevant to the EQ where there was only one item per dimension.

**DISTRIBUTION**

Dimension scores were least skewed in the case of the CRQ, for which no respondents were either on the “floor” (the worst health score) or the “ceiling” (the best health score) (table 1). For the SF-36 the majority of respondents’ scores were on the “floor” or “ceiling” for the Role dimensions, while for Physical functioning 35\% of respondents scored in the lowest decile, all of which indicate constraints on measuring changes in health from baseline. Only the Activity score distribution of SGRQ demonstrated an obvious “floor” effect of 26\%. Substantial “ceiling” effects were observed on all dimensions of the EQ, although this was not evident in the distribution of the Rating scale nor the EQ-5D.

**VALIDITY**

Support for construct validity of the SF-36 and the EQ was provided by a comparison of the scores profile for COPD patients with an age-matched and sex-matched sample of the general population drawn from the same city. This was markedly different for all dimensions of the SF-36 except Mental health. Similarly, patients’ scores on the EQ indicated poorer health compared with the same matched sample of the general population.\textsuperscript{16} All questionnaires were found to include dimensions which differentiated significantly between patients on the basis of their experience of breathlessness, where this was defined as severe if respondents stated that they stopped for breath when walking on level ground at their own pace (fig 1).\textsuperscript{15} (As the numbers of questionnaires available for comparison varied, a comparison was made between patients who attempted all four questionnaires (n = 58) and those who attempted three or less (n = 98). The results for patients in these two groups revealed no significant differ-
Outcome measures in COPD

In addition to examining intra-questionnaire characteristics, inter-questionnaire comparisons may be made. The four questionnaires were compared directly by calculating effect sizes for the dimension scores in relation to breathlessness, distance walked in the 6MWT, breathlessness measured at the end of the 6MWT, and FEV₁% predicted (figs 1–4; directions of signs have been ignored), and recent hospital admission and morbidity. For this purpose, patients were divided into groups representing severe and less severe breathlessness (fig 1), into two groups around the median for respiratory indicators (figs 2–4), and according to the presence or absence of other indicators.

With regard to breathlessness on exertion, large effect sizes were observed for Activity, Impact and Total (SGRQ), Mastery (CRQ), Physical functioning (SF-36), and the two EQ dimensions; moderate effect sizes were observed for Dyspnoea (CRQ), Social functioning, Vitality and General health perception (SF-36); and small effect sizes were seen for Fatigue (CRQ), Symptoms (SGRQ), Pain, Mental health and Role limitations (emotional) (SF-36) (fig 1).

Tests of exercise tolerance produced some large or moderate effect sizes for both condition specific and generic questionnaires (figs 2 and 3). For FEV₁% predicted effect sizes were moderate to small (fig 4).

Six dimensions of the SF-36 questionnaire identified patients who had been admitted to hospital within the last six months. The Pain and Physical functioning dimensions of the SF-36 and Activity, Impact and Total dimensions of the SGRQ distinguished the presence of morbidity.

RELIABILITY

Reliability over the first interval of six months was examined for all four instruments, revealing no evidence of bias between assessments (table 2). The 95% confidence intervals around the mean differences included zero for all dimensions except General health perception (SF-36), but exceeded 10 points (on the 100 point scales) for five dimensions of the SF-36. Reliability over the second six month period was similar but with slightly lower levels of correlation.

RESPONSIVENESS

Responsiveness for groups of patients was first examined by relating the differences in mean scores to patient perceived health change between initial assessment and first follow up, and between first and second follow up visits, and for this purpose the five categories have been combined into three – worse, same, and better.

At the first follow up visit the mean score differences were associated with the transition question for the two condition specific questionnaires (SGRQ and CRQ) with results for patients feeling “better” being associated with positive changes in scores and those for patients feeling “worse” being associated with negative changes in scores (table 3). These mean differ-

\[
\text{Effect size} = \frac{\text{mean difference between groups}}{\text{pooled standard deviation}}
\]

For SGRQ, CRQ, SF-36, and EQ, the mean effects across the four instruments were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all small (≤ 0.2) except for EQ, which showed a moderate effect size (0.3). The mean effects for the condition specific questionnaires were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all small (≤ 0.2) except for EQ, which showed a moderate effect size (0.3).

For the 6MWT, the mean effects across the four instruments were:

- SGRQ: 0.2
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all moderate to large (≥ 0.5).

For the condition specific questionnaires, the mean effects were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all moderate to large (≥ 0.5).

For the condition specific questionnaires, the mean effects were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all moderate to large (≥ 0.5).

For the condition specific questionnaires, the mean effects were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all moderate to large (≥ 0.5).

For the condition specific questionnaires, the mean effects were:

- SGRQ: 0.1
- CRQ: 0.2
- SF-36: 0.3
- EQ: 0.4

These effect sizes were all moderate to large (≥ 0.5).
CRQ results for all patients were included, which might have implications for the responsiveness of the questionnaire. The CRQ dimensions have been transformed onto a 0 (worst function) to 100 (best function) scale.

### Discussion

The results of the study have confirmed the feasibility of use and the acceptability of three of the four outcome measures for patients with COPD in an outpatient clinic setting, with high response rates being achieved. The numbers of patients attempting the four questionnaires were not identical, but the results for those attempting all four were similar to those who attempted three or less (data available on request).

The CRQ can be self administered but, with the minimal supervision provided in this study, levels of item completion were relatively lower than for the other self administered questionnaires, suggesting low comprehensibility and/or irrelevance of some items. Furthermore, there were low correlations between some items and their dimensions, inferring a lack of homogeneity. Dimensions of the SGRQ which are obviously

### Table 2

<table>
<thead>
<tr>
<th>Instrument</th>
<th>n</th>
<th>Mean difference (SD)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
<td>35</td>
<td>-0.86 (-0.4)</td>
<td>(-4.4 to 3.5)</td>
</tr>
<tr>
<td>Social functioning</td>
<td>49</td>
<td>0.42 (-1.6)</td>
<td>(-9.2 to 6.1)</td>
</tr>
<tr>
<td>Role limitations (physical)</td>
<td>39</td>
<td>0.21 (8.3)</td>
<td>(-6.1 to 22.7)</td>
</tr>
<tr>
<td>Role limitations (emotional)</td>
<td>39</td>
<td>0.18 (6.0)</td>
<td>(-12.0 to 24.0)</td>
</tr>
<tr>
<td>Pain</td>
<td>47</td>
<td>0.48 (-4.3)</td>
<td>(-3.7 to 12.2)</td>
</tr>
<tr>
<td>Mental health</td>
<td>47</td>
<td>0.74 (0.4)</td>
<td>(-4.0 to 9.9)</td>
</tr>
<tr>
<td>Social functioning</td>
<td>46</td>
<td>0.70 (1.6)</td>
<td>(-3.1 to 6.3)</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>0.44 (7.7)</td>
<td>(1.4 to 14.0)</td>
</tr>
<tr>
<td>SGRQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>34</td>
<td>0.76 (1.6)</td>
<td>(-3.0 to 6.2)</td>
</tr>
<tr>
<td>Activity</td>
<td>21</td>
<td>0.74 (-1.9)</td>
<td>(-6.2 to 2.4)</td>
</tr>
<tr>
<td>Impact</td>
<td>16</td>
<td>0.46 (-3.3)</td>
<td>(-7.6 to 0.9)</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>0.84 (1.2)</td>
<td>(-4.3 to 6.6)</td>
</tr>
<tr>
<td>CRQ†</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dyspnoea</td>
<td>26</td>
<td>0.77 (1.1)</td>
<td>(-4.2 to 6.4)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>25</td>
<td>0.92 (0.3)</td>
<td>(-5.0 to 5.7)</td>
</tr>
<tr>
<td>Emotional function</td>
<td>21</td>
<td>0.79 (2.8)</td>
<td>(-2.6 to 8.3)</td>
</tr>
<tr>
<td>Mastery</td>
<td>26</td>
<td>0.84 (0.3)</td>
<td>(-4.4 to 5.1)</td>
</tr>
<tr>
<td>EQ</td>
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<td></td>
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</tr>
<tr>
<td>EQ-5D</td>
<td>42</td>
<td>0.67 (0.8)</td>
<td>(-3.2 to 4.8)</td>
</tr>
<tr>
<td>Rating scale</td>
<td>49</td>
<td>0.65 (-0.2)</td>
<td>(-4.0 to 3.6)</td>
</tr>
</tbody>
</table>

† The CRQ dimensions have been transformed onto a 0 (worst function) to 100 (best function) scale.

### Table 3

<table>
<thead>
<tr>
<th>Perceived health change by first follow up</th>
<th>Worse</th>
<th>Same</th>
<th>Better</th>
<th>p values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) difference</td>
<td>Mean (SD) difference</td>
<td>Mean (SD) difference</td>
<td>Mean (SD) difference</td>
<td></td>
</tr>
<tr>
<td>SF-36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
<td>-13.0 (-21.8)</td>
<td>0.4 (11.7)</td>
<td>6.6 (10.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>Social functioning</td>
<td>-10.5 (20.1)</td>
<td>1.6 (26.7)</td>
<td>13.2 (24.4)</td>
<td>0.005</td>
</tr>
<tr>
<td>Role limitations (physical)</td>
<td>-4.2 (27.1)</td>
<td>-8.3 (44.9)</td>
<td>13.3 (28.1)</td>
<td>0.154</td>
</tr>
<tr>
<td>Role limitations (emotional)</td>
<td>7.1 (52.4)</td>
<td>-6.0 (56.1)</td>
<td>15.1 (26.2)</td>
<td>0.154</td>
</tr>
<tr>
<td>Pain</td>
<td>-1.3 (26.6)</td>
<td>4.3 (27.2)</td>
<td>-2.5 (17.3)</td>
<td>0.51</td>
</tr>
<tr>
<td>Mental health</td>
<td>-6.8 (30.3)</td>
<td>-0.4 (15.1)</td>
<td>-2.9 (15.5)</td>
<td>0.27</td>
</tr>
<tr>
<td>Viscosity</td>
<td>-6.0 (17.6)</td>
<td>-1.6 (16.3)</td>
<td>2.1 (14.7)</td>
<td>0.23</td>
</tr>
<tr>
<td>General health perception</td>
<td>-5.7 (14.8)</td>
<td>-7.1 (20.2)</td>
<td>2.9 (10.9)</td>
<td>0.11</td>
</tr>
<tr>
<td>SGRQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>-6.7 (17.0)</td>
<td>1.6 (13.4)</td>
<td>16.8 (11.4)</td>
<td>0.001</td>
</tr>
<tr>
<td>Activity</td>
<td>-3.7 (17.7)</td>
<td>-1.9 (9.8)</td>
<td>10.4 (10.7)</td>
<td>0.005</td>
</tr>
<tr>
<td>Impact</td>
<td>-2.0 (17.3)</td>
<td>-3.3 (16.0)</td>
<td>12.1 (14.8)</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td>-6.8 (12.0)</td>
<td>1.2 (8.7)</td>
<td>15.1 (9.0)</td>
<td>0.008</td>
</tr>
<tr>
<td>CRQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>-9.5 (6.5)</td>
<td>-1.1 (12.2)</td>
<td>14.9 (16.2)</td>
<td>0.003</td>
</tr>
<tr>
<td>Fatigue</td>
<td>-3.9 (11.4)</td>
<td>-0.2 (7.9)</td>
<td>11.3 (14.2)</td>
<td>0.001</td>
</tr>
<tr>
<td>Emotional function</td>
<td>-3.4 (13.8)</td>
<td>4.3 (7.7)</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Mastery</td>
<td>-4.9 (12.0)</td>
<td>-0.3 (11.9)</td>
<td>4.2 (8.2)</td>
<td>0.19</td>
</tr>
<tr>
<td>EQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQ-5D</td>
<td>-5.1 (12.1)</td>
<td>-0.8 (11.0)</td>
<td>-3.2 (10.7)</td>
<td>0.28</td>
</tr>
<tr>
<td>Rating scale</td>
<td>-10.5 (14.6)</td>
<td>0.2 (13.3)</td>
<td>3.6 (13.6)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Where a mean difference >0 indicates a health improvement.

*p values from one-way ANOVA to compare mean score differences by perceived health change group.
In addition to the comparison of reported a change. (between first follow up at six months and second follow up at 12 months) for those who divided by the standard deviation of change: small \(=0.2\) to <0.5; moderate \(=0.5\) to <0.8; large \(=0.8\) for dimensions of the four instruments for the first follow up period (between initial assessment and first follow up period six months later) for those who reported a change.

Figure 5 Standardised response means (SRM) for the Rating scale, and clear differentiation of patients according to the severity of their disease. The Rating scale, but not the EQ-5D, has been shown to be responsive to the minor changes in health which are typical of patients with chronic disease. Rating scales have been used with considerable success for other conditions and patient groups, their disadvantages being that they provide less information about the nature of the change and are inadequate for cross-sectional comparisons.

The CRQ was used in a subsample of patients. In generating items which cause dyspnoea, patients provide the clinician with insight into the restrictions which the disease inflicts on their activities and life style. Being interviewer administered, completion levels were high. In addition, impressive properties of internal consistency, validity, and responsiveness were achieved. The widespread use of the CRQ in a clinic setting, however, is limited by the need for administration by interview and any version for self completion would need to be validated on a national population.

The design of the SF-36 as a measure of general health status was reflected in its wider scope to detect comorbidity and recent hospital admission and thereby indicates its potential use in assessing side effects of treatment and the impact of complications. It is clear that the Role limitations dimensions require re-designing, for example, to provide five point scales in place of their Yes/No response format as well as instructions to cover more clearly people who are no longer employed in the workplace\textsuperscript{17,18} and in whom the disease onset is later in life. We would not propose to discard the dimension as a whole, since the fulfilment of a person’s role is an important consideration in the field of rehabilitation medicine. Furthermore, we would add extra items to the Physical functioning dimension – such as walking within the home or getting up from a chair – in order to overcome the “floor” effect observed in our study.

A single index measure of health is an important tool for policy makers, applying both to choices between cost effective treatments for different groups of patients and to choices between treatments for the same group, and was designed for use in economic evaluations. The EQ in this study has demonstrated acceptability to patients, high rates of item completion, a reasonable distribution of responses for the Rating scale, and clear differentiation of patients according to the severity of their disease. The Rating scale, but not the EQ-5D, has been shown to be responsive to the minor changes in health which are typical of patients with chronic disease. Rating scales have been used with considerable success for other conditions and patient groups,\textsuperscript{19} their disadvantages being that they provide less information about the nature of the change and are inadequate for cross-sectional comparisons. The results from this study suggest that the EQ-5D is inappropriate for use in this patient group.

In addition to the comparison of appropriate questionnaires for patients with COPD in an outpatient setting, this study has contributed to the discussion of more general issues.

With regard to exercise tolerance, the relationship observed between the walking test and physical factors measured by the questionnaires – such as physical function, activity and general health status – is not surprising and leads us to suggest that, if verified in other studies, questionnaires could replace the

related to mobility, such as Activity and Total, were found to have large and moderate effect sizes, clearly discriminating between patients on the severity of their disease. In addition, the more general dimensions of Activity, Impact and Total identified the presence of comorbidity. However, results obtained with this questionnaire in this study suggest that some revision may be required before choosing it for an elderly patient group with long established chest disease.

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With regard to exercise tolerance, the relationship observed between the walking test and physical factors measured by the questionnaires – such as physical function, activity and general health status – is not surprising and leads us to suggest that, if verified in other studies, questionnaires could replace the
walking test which many COPD patients find onerous. Again, the lack of association between health related quality of life and objective measures of respiratory function has illustrated the importance of obtaining subjective health measures for this group of patients.

Dimensions related to mental health in both condition specific and generic questionnaires appeared to be less relevant and showed little or no differences between patient groups. Perceived mental health in older people, including those with chronic ill health, has been reported to be good in other studies because of patients’ lower expectations and coming to terms with limitations.20 21

This study has provided the first opportunity to undertake comparisons of responsiveness between the two leading condition specific instruments for COPD, both of which have been shown to be responsive to change. The condition specific dimensions were most responsive in the first follow up period, but this was not repeated in the second follow up period. A similar result was found by Fitzpatrick et al20 with respect to attenuated responsiveness in the second follow up period of rheumatology patients. The instability in the degree of responsiveness, particularly for the key dimensions of Symptoms and Dyspnoea, is an interesting finding and clearly requires exploration in future. It could have implications for the repeated use of questionnaires in clinical trials.

Over and above the use of questionnaires to evaluate changes in health between groups of patients, clinicians may have an interest in the use of these instruments at the individual patient level. In this study the measurement of patient perceived health has provided important additional information to conventional measures such as spirometric tests. For a busy clinician the Rating scale of the EQ and the transition question have been shown to detect change, but neither provides insight into the nature and full extent of a patient’s perceived health problem. Moreover, the transition question provides only crude categorical information about the extent of any improvement. The SGRQ and the SF-36 are in need of some revision. The CRQ is relatively expensive in the interview format and the self completed version would need to be validated. There remains, therefore, some caution in measuring and interpreting changes over time in individual patients.

Further development in appropriate outcome measures for patients with COPD is necessary. The SGRQ could be improved by modification and the SF-36 by the addition of items specific to COPD, while the self completed version of the CRQ would need to be validated. Another option is the addition of dimensions to a condition specific instrument to cover domains important to patients with COPD but which are currently excluded, such as pain. These and other developments would enhance the assessment of health and improve the quality of data. The measurement of patient perceived health in COPD is sufficiently important to warrant such effort.

In conclusion, the feasibility of using condition specific (CRQ and SGRQ) and generic (SF-36 and EQ) questionnaires with COPD patients in an outpatient setting has been demonstrated, with high response rates being achieved. The discriminative and evaluative properties of the condition specific CRQ and SGRQ have been confirmed in those patients who completed them. Some revision of the SGRQ would improve the internal consistency and completion of items. Both generic measures exhibited valid patterns in terms of breathlessness and exercise tolerance and comparisons on the basis of disease severity, while the SF-36 provided wider scope. Certain dimensions of the SF-36 and the Rating scale of the EQ, but not the EQ-5D, were responsive to health change.

Results from this study and elsewhere indicate that the optimum strategy in outcome measurement is to use a condition specific together with a generic instrument. This combines the advantages of the former with the monitoring of those aspects of health especially affected by COPD, as well as providing a broader picture of a patient group with considerable comorbidity. With certain reservations outlined in the text, the present evidence suggests that the CRQ, SF-36 and Rating scale of the EQ are the instruments of choice for patients with chronic obstructive pulmonary disease.

The authors acknowledge the assistance of their colleagues in the Respiratory Function Unit and Chest Clinic, Royal Hallamshire Hospital, Sheffield, and the Medical Care Research Unit, University of Sheffield Medical School, and thank Dr Paul Jones and Dr Gordon Guyatt for the use of their questionnaires. The study was funded by the Medical Research Council of the United Kingdom.

5 Brazier JE, Harper R, Jones NMB, O’Cathain A, Thompson SG, Deverill M, Forbringer A. A comparison of two approaches to measuring change: the assessment of health and improve the quality of data. The measurement of patient perceived health in COPD is sufficiently important to warrant such effort.


Comparison of outcome measures for patients with chronic obstructive pulmonary disease (COPD) in an outpatient setting.

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Thorax 1997 52: 879-887
doi: 10.1136/thx.52.10.879

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