



Brazilian version of airways questionnaire 20: a reproducibility study and correlations in patients with COPD[☆]

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Summary This study describes the correlations and reproducibility of AQ20, a simple health status questionnaire with 20 questions, which was designed to be useful especially in time sparing situations. A formal language validation process was done, in order to validate the AQ20 before studying its reproducibility. Thirty stable COPD patients answered the final version twice within 15 days. To test the reproducibility of AQ20, the interclass correlation coefficient and Bland–Altman display were used. Results were correlated with FEV₁, SpO₂, BMI, Mahler BDI, and the Saint George Respiratory Questionnaire (SGRQ). Twenty-five patients (83.3%) were male, with a mean age of 68.6 years. The mean predicted FEV₁ (%) was 56.8%. The interclass correlation ratio for the total score was $\alpha = 0.90$ for the intraobserver variability and $\alpha = 0.93$ for the interobserver variability. The correlation with total SGRQ score was 0.76, with $P < 0.001$. The mean application time for AQ20 was 4 min and 6 s, and the score calculation time, was 8 s. It can be concluded that AQ20 is reproducible, with an excellent correlation with SGRQ total score, and also having the advantage of taking just a few minutes to be applied and to have its score calculated.

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Introduction

Chronic obstructive pulmonary disease (COPD) is a disease state associated with a high degree of social and physical disability. There is an increasing awareness for the need to assess health-related quality of life or health status, however, there is a weak correlation between physiological

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impairment and health status in COPD.¹ Several instruments (generic and specific health status questionnaires) have been intensively used in the clinical trials to assess the patient-oriented impact of different interventions on COPD.²⁻⁶ The use of standardized questionnaires permits the collection of health status scores in multinational studies, but this is only possible if great care is taken in the linguistic and cultural translation of a questionnaire from one language to another.⁷ Another issue with these questionnaires is that they tend to be rather long and complex to use and there is a need for shorter simpler questionnaires where this is possible.⁸

The AQ20 is a specific questionnaire, for obstructive diseases, and it was developed by Quirk and Jones.⁹ It has only 20 questions (of yes/no/not applicable answers), and requires a small amount of time to answer it and calculate its scores. As far as we know, there are only five AQ20 studies previously published in the literature,¹⁰⁻¹⁴ and two of them deals with COPD patients.^{10,15} A good correlation of AQ20 and another disease-specific health status questionnaire, the Saint George Respiratory Questionnaire (SGRQ; $r = 0.86$),¹⁰ was shown in COPD patients. In asthmatics, a good correlation was found with the Asthma Quality of Life Questionnaire (AQLQ; $r = 0.80$) as well.¹¹

The objective of this study was to evaluate a linguistic and cultural translation of a Brazilian Portuguese version of the AQ20 with respect to: (1) the reproducibility of AQ20, particularly the inter- and intra-observer variability; (2) the time spent in the completion and score calculation; (3) correlations with other COPD established outcome measurements.

Material and methods

Patients:

1. *Inclusion criteria:* Diagnosis of COPD (2003 updated GOLD criteria)¹⁴ with clinical stability, assessed by the five following criteria: lack of unscheduled hospitalization 30 days before and during the study; stability of pulmonary symptoms, assessed by a standardized questionnaire; rest SpO₂ (%) variation less than $\pm 2\%$; FEV₁ variation less than $\pm 10\%$; no change in medication during the study.
2. *Exclusion criteria:* concomitant pulmonary diseases other than COPD; other comorbidities, or incapacitant diseases.

The patients were selected in a consecutive order, from the COPD outpatient clinic at the Federal University of São Paulo, Brazil.

Protocol

The study protocol used the Brazilian Portuguese version of AQ20, previously obtained from a formal native language translation and back translation process of the original English version of AQ20 (Table 1).¹⁶ In the translation period, no substantial modification in the questions were needed.

The protocol followed similar methods used in the validation of SGRQ¹⁶ and SF-36¹⁷ in Brazil, and is described below in the following paragraphs.

The questionnaires were filled out in a quiet room, alone, after the AQ20's instructions were read by one interviewer. In the illiterate patients, the questionnaires were read in a loud voice by the interviewer. The AQ20's questionnaire and its instructions are shown in Table 4. The patients were requested to fill out a form about the difficulties they had when answering the AQ20.

At the first visit, the following measurements were taken: body mass index (BMI), spirometry (ATS standards) and pulse oximetry (SPO₂) after 15 min of rest and breathing room air and; on the same day the AQ20 was applied twice by two different observers and the patients were required to answer three other questionnaires: SGRQ, baseline dyspnea index (BDI) and the Brazilian Market and Research Society Questionnaire (SEC),¹⁸ to assess the socioeconomic status.

Reproducibility

To test intra-observer reproducibility, the AQ20 was applied twice in the same day, by two different observers in a random order, with no previous knowledge of the answers of the patients. To test intra-patient and intraobserver reproducibilities, after a 15 day interval, the AQ20 was applied a third time to the same patients, by one of the observers who had administered the questionnaire on the first day.

Completion time

The time to complete the AQ20 and SGRQ and calculation of its scores were measured with a digital chronometer.

Statistical analysis

The results are shown in mean \pm sd. Intra-class correlation coefficient (ICCC) was calculated to evaluate reproducibility between the same questionnaires. As the variables presented a non-normal

Table 1 AQ20 questionnaire's instructions and questions.

Airways Questionnaire 20			
The following questions are concerned with the effect of your chest trouble on your everyday life. Please respond Yes, No or Not Applicable (N/A) to each item.			
Questions	Yes	No	N/A
1. Do you suffer from coughing attacks during the day?			
2. Because of your chest trouble do you often feel restless?			
3. Because of your chest trouble do you feel breathless maintaining the garden?			
4. Do you worry when going to a friend's house that there might be something there that will set off an attack of chest trouble?			
5. Do you suffer from chest symptoms as a result of exposure to strong smells, cigarette smoke or perfume?			
6. Is your partner bothered by your chest trouble?			
7. Do you feel breathless while trying to sleep?			
8. Do you worry about the long term effects on your health of the drugs that you have to take because of your chest trouble?			
9. Does getting emotionally upset make your chest trouble worse?			
10. Because of your chest trouble are there times when you have difficulty getting around the house?			
11. Because of your chest trouble do you suffer from breathlessness carrying out your activities at work?			
12. Do you feel breathlessness walking upstairs because of your chest trouble?			
13. Because of your chest trouble do you suffer from breathlessness doing housework?			
14. Because of your chest trouble do you go home sooner than others after a night out?			
15. Because of your chest trouble do you suffer from breathlessness when you laugh?			
16. Because of your chest trouble do you often feel impatient?			
17. Because of your chest trouble do you feel that you cannot enjoy a full life?			
18. Do you feel drained after a cold because of your chest trouble?			
19. Do you have a feeling of chest heaviness?			
20. Do you bother much about your chest trouble?			

distribution, Spearman correlation coefficient were calculated to evaluate association between two ordinal variables. A $P < 0.05$ was considered significant. The analyses were performed with the SPSS 10.0 software.¹⁹

The protocol was approved by the University Ethical Committee and a written informed consent was obtained from all patients.

Results

The initial sample comprised of 35 patients, but five were excluded (three patients because of clinical instability during the study, and two did not return for the second visit), totaling 30 patients at the end of the study. The patients' clinical characteristics are shown in Table 2. Twenty-five (83.3%) were male, seven (23.4%) were undernourished, fourteen (46.6%) obese and 7 (23.4%) were illiterate. For the illiterate subjects, the AQ20 was read in a loud and uniform voice by the observers, and their answers written down. No other help was given, to avoid any influence in the pattern of the answers. The recently updated GOLD¹⁴ classification of COPD and other clinical characteristics are listed in Table 3. The hypoxemic patients were receiving continuous domiciliary oxygen therapy.

There was an excellent intra-observer reproducibility, with the ICC for the AQ20 scores obtained by the same observer 15-days apart of 0.90, $P < 0.01$. When a sub-analysis was made for the illiterate patients, the ICC was 0.87 ($P < 0.01$). A similar value was obtained for the SGRQ in the same situation (ICC = 0.89, $P < 0.01$). The inter-observer variation calculated for AQ20 scores obtained by two different observers on the same day was 0.93, $P < 0.01$ and 0.92, $P < 0.02$ for a variation over a 15-day interval.

Table 2 Demographic and pulmonary function values for the 30 COPD patients evaluated with the AQ20 questionnaire.

	Mean \pm SD
Age (years)	68.6 \pm 8.5
BMI (kg/m ²)	25.7 \pm 4.7
FEV ₁ (l)	1.26 \pm 0.5
FEV ₁ (%)	56.8 \pm 23.3
FEV ₁ /FVC	47.1 \pm 11.0
SpO ₂ (%)	92.3 \pm 3.5

Table 3 Gender, COPD stage (GOLD criteria), rest oxygen saturation and nutritional status of the 30 COPD patients.

	n (%)
Male	25 (83.3)
Illiterate	7 (23.3)
COPD stages (GOLD criteria)	
I (mild)	4 (13.3)
II (moderate)	11 (36.7)
III (severe)	10 (33.3)
IV (very severe)	5 (16.7)
SpO ₂ > 88%	25 (83.3)
SpO ₂ \leq 88%	5 (16.3)
Obese (BMI \geq 27 kg/h ²)	14 (46.6)
Undernourished (BMI < 22 kg/h ²)	7 (23.4)
Eutrophic (22 \leq BMI < 27 kg/h ²)	9 (30)

Doubts

All patients filled out a form about the difficulties they had when answering the AQ20. Twenty-five patients (83.3%) found that AQ20 had a good size, 3 (10%) found it too short for their necessities, and 2 (6.7%) found it too big. Twenty-eight patients (93.3%) found AQ20 very easy to answer, and 26 (87.7%) had no doubt in answering it. The questions referred as doubtfuls were:

1. Question 5: one patient wanted to have another option to answer, beyond yes or no.
2. Question 8: one patient did not understand completely the meaning of this question.
3. Question 6: one patient did not know his partner's opinion about his chest trouble.
4. Question 18: one patient thought he feels drained after a cold, but not because his chest troubles.

Construct validity was tested by comparing AQ20 scores with other clinical and functional parameters. There was a good correlation with the total SGRQ score, $r = 0.76$ ($P < 0.01$), Fig. 1. The AQ20 score also correlated with the three domains of SGRQ (symptoms: $r = 0.40$, $P < 0.03$; activities: $r = 0.67$, $P < 0.01$; impact: $r = 0.71$, $P < 0.01$).

To obtain a more detailed analysis of the relationship between the long SGRQ and the shorter AQ20, the patients were divided into two groups according to the updated GOLD criteria (mild to moderate: GOLD I and II; severe-very severe: GOLD III and IV). In the mild to moderate group, the correlation between AQ20 and SGRQ total score

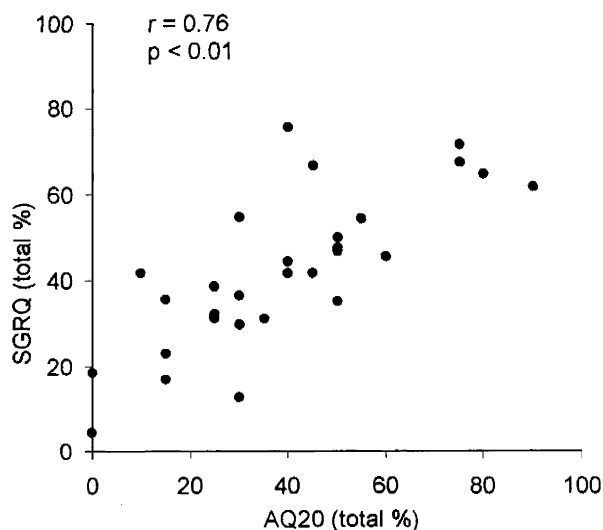


Figure 1 Spearman's correlation between AQ20 and SGRQ total (%) scores.

was $r = 0.54$ ($P < 0.04$), and in the severe–very severe group, $r = 0.83$ ($P < 0.01$).

When the patients were divided in hypoxemic ($\text{SpO}_2 \leq 88\%$) and non-hypoxemic,²⁰ the AQ20 and SGRQ correlations were $r = 0.82$ ($P < 0.09$) and $r = 0.64$ ($P < 0.01$), respectively.

No gender-related differences were seen for AQ20 and SGRQ means. The mean \pm SD for AQ20% and SGRQ total % score (respectively) for men were 36.80 ± 20.10 and 40.29 ± 16.75 , and for women were 52.00 ± 32.13 and 53.05 ± 20.74 . No statistical significant differences were found between the mean AQ20, SGRQ, age, FEV₁%, BDI and SpO₂% when the sample was divided according to gender (P values, respectively: 0.17; 0.15; 0.45; 0.21 and 0.84).

There was a modest correlation between AQ20 and breathlessness measured with the BDI (Table 4), but we also noted that the repeatability of the BDI over 15 days was quite weak ICC = 0.37 ($P < 0.01$).

The AQ20 took 4.1 ± 1.3 min to be completed, compared to the SGRQ, which required 13.06 ± 4.8 min. On average it required only 8 s to manually calculate the score the AQ20 compared to 3.8 min for the SGRQ.

Discussion

The objective of this study was to analyse the reproducibility and construct validity of a Portuguese translation of the AQ20, an obstructive disease-specific health status questionnaire in

Table 4 BDI's correlations with AQ20 in the two visits.

	1 AQ20 (Observer 1, day 1)	2 AQ20 (Observer 2, day 1)	3 AQ20 (Observer 1, day 15)
1st BDI (Observer 1, day 1)	$r = -0.36$ $P < 0.05$	$r = -0.47$ $P < 0.01$	$r = -0.40$ $P < 0.03$
2nd BDI (Observer 1, day 15)	$r = -0.56$ $P < 0.01$	$r = -0.64$ $P < 0.01$	$r = -0.44$ $P < 0.02$

Brazilian COPD patients, once that no substantial modifications in the AQ20 were necessary in the process of validation and cultural adaptation to the Brazilian language (Portuguese).¹⁶ Several health status questionnaires have been described in the literature, but the majority of them are time-consuming, which may limit their use. There are only five published studies evaluating the AQ20 properties, just one of them in COPD patients.^{9–13} As far as we know, this is the first study that measured and compared the time spent for the application and calculation of the AQ20 and SGRQ scores. The AQ20 required less than 5 min to be completed and calculated. This was due to the simplicity of its questions and scoring system. The simplicity of the questionnaire also meant that it needed little modification to be appropriate to Brazilian patients.

There was a good intra-class correlation for the AQ20 scores obtained by two different observers. This was well above the minimal intra-class correlation coefficient value of ≥ 0.75 accepted for the demonstration of the reproducibility of a new questionnaire.^{21,22} All correlation coefficients found in this study were equal or superior to 0.90. As Brazil is a developing country, and part of the population is still illiterate, 7 patients selected for the study had this condition, but a similar ICC value (ICC = 0.87, $P < 0.01$) was seen, showing that reading the questions from a simple health status questionnaire for this sample did not interfere with its reproducibility.

We found a reasonable level of correlation between the AQ20 and the SGRQ domain scores. The lower correlation with SGRQ observed in milder patients could reflect some loss in sensitivity in this subset of patients, a known characteristic of shorter questionnaires, called ceiling effect.^{8,10,12} However, due to power limitations, a definitive conclusion cannot be made, and this question

should be further evaluated with a larger sample size.

It is desirable, when defining the characteristics of a new instrument, to know how it correlates with commonly used outcomes. Correlations of AQ20 and FEV₁, FEV₁/FVC, SpO₂, BMI and SEC were non-significant, for the whole sample analysis, but this may have occurred because of an insufficient sample size to detect such correlations, and this is a limitation of this study. As far as we know, there is no previously published study that has studied the possibility of significant correlation of AQ20 and FEV₁ or hyperinflation parameters in COPD patients.¹⁰ In one study, a weak correlation between the changes in both AQ20 scores and the FEV₁ after medical treatment in asthmatics was found ($r = -0.40$, $P < 0.05$).¹² In another study (also in asthmatic patients), a significant correlation of AQ20 and peak flow (morning peak flow: $r = 0.30$; evening peak flow: $r = 0.29$), but not with FEV₁,¹¹ has been seen.

In this study, dyspnea was evaluated with the BDI, an instrument that has shown to correlate with FEV₁ ($r = 0.41$), FVC ($r = 0.56$) and the distance walked in 12 min ($r = 0.60$).²³ The BDI is usually used to assess the impact of interventions like pulmonary rehabilitation²⁴⁻²⁶ but has also been used in studies of bronchodilator response in COPD patients.²⁷ In this study, a statistically significant correlation with AQ20 was found, which is the first time that such a correlation has been shown. The strength of the correlation varied between -0.36 and -0.64 . This variability may have been due to poor reproducibility of BDI in this study (ICC = 0.37, $P < 0.01$). In other studies, AQ20 has been shown to correlate with dyspnea, when measured by the Oxygen Cost Diagram ($r = 0.60$, $P < 0.005$).¹⁰

Limitations of the study

The influence of gender distribution found in the sample studied may reflect the gender bias in diagnosing COPD, mentioned in the literature.²⁸ It is known that women now suffer from COPD at least as commonly as men, and they seem to be more predisposed to suffer the adverse respiratory consequences of tobacco smoking with the development of COPD at an earlier age and with a greater degree of lung function impairment for a given amount of tobacco exposure, but COPD is much more diagnosed in men, due to historical reasons.²⁸ There is no previous study, to our knowledge, that has addressed gender differences in health status in COPD patients. The present

study was not designed to detect gender differences in health status (the sample size had no power to detect them), but there was no difference between AQ20 and SGRQ means, when men were compared to women. Although it cannot be concluded whether a true difference in health status sex exists, there is no evidence to expect gender differences in the reproducibility or construct validity in the AQ20, although this issue could be further evaluated in another study.

Conclusion

We conclude that the Brazilian Portuguese version of the AQ20 is a specific health status questionnaire for COPD, being short and quick to complete. Despite its simplicity, we have demonstrated that AQ20 has very good reproducibility and correlations with more complex measures of health status and dyspnea. More studies are necessary to determine the minimal clinical significance and normal values for a COPD population, as well as its response to interventions in COPD patients.

References

1. Okubadejo AA, Jones PW, Wedzicha JA. Quality of life in patients with chronic obstructive pulmonary disease and severe hypoxemia. *Thorax* 1996;51:44-7.
2. Jones PW, Quirck FH, Baveystock CM. The St. George's Respiratory Questionnaire. *Resp Med* 1991;85(Suppl B):25-31.
3. Kaplan RM, Atkins CJ, Timms R. Validity of a quality of well being scale as an outcome measure in chronic obstructive pulmonary disease. *J Chron Dis* 1984;37:85-95.
4. Guyatt GH, Bermann LB, Townsend M, Pugsley SO, Chambers LW. A measure of quality of life for clinical trials in chronic lung disease. *Thorax* 1987;42:773-8.
5. Bergner M, Bobbit RA, Carter WB, Gilson BS. The Sickness Impact Profile: development and final revision of a health status measure. *Med Care* 1981;19:787-805.
6. Jones PW. Health status measurement in chronic obstructive pulmonary disease. *Thorax* 2001;56:880-7.
7. Guillemin F. Cross-cultural adaptation and validation of health status measures. *Scand J Rheumatol* 1995;24:61-3.
8. Quirk FH, Jones PW. Back to basics: how many items can adequately represent health-related quality of life in airways disease? *Eur Respir Rev* 1997;7(42):50-2.
9. Quirk FH, Jones PW. Repeatability of two new short airways questionnaires. *Thorax* 1994;49:1075-9.
10. Hajiro T, Nishimura K, Jones PW, Tsukino M, Ikeda A, Koyama H, Izumi T. A novel, short, and simple questionnaire to measure health-related quality of life in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 1999;159:1874-8.
11. Barley EA, Quirk FH, Jones PW. Asthma health status measurement in clinical practice: validity of a new short and simple instrument. *Respir Med* 1998;92:1207-14.

12. Oga T, Nishimura K, Tsukino M, Sato S, Hajiro T, Mishima M. Comparison of the responsiveness of different disease-specific health status measures in patients with asthma. *Chest* 2002;122(4):1228–33.
13. Alemayehu B, Aubert RE, Feifer RA, Paul LD. Comparative analysis of two quality-of-life instruments for patients with chronic obstructive pulmonary disease. *Value Health* 2002;5(5):436–41.
14. Fabbri LM, Hurd SS. Global strategy for the diagnosis, management, and prevention of COPD: 2003 update. *Eur Respir J* 2003;22:1–2.
15. Souza TC, Jardim JR, Jones PW. Validation of the Saint George's Respiratory Questionnaire in patients with chronic obstructive pulmonary disease in Brazil. *J Pneumologia* 2000; 26(3):119–128. Available from World Wide Web:http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-3586200000300004&lng=en&nrm=iso. ISSN 0102-3586 [in Portuguese].
16. Camelier A, Rosa FW, Jones PW, Jardim JR. Validation of the Airways Questionnaire 20—AQ20 in patients with chronic obstructive pulmonary disease (COPD) in Brazil. *J Pneumologia* 2003;29(1):28–35. Available from [www.<http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-35862003000100007&lng=en&nrm=iso>](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-35862003000100007&lng=en&nrm=iso). ISSN 0102-3586 [in Portuguese].
17. Ciconelli R, Ferraz M. Translation to Portuguese and validation of the generic quality of life questionnaire "Medical Outcomes Study 36-Item Short Form Health Survey (SF-36)". *Rev Bras Reumat* 1999;39:143–50 [in Portuguese].
18. Brazilian Society of Market Research. *Econ Classification Brazil* 1997;2:31–2.
19. Norusis MJ/ SPSS Inc. *SPSS for windows*. Chicago, IL: SPSS Inc.; 1993.
20. Oliveira JA, Jardim JR, Rufino R. I Brazilian consensus of chronic obstructive pulmonary disease. *J Pneumologia* 2000;26(Suppl 1):S1–52.
21. Guyatt G, Walker S, Norman G. Measuring change over time: assessing the usefulness of evaluative instruments. *J Chron Dis* 1987;40(2):171–8.
22. Striner DL, Norman GR. Health measurement scales—a practical guide to their development and use. *Oxf Med Public* 1989;8:81–96.
23. Mahler DA, Weinberg DH, Wells CK, Feinstein AR. The measurement of dyspnea, contents, interobserver agreement, and physiologic correlates of two new clinical indexes. *Chest* 1984;85:751–8.
24. O'Donnel DE, McGuire M, Samis L. The impact of exercise reconditioning on breathlessness in severe chronic airflow limitation. *Am J Respir Crit Care Med* 1995;152:2005–13.
25. Goldstein RS, Gort EH, Stubbing D. Randomized controlled trial of respiratory rehabilitation. *Lancet* 1994; 344:1394–7.
26. Reardon J, Awad E, Normandin E. The effect of comprehensive outpatient pulmonary rehabilitation on dyspnea. *Chest* 1994;105:1046–52.
27. Mahler D, ZuWallack R, Rickard K. Effects of salmeterol and ipratropium on dyspnea as measures by six minute walk and baseline dyspnea/transitional dyspnea index. *Am J Respir Crit Care Med* 1997;155:A278.
28. Chapman KR. Chronic obstructive pulmonary disease: are women more susceptible than men? *Clin Chest Med* 2004;25(2):331–41 Review.