Scientific Letter

Reproducibility of the Lung Information Needs Questionnaire Via Phone Call Compared With Face-to-face Application in Patients With Chronic Obstructive Pulmonary Disease

To the Director,

To reduce symptoms and future risk of exacerbations in patients with chronic obstructive pulmonary disease (COPD),[1] knowledge of the disease and adherence to treatment are essential.[2,3] Questionnaires have been developed to assess patient knowledge on COPD, such as Bristol COPD Knowledge Questionnaire (BCKQ) and Lung Information Needs Questionnaire (LINQ).[4,5] Overall questionnaires have been developed for face-to-face application, requiring patients to attend outpatient clinics what includes time for dislocation and transport expenses. Administration via phone call may offer greater convenience to the patient; however, it remains unclear whether this method yields equivalent outcomes. Therefore, this study aimed to assess the reproducibility of the LINQ via phone call compared with face-to-face application.

We conducted a cross-sectional study (Unifesp Institutional Research Board 40587520.70000.5505; no. 88) with consecutively selected patients with COPD, both sexes, aged over 40 years old. Education level and spirometry results from the past 12 months were collected from clinical records. Airflow limitation and its severity were classified according to GOLD.[1] The LINQ consists of 16 questions divided into six domains, with distinct scores: disease knowledge, medications, self-management, smoking, exercise, and diet. Higher scores indicate a greater need for information. The questionnaire has no cut-off score to stage the degree of information needs.[5] The questionnaire was administered at two different time points by the same evaluator (SSN). The first administration was conducted face-to-face, with the evaluator reading the questions to the patient and recording the responses. The second administration was conducted via phone call 7–10 days later, following the same procedure. If the patient did not understand a question, it was repeated; if further clarification was needed, synonyms were provided. To assess the reliability of the LINQ responses, the intraclass correlation coefficient (ICC) estimates and their 95% confident intervals to single measurement, absolute-agreement, two-way mixed-effects model were calculated using SPSS statistical package version 27 (SPSS Inc., Chicago, IL). Reliability was classified as poor (<0.5), moderate (0.5 to <0.75), good (0.75–0.9), or excellent (>0.9) (16–18).[6] Spearman's correlation was used to evaluate the relationship between the LINQ score and the number of COPD exacerbations. The sample size was calculated using the electronic Sample Size Calculator (web), retrieved from http://wnarifin.github.io. Using the ICC for hypothesis testing, with

Table 1

Intraclass Correlation Coefficient (ICC) for LINQ Domains in Face-to-face and Phone Call Applications.

Domain	ICC	95% CI	Degree
Disease knowledge	0.91	0.90–0.93	Excellent
Medicines	0.83	0.79–0.86	Good
Self-management	0.86	0.84–0.91	Good
Smoking	0.90	0.86–0.94	Good
Exercise	0.95	0.94–0.96	Excellent
Diet	0.86	0.77–0.90	Good

CI: confidence interval.

a minimum acceptable reliability of 0.65, expected reliability of 0.80, significance level (α) of 0.05, power ($1 - \beta$) of 0.80, number of raters/repetitions per subject (k) of 2, and an expected dropout rate of 10%, a sample size of 86 individuals was required.

Eighty-eight patients with COPD were included, with a mean age 68.9 ± 8.3 years old, 53% female, and 59.1% Caucasian. Most patients were classified as having moderate (44.3%) or severe (37.5%) COPD[1]; 45.5% had complete elementary school, 27.3% incomplete high school; 53.4% did not experience exacerbations in the last 12 months. Median mMRC score was 2, and mean CAT score 14.5 ± 9.9. No patient was using long-term oxygen therapy. The most frequent comorbidities found in our patients were systemic arterial hypertension, dyslipidemia, diabetes, gastroesophageal reflux, and osteoporosis, in accordance with the literature.[7]

Good to excellent ICC values between face-to-face and phone call applications were observed for all domains (Table 1). The agreement in responses for patients under 65 years old and ≥65 years old yielded ICC of 0.82 and 0.86, respectively, indicating good reliability of the two methods across both age groups. Regarding educational level, the agreement between the two administration methods yielded an ICC of 0.99 among illiterate individuals, 0.87 for those with elementary education, and 0.69 for those with high school education. As there was only one individual in the sample with higher education, it was not possible to calculate the ICC for this educational level. No correlation was found between the LINQ score administered face-to-face ($r = 0.002$, $p = 0.982$) or by phone call ($r = 0.001$, $p = 0.993$) with the number of COPD exacerbations in the past year.

LINQ application via phone call provided results similar to those obtained by face-to-face application showing that phone calls are a reliable what allows more patients with COPD to be interviewed, and their information needs assessed without displacement or expenses. The LINQ identifies incorrect behaviors that may compromise self-management. This comprehensive evaluation allows healthcare professionals to identify gaps in patient knowledge and develop educational materials tailored to specific needs.[1] The

LINQ questions are objective, with short responses, and require minimal time for completion (approximately 6 min). The questionnaire covers two areas: whether healthcare professionals have provided instruction and whether patients have understood and followed those instructions. Individual questions analysis showed that only question 7 was classified as moderate (ICC = 0.79). This question refers to patient satisfaction regarding information about inhalation devices, and the moderate agreement may be due to the different types of devices prescribed by the healthcare system. Thus, administering the LINQ via phone call may help identify patients' specific information needs in advance, allowing the healthcare team to address these needs during consultations in line with precision medicine principles. GOLD[1] emphasizes that education increases patient knowledge and lead to behavior change. As the evaluation of reliability across different education levels was not a primary objective of the study, the distribution of individuals by education level was heterogeneous. The extremes, both illiterate patients and those with $\geq$12 years of education had fewer participants, and concordant or discordant responses may have influenced their ICC values. The fact that 76.1% of our population had an education level sufficient to understand the questions well supports the use of the LINQ questionnaire in telephone-based assessments. When interpreting individual scores provided by the LINQ, the patient's characteristics should be considered.

Other questionnaires have been administered via phone more than once but without comparison to face-to-face administration. An international survey on Childhood Asthma and Allergy evaluated atopic eczema in a group of Brazilian children, showing excellent reproducibility (Kappa 0.81–0.82).[8] In Spain, the Rankin questionnaire assessed functionality in post-stroke patients and found an excellent Kappa score between two interviewers (0.81).[9] These studies support the good to excellent results observed with the LINQ domains administered via phone call compared to face-to-face. The LINQ questionnaire was not applied in other formats, but it has been shown that traditional epidemiological risk factors can be collected with equal or even better reliability in web-based questionnaires compared to traditional approaches.[10] The comparison of administering a breast cancer care questionnaire via digital format and postal method showed no difference in response rates.[11]

Nowadays mobile phones are an important means of communication, allowing relatively easy interaction. However, patients may experience impairments (e.g., hearing difficulties), but these can be mitigated with assistance from a family member. The information collected by the LINQ may vary depending on the patient's memory, but this limitation can occur with any questionnaire.

This study presents a novel finding as the first to demonstrate the reliability of the LINQ via phone call.

In our study, the LINQ score did not correlate with the number of COPD exacerbations. A similar result was found by Amado et al.[12] (p = 0.641). However, Amado et al.[12] showed that a high LINQ score is an independent predictor of hospitalizations due to COPD exacerbations (HR 2.3 [95% CI 1.1–5.1], p = 0.029).

We conclude that the LINQ questionnaire is easy and quick to apply, and well understood by patients. The phone call modality allows its administration without compromising response reliability, enabling healthcare teams to assess a patient's knowledge about their disease in advance of consultations, thus facilitating targeted interventions to improve self-management and treatment adherence.

CRediT Authorship Contribution Statement

Soraya S. Nohara: Significant participation in study design, data collection, or data analysis/interpretation; involvement in the preparation or review of the manuscript; approval of the final version of the manuscript for publication; responsibility for the accuracy and integrity of all aspects of the research.

Gerson F. Souza: Involvement in the preparation or review of the manuscript.

Maria E. Leão: Involvement in the preparation or review of the manuscript; approval of the final version of the manuscript for publication.

Ana C. Fleury: Involvement in the preparation or review of the manuscript.

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Conflict of Interests

The authors state that they have no conflict of interests. **Q2**

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