Feasibility and Effectiveness of an Educational Program in Italian COPD Patients Undergoing Rehabilitation

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BACKGROUND: Self-management education is associated with improvement in quality of life and reduction of hospital admissions. Nevertheless, the data are insufficient to formulate clear recommendations regarding the type and content of education programs for COPD patients, and few data are available on knowledge of the disease itself. OBJECTIVE: To test the level of patients' knowledge of their disease and therapy at baseline and after an educational program (COPD-EP); the feasibility of structured educational sessions; the influence of clinical status (degree of severity of disease, presence of comorbidities, oxygen use), demographics status (age, sex), previous knowledge level, previous lessons attendance and adherence of COPD-EP to the variation of knowledge after program. METHODS: Selected COPD in-patients and out-patients referred to rehabilitative hospital departments were enrolled. The study was divided into 2 parts: a pre-study phase (educational materials and health team preparation) and a study phase. All COPD subjects received one educational brochure and were invited to attend seven 30-min group lessons to complete the educational program. Learning effect was evaluated by a 20-questions multiple choice learning questionnaire (LQ). RESULTS: We enrolled 158 subjects, of whom 44.9% had previous formal education lessons on COPD management and 69.6% had previous rehabilitative hospitalizations. At baseline, the LQ total score was 15.2 ± 3.5 points, which increased to 16.9 ± 3.0 points post COPD-EP ($P < .001$). Pre-to-post change of LQ scores significantly correlated with adherence ($R = 0.24$, $P = .002$) and Severity Index of Cumulative Illness Rating Scale score ($R = -0.22$, $P = .001$). Subjects with low baseline knowledge were more likely to have improved LQ scores than subjects with greater levels of knowledge. Subjects without prior educational COPD lessons improved more than subjects who had attended previous education. CONCLUSIONS: A formal COPD-EP is feasible and effective in improving subject knowledge and self-management. Specific learning instruments to follow up this population should be validated. *Key words: self-management; questionnaire; learning; education.* [Respir Care 2013;58(2):327–333. © 2013 Daedalus Enterprises]

Introduction

COPD is a serious public health problem worldwide.[1] A study published by the World Bank/World Health Organization reported that COPD is likely to rise from being the twelfth most burdensome disease in 1990 to the fifth in 2020.[1] A study published by the World Health Organiza-

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tion reported that COPD is the fifth leading cause of death in the World in 2002.[1] The prevalence, morbidity, and mortality for COPD are increasing, especially in countries with an aging population and where the smoking rates are high.[1]

Pulmonary rehabilitation programs, which include comprehensive interventions (exercise training, pharmacologic management, and psychosocial and nutritional support), also incorporate education and self-management as important skills to be achieved for the standard care of COPD patients.[2] Self-management is a concept applied to any formalized patient education aimed at teaching strategies to carry out medical regimens specific to the disease, to guide any change of health behavior, and even to provide emotional support to manage the disease and functional living.[3] Moreover, international guidelines on pulmonary rehabilitation recommend the inclusion of disease-specific learning content to provide patients with information related to their condition and therapies.[2]

A recent Cochrane review by Effing et al[4] has confirmed that self-management education in COPD is associated with improvement in quality of life and in reduction of hospital admissions, with no indications of any side effects in other outcome parameters. However, the authors emphasize that due to the heterogeneity of studies, including types of interventions, populations, follow-up, and outcome measures, the data are still insufficient to formulate clear recommendations regarding the form and content needed to provide effective self-management education programs for COPD patients.

The aims of this study were to test in a rehabilitation setting the effect of a formal educational program for COPD patients (COPD-EP) on: the level of patient knowledge of their disease and therapy at baseline and after a formal educational program (COPD-EP) (the knowledge was assessed by a specific learning questionnaire [LQ]); the feasibility of implementing structured educational sessions as evaluated by the number of patients who completed the study period and the extent of participant attendance; and the influence of clinical status (degree of severity of disease, presence of comorbidities, oxygen use), demographics status (age, sex), previous knowledge level, previous educational program attendance and adherence to COPD-EP with respect to the variation of knowledge after the end of the program, as assessed by analyzing the associations and correlations between variables.

QUICK LOOK

Current knowledge

Pulmonary rehabilitation programs, which include comprehensive interventions, also incorporate education and self-management as important skills to be achieved for the standard care of COPD. Self management education in COPD is associated with improvement in quality of life and in reductions in hospital admissions.

What this paper contributes to our knowledge

A formal COPD educational program is feasible and effective in improving patient knowledge and self-management. Patients most likely to benefit from education are those with high adherence, fewer comorbidities, and a lower level of knowledge regarding their disease and its related problems.

Methods

In Italy, educational sessions in pulmonary rehabilitation programs are sometimes not formally delivered, and the sessions not homogeneously planned. Therefore, the type and amount of educational content may vary among programs in relation to local organization and availability of spaces and human resources.

Pre-study Phase

To improve homogeneity regarding this important topic, after the publication of a more structured and formal program/plan on COPD education,[5] we started a pre-study phase that lasted from January 15 to July 15, 2009. During this period the educational material for the study phase was approved by consensus.

Educational Material Preparation

Our program was a learning-based educational approach according to the most recent evidence in COPD.[2] A Web depository of content[5] served as a start for preparing the educational material. A panel of experts (medical doctors, physiotherapists, nurses, and psychologists) discussed the content topics and extracted the appropriate tools, which were then modified and adapted in relation to the characteristics of our subjects and the rehabilitation environment. The group met twice to select the available material and to define the learning elements to be included in the educa-

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tional program. The educational sessions included 7 topics as follows: basic pathophysiology of COPD; how to recognize the occurrence and how to treat an exacerbation; nutrition in COPD; use of medications, oxygen, and other devices; lifestyles; impact on mood; and goals and methods of rehabilitation.

A set of 80 slides was created to assist health professionals to deliver the educational program. In addition, all study participants received supporting materials, which included a brochure with drawings and figures depicting the selected topics.

Learning Questionnaire

Since at the time of our study no specific questionnaire for testing the learning effect of an educational program in Italian patients was available, we devised a multiple choice LQ with 20 questions specifically related to the 7 educational topic areas, and grouped them into 5 domains: 6 questions each on COPD pathophysiology and lifestyles, 3 questions each on medications and rehabilitation, and 2 questions on oxygen therapy. See the supplementary material at http://www.rcjournal.com for details of the tool and the scoring system (range 0–20, higher score reflects greater knowledge). Three possible answers were developed for each question, only one being correct. Prior to the current study the LQ was delivered to a group of 40 COPD patients, to assess the clarity of presentation of the questions. As a result, 5 changes were made to improve understanding. To verify reliability, LQ was re-tested 3 times in 15 patients, changing the order of questions with an interval time of 1 hour per each filling request. The first and the third test were compared. The intraclass correlation coefficient was 0.85.

Health Team Preparation

A multidisciplinary team (nurse, physician, physiotherapist, dietitian, psychologist, and pharmacist) was responsible for education. All health professionals involved attended a 2-hour training workshop to become familiar with the material and to homogenize the teaching strategy for subjects during the educational sessions.

Study Phase

Subject enrollment lasted from September 2009 to December 2010. The study was designed as a prospective pre-to-post comparison of measurements.

Subjects were enrolled from 5 Italian rehabilitative respiratory departments (Fondazione Salvatore Maugeri [Brescia], Ospedale Privato Accreditato Villa Pineta [Gaiato-Modena], Istituto Nazionale di Ricovero e Cura per Anziani [Lucca], Ospedale Fondazione Macchi [Varese], and Ospedale Università di Pisa [Pisa]).

Inclusion/Exclusion Criteria

Inclusion criteria were COPD diagnosis and Mini-Mental State Examination score > 20.[6–9] Diagnosis and classifications were made according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines.[7] Clinically unstable patients or those unable to participate in the COPD-EP program because they were bedridden or admitted only for a short stay were excluded from the study.

The study was approved by the appropriate ethical committee in Fondazione Salvatore Maugeri. Subjects gave their informed consent to participate.

Protocol

All enrolled subjects received a hospital-based rehabilitation course according to the American Thoracic Society and European Respiratory Society guidelines,[8] plus a full educational program (COPD-EP).

COPD Educational Program

At the beginning of the study, all subjects received the brochure and were invited to attend seven 30-min sessions over 2–3 consecutive weeks to complete the full educational program. Sessions were conducted by different members of the educational team, in a group setting (up to 30 people), and in a dedicated room, using the prepared teaching materials (slides and brochure). The teaching sessions were standardized according to the following the sequence of the 7 topics detailed previously.

Rehabilitation Course

The rehabilitation plan started the day after the admission to the study and was carried out as an in-patient or out-patient program. The in-patient program included 6 sessions of 2 hours per week, and the out-patient program included 3 sessions of 2 hours per week.

Outcome Measures

The main outcome measure, LQ scores, was assessed on 2 occasions: the day before the first educational session, and one day after the end of the COPD-EP course. In addition, clinical and demographic measures (GOLD stage, comorbidities by means of Cumulative Illness Rating Scale,[9] length of disease, previous admission to rehabilitation or educational courses), site of residence (small or large village, town), level of school education, and pres-

ence of caregiver (yes or no) were also documented. The Cumulative Illness Rating Scale is a gravity index that evaluates the presence and the degree (from 1 = absence to 5 = very severe degree) of morbidities in 13 body systems (for example, respiratory system, cardiac systems, others). The score is divided into 2 items: the first refers to the severity index, which shows the mean of severity of morbidities of all 13 systems evaluated, and the second is the comorbidity index showing the number of body systems with the presence of morbidity with a degree > 3.

Finally, we tested the adherence to COPD-EP by assessing the percentage of attended sessions. Adherence was defined as attendance of at least 70% of the total educational sessions in the program.

Statistical Analysis

Data were analyzed using statistical software (Stata 11, StataCorp, College Station, Texas). Descriptive statistics were used to define the subject characteristics. Changes in LQ scores were compared with the Wilcoxon test for paired measures. Based on LQ scores, we generated 2 series of binary categories in the study population: high knowledge (subjects with baseline LQ score higher than median value) or low knowledge (subjects with baseline LQ score below the median value); and those who improved (at least one point of improvement in the LQ total score) or subjects who worsened (with worse LQ total score).

A non-parametric analysis was performed between the groups that improved or worsened for continuous variables by the Wilcoxon Mann-Whitney test, for categorical variables by Kruskal-Wallis test, and for binary variables by the Pearson chi-square test.

The Spearman correlation was used to examine the relationship between total LQ scores and the other continuous variables. Subjects with unchanged LQ score were excluded from the analysis. The McNemar test was used to identify or find associations among the high knowledge group, low knowledge group, those who improved, and those who worsened. P values < .05 were considered statistically significant.

Results

Of the 714 patients admitted for rehabilitation, 158 (22%) fulfilled the inclusion criteria and were selected as participants. We excluded 168 (24%) because of low Mini-Mental State Examination scores, and 381 (58%) were unable to attend the full COPD-EP courses because of unstable condition (n = 154, 22%), bedridden (n = 182, 26%), or short stay (n = 45, 6%). Seven patients refused to participate (1%). Of the 158 included subjects, 138 completed the rehabilitative courses as in-patients, and 20 as out-patients. The average stay in the hospital was 20 ± 23 days. The number of subjects participating in each educational session ranged from 3 to 25.

Table 1. Clinical and Demographics Characteristics

Age, mean ± SD, y	71.1 ± 8.3
Disease, mean ± SD, y	13.3 ± 9.6
Male (%)	72.8
GOLD Stage (%)	
I	3.4
II	29.7
III	21.4
IV	45.5
Severity Index Score, mean ± SD	1.01 ± 0.55
Comorbidity Index Score, mean ± SD	2.4 ± 1.67
Education Level (%)	
Primary school	57.1
Secondary school	26.9
High school	14.7
University	1.3
Place of Residence (%)	
Town (> 100,000 people)	20.9
Medium village (> 10,000 people)	38.0
Small village (< 10,000 people)	41.1
Mini-Mental Score Examination score, mean ± SD	26.65 ± 3.39
Caregiver present (%)	
Yes	32.9
No	67.1
Oxygen Use (%)	
Yes	57.0
No	43.0
Previous Rehabilitative Hospitalization (%)	
Yes	69.6
No	30.4
Previous educational lessons (%)	
Yes	44.9
No	55.1

GOLD = Global Initiative for Chronic Obstructive Lung Disease

Table 1 shows the clinical and demographics characteristics of the study population. The majority of subjects were male, in severe disease stage (GOLD stage III and IV), had low school education and previous admissions for rehabilitation. Less than half of them had already attended previous formal COPD education programs, and 69 subjects (43.7%) had both previous rehabilitative hospitalizations and had attended formal COPD educational program (planned group lessons with visual and paper material).

All the included subjects completed the study period as planned. Participants attended an average of 80.4 ± 24.4% of sessions, corresponding to 5.6 ± 1.7 sessions for each subject (adherence of COPD-EP).

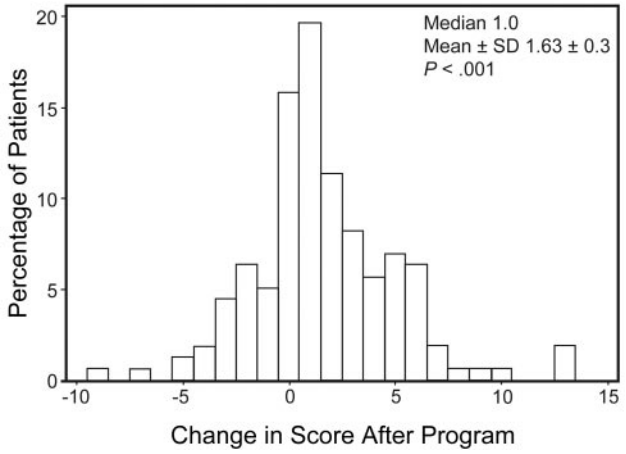

Figure. Change of learning questionnaire score after COPD education program.

Table 2. Learning Questionnaire Scores*

Domain	Number of Questions	Learning Questionnaire Score, mean ± SD		P†
		Pre	Post	
COPD knowledge	6	4.20 ± 1.27	4.82 ± 1.16	< .001
Rehabilitation	3	2.28 ± 0.91	2.64 ± 0.61	.005
Healthy lifestyles	6	4.56 ± 1.50	5.22 ± 1.16	< .001
Drugs	3	2.74 ± 0.60	2.82 ± 0.46	.19
Oxygen use	2	1.34 ± 0.60	1.44 ± 0.68	.09
Total (0–20)	20	15.2 ± 3.49	16.94 ± 2.99	< .001

* Each correct answer is scored as 1, so a total of 20 points is possible. For each domain the total possible score is equal to the number of questions.
† Via Wilcoxon Mann-Whitney test for paired measures.

Learning Questionnaire

At baseline the LQ total score was 15.2 ± 3.5 points (median 16), increasing to 16.9 ± 3.0 points post COPD-EP (median 18), with a pre-to-post change of 1.6 ± 0.3 points. These differences were statistically significant ($P < .001$, 95% CI 1.09–2.2).

The Figure shows the change of LQ score after COPD-EP (percentage of subjects). The majority of subjects (about 20%) improved one point of LQ score. Sixty-four percent of the subjects improved, whereas the remaining 36% did not change (15.7%) or worsened (20.3%) after the educational session. The percentage of subjects who correctly answered all questions improved from 5.7% at baseline to 20.9% post COPD-EP.

Table 2 shows the score distribution in the 5 domains. The domains of COPD knowledge, rehabilitation, and healthy lifestyles improved significantly after the educational intervention, while the domains of drugs and oxygen use were unchanged.

Correlations and Associations

Pre-to-post changes of LQ score significantly correlated with adherence ($R = 0.24$, $P = .002$) and baseline severity index scores ($R = -0.22$, $P = .001$).

With regard to the binary categories of subjects, the group that improved ($n = 101$) had significantly higher adherence (83.6 ± 2.4 vs 68.3 ± 4.0%, $P < .001$), when compared to the group that worsened ($n = 32$).

The group that improved had a severity index score significantly lower than the group that worsened (1.0 ± 0.5 vs 1.2 ± 0.6, $P = .03$), while age (71.0 ± 1.5 y vs 71.0 ± 0.8 y, $P = .50$), years of disease (13.3 ± 0.9 y vs 16.2 ± 3.4 y, $P = .70$), comorbidity index score (2.4 ± 0.2 vs 2.8 ± 0.3, $P = .10$), and GOLD stage (stage IV 51.6% vs 42.9%, $P = .80$) were similar between the 2 binary categories.

No statistically significant baseline knowledge differences were found between subjects with and without prior pulmonary rehabilitation (15.4 ± 3.6 vs 14.9 ± 3.2, $P = .11$) and with or without prior educational COPD lessons (15.8 ± 3.5 vs 14.9 ± 3.5, $P = .08$). We have found similar improvement in subjects with and without prior pulmonary rehabilitation (1.3 ± 3.0 vs 2.3 ± 4.1, $P = .08$). Subjects without prior educational COPD lessons improved significantly more than subjects with previous educational COPD lessons (2.2 ± 3.9 vs 1.0 ± 2.6, $P = .03$).

A significantly higher probability of improvement in LQ scores was found in the low knowledge, compared to the high knowledge, subjects (87.4% vs 59.3%, $P < .001$).

Discussion

The present study has shown that a multidisciplinary educational program delivered to Italian COPD patients is feasible and effective for improving knowledge of disease management. A significant correlation was found between adherence to this program and learning effect. Moreover, subjects with low educational level at baseline were more likely to benefit from this program.

Despite a recent meta-analysis[4] showing that a program of self-management in these patients may decrease hospitalizations and dyspnea and increase quality of life, the actual scientific evidence does not clearly describe whether or not COPD patients are able to understand the importance of their disease and associated complications nor describe how specific education can influence their knowledge.

Indeed, few studies have been conducted to test knowledge and skills of COPD patients and/or the response to a structured educational program. Hernandez et al[10] conducted a telephone survey in 389 patients, confirming that although most patients claimed to be well informed about

COPD, the level of consciousness of the disease was poor, especially in relation to the causes, appropriate therapies, and management during the acute phase.[10] However, their results cannot be directly compared to ours because their patient population had less severe COPD and the researchers did not investigate specific knowledge regarding COPD.

Jones et al,[11] using a questionnaire to test the educational impact of pulmonary rehabilitation, in a study with a similar design to ours, concluded that "a structured educational track may help to rectify patients' gap of knowledge on the management of their respiratory condition."[11] Our results are also consistent with findings from Crisafulli et al,[12] who described a program in a rehabilitation setting similar to ours. Indeed, they found a high attendance rate (79%) to the program, demonstrating the acceptability and perceived worth of educational programming in a COPD population.

Studies published so far[10,11,13] have looked at the effects of modifications in knowledge after educational programs only in patients with mild COPD who were in an outpatient setting. Our study, by comparison, used learning tools dealing with long-term management, rehabilitation, and severity of the disease to educate patients with more severe COPD during in-patient hospitalization. Our findings show that COPD knowledge, rehabilitation, and healthy lifestyles areas can be significantly improved after an educational intervention.

In regard to medication and oxygen use knowledge, the subjects had high baseline scores, and for this reason we were not surprised that they did not show much improvement in LQ scores. It is noteworthy that a low baseline level of COPD knowledge was not disadvantageous. The low level of basal education was more likely to result in a learning effect after delivery of the structured program. Indeed, the greatest educational benefit goes to those participants without much previous knowledge, independently from their characteristics such as age, low formal school education, severity of disease, living in a rural area, need of a caregiver, or absence of previous rehabilitation course. Moreover, the possible explanation on why subjects who did not have any previous access to educational courses improved more than subjects who attended previous educational courses is that the first access to a structured educational program is likely to produce better increases in knowledge than subsequent access; thus, the reinforcement could produce less benefit. However, this hypothesis remains speculative and necessitates future studies for confirmation.

Despite the present findings, several limitations of our study should be considered. First, this study did not include a control group, and therefore no comparisons and definite conclusions can be made. Second, the learning effect of the intervention was tested only over a relatively short period of active rehabilitation, and we did not assess changes after discharge during long-term follow-up. Third, it is possible that we did not investigate other important patient characteristics, for example, informal sources of information such as Internet social networking, medical TV programs, family, or friends, which might have influenced baseline scores. Fourth, we used a questionnaire with some limitations: it was developed by consensus and was not formally validated. It is possible that a "ceiling" effect was achieved because of the high proportion of subjects (20.9% of subjects) with 100% score on the post-education assessment, and the high baseline level of knowledge for some categories may have implications for the validity of the LQ; thus, the choice of different questions could have resulted in different outcomes. Future randomized trials are needed to fully test the beneficial effects of a structured educational program for COPD patients and the possible costs and benefits of such an intervention.

Conclusions

Our findings demonstrate that a formal educational program dedicated to COPD patients is highly feasible and effective in improving patient knowledge in managing the disease. Patients most likely to benefit from education are those with high adherence, low comorbidities, and lower level of knowledge about the disease and its related problems. Although preliminary, our data warrant future research in this area to validate specific learning instruments and/or strategies for COPD education, and to determine if an improvement in knowledge can influence disease management.

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