Effect of Health Coaching Delivered by a Respiratory Therapist or Nurse on Self-Management Abilities in Severe COPD: Analysis of a Large Randomized Study

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BACKGROUND: Self-management of patients with COPD has received increasing attention in recent years given its association with improved outcomes. There is a scarcity of feasible interventions that can improve self-management abilities. We recently reported the positive effect of health coaching, started at the time of hospital discharge, on re-hospitalizations and emergency department visits for patients with COPD admitted for an exacerbation. In this substudy, we aimed to investigate the effects of health coaching delivered by a respiratory therapist or a nurse compared with guideline-based usual care on self-management abilities in COPD. METHODS: Self-management was measured by using the Chronic Respiratory Disease Questionnaire mastery domain and was assessed at baseline, at 6 months, and at 12 months after hospitalization. RESULTS: Two hundred and fifteen subjects hospitalized for a COPD exacerbation were randomized to the intervention or the control. The mean change in the Chronic Respiratory Disease Questionnaire mastery score from baseline to month 6 was $\Delta0.58\ 32 \pm 1.29$ on the intervention arm and $\Delta0.17\ 32 \pm 1.14$ on the control arm ($P = .02$). Of the intervention subjects, 55% had at least a 0.5-point increase in Chronic Respiratory Disease Questionnaire mastery (minimum clinically important difference) compared with 38% in the control group. Health coaching was an independent predictor of the minimum clinically important difference or greater change in the Chronic Respiratory Disease Questionnaire mastery score at 6 months after initiation of the intervention (odds ratio 1.95, 95% CI 1.01–3.79). The changes in the Chronic Respiratory Disease Questionnaire mastery score at 12 months showed a trend but did not attain statistical significance. CONCLUSIONS: Health coaching delivered by a respiratory therapist or a nurse improved self-management abilities when applied to subjects with COPD after hospital discharge for an exacerbation. (ClinicalTrials.gov Identifier: NCT01058486, Mayo IRB 09–004341). *Key words: Chronic Respiratory Questionnaire mastery domain; COPD; health coaching; intervention; self-management.* [Respir Care 2019;64(9):1065–1072. © 2019 Daedalus Enterprises]

Introduction

Interventions to support COPD self-management in patients with COPD have received increasing attention over the past years given the association with improved out-

comes.[1,2] Self-management interventions may contain multiple interacting components in which patients are taught new skills, such as monitoring signs and symptoms to detect deterioration and adherence to treatment or lifestyle change to apply in their daily lives. There is a scarcity of feasible interventions that can improve self-management abilities. We recently reported the positive effect of health coaching that started at the time of hospital discharge, on re-hospitaliza-

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tions, and at emergency department visits in patients with COPD admitted for an exacerbation.[3] We postulated that health coaching improves self-management abilities. Health coaching has the potential to improve self-management abilities primarily because it is patient-centered and rooted in a solid theoretical framework of communication and behavior change known as motivational interviewing.[4-7]

This was a secondary analysis of a published[3] randomized clinical trial implemented in a population of subjects with COPD (hospitalized for an exacerbation) with a high risk of poor outcomes in which self-management is so critical. We investigated the effect of a simple intervention (health coaching delivered over the telephone by a respiratory therapist or a nurse) compared with usual care on a very specific outcome: self-management abilities measured by the the Chronic Respiratory Disease Questionnaire mastery domain. This domain encompasses 2 critical and recognized constructs of self-management in COPD: #1 self-efficacy,[8] to deal with breathlessness and the disease itself; and #2 coping with emotions associated with worsening symptoms and outcomes.[9,10]

Methods

Design Overview

This was a secondary analysis of a published multi-site (Mayo Clinic, Rochester, Minnesota, and Health Partners Regions Hospital, Minneapolis, Minnesota), randomized trial that compared a health-coaching intervention with guideline-based usual care for subjects after a hospitalization for a COPD exacerbation. Inclusion criteria for the published multi-site effectiveness study included the following: a primary diagnosis of a COPD-related hospitalization (exacerbation or pneumonia) and the ability to interact with a coach in telephone communication.

Randomization

We randomly assigned subjects by using an online computer-generated simple binomial randomization program into the 2 groups, stratified by the center.

Intervention

Health coaches met with the subjects at least once in person after discharge with subsequent sessions conducted by telephone, once a week for the initial 3 months, and once a month thereafter. Health coaches followed a set agenda that reviewed the rationale for the study. The first visit was in person and lasted ~2 h. Visit 1 was oriented to discussing the concept of self-management, goal setting, and action planning, and the specifics of the telephone sessions to come. Each encounter embodied the spirit of motivational interviewing: the subject is the expert; the willing-

QUICK LOOK

Current knowledge

Interventions to support COPD self-management in patients with COPD have received increasing attention over the years, given the association with improved outcomes. There is a scarcity of feasible interventions that can improve self-management abilities in severe COPD.

What this paper contributes to our knowledge

This randomized study indicated that health coaching delivered by a respiratory therapist or a nurse represented a simple intervention that improved self-management abilities. The Chronic Respiratory Disease Questionnaire mastery domain was a feasible and valid method to measure the self-management process and permitted these self-management results from different interventions to be replicated.

ness of the coach to listen deeply to understand the subject and empowerment of the participant to adopt the behavior that he or she feels is important to pursue, even if not related to his or her pulmonary condition.

Coaches asked the subject what he or she already does to be more comfortable living with chronic lung disease and to be and stay healthy in general, and tried to explore future hopes and goals[11] that he or she could work toward. Details of the intervention can be obtained from Table 1 and our previous open-access reports.[3,11] Disease-specific health-related quality of life was measured by using the Chronic Respiratory Disease Questionnaire at baseline, 6 months, and 12 months after hospital discharge. The minimum clinically important difference accepted for this instrument is 0.5 points. The Chronic Respiratory Disease Questionnaire is a well-accepted tool to measure health status in COPD and has 4 domains: dyspnea, fatigue, emotional, and mastery.[12]

Self-management, the primary outcome of this substudy, was assessed by using the Chronic Respiratory Disease Questionnaire mastery domain at baseline (immediately after discharge), at 6 months, and at 12 months. Chronic Respiratory Disease Questionnaire mastery has 4 items that measure 2 key self-management abilities: (1) self-efficacy,[8] and (2) panic and anxiety.[9,10,13] Each item's score ranges from 1 (worst) to 7 (best). The 4 items are the following: "How often during the last 2 weeks did you have a feeling of fear or panic when you had difficulty getting your breath?"; "In the last 2 weeks, how much of the time did you feel very confident and sure that you could deal with your illness?"; "How often during the last 2 weeks did you feel you had complete control of your

Table 1. A Brief Summary of the Intervention Content

Content Outline	Additional Considerations for Interventionist
Greeting, set agenda for session	
Elicit participant experience and opinions about the self-management goals from session 1	Use O.A.R.S.
	Listen for what they did try and what did work, affirm
	Resist the urge to immediately attempt solving their problems and barriers
	Connect their thoughts and behavior back to the values that they mentioned at the last session as appropriate
Individualized, collaborative conversation about physical activity recommendations	Listen for ambivalence
	Summarize both sides of the ambivalence; start with the reasons for not changing, followed by reasons for changing
	Let me see if I understand what you've said. . .
	Ask: Did I get it all?
	Ask about the next step
	Where does that leave you now
	What is the next step?
	O.A.R.S.
	Use E-P-E when sharing information
Describe and then discuss "self-management"	Use E-P-E to describe content extracted from the self-management workbook*
	Discuss the use of the book in general
	Discuss how the concept of self-management connects to patient values and strengths, if appropriate
	Listen for change talk, respond with O.A.R.S.
	Collaborate in setting goal for participants to read chapter 2 of workbook* before the next session
Review the Self-Management Action Plan	Elicit patients' thoughts about the self-management domains included and the format in general
	Discuss the process of action planning
	Discuss patients' role in collaborative action planning in the session and experimenting with action plans out of the session
	Use E-P-E when providing information about domains
	Listen for ambivalence about various self-management behaviors; respond with O.A.R.S.
Collaborate in creating action plan on the Self-Management Action Plan form (most often, physical activity at session 2)	Elicit patients' preferences and/or desires for behavior change, eg, "What would you be willing to try before our next meeting with (the self-management area they selected)?"
	Elicit patients' choice, do not assign goals, use the patients' language to describe the goal
	Assess confidence for goal completion
	Listen for ambivalence about the action planning process or self-management behavior itself
	O.A.R.S.
	Listen for and respond to change talk
	Connect goals to patients' values, strengths, and priorities when possible
Elicit participants' thoughts and feelings about the session	O.A.R.S., eg, "What seems most personally relevant to you of all that we discussed today?"
	Reaffirm commitment to action plan and express optimism, eg, "Is that what you plan to do?"
	Listen for ambivalence
	If the clients are ambivalent, then use O.A.R.S. and collaborate in problem solving if appropriate
Briefly describe what patients can expect in session 3 and close the session	

* From Reference 30.
O.A.R.S. = open-ended questions, affirmations, reflections, and summaries
E-P-E = elicit-provide-elicit

breathing problems?"; and "How often during the last 2 weeks did you feel upset or scared when you had difficulty getting your breath?"

Control Group: Guideline-Based Usual Care

Both the intervention arm and usual care group received care by following the Global Initiative for Chronic Ob-

structive Lung Disease and were also referred to conventional pulmonary rehabilitation.[14]

Data and Safety Monitoring

The National Institutes of Health that funded this study required a data and safety monitoring board to monitor

Table 2. Logistic Model to Determine the Predictive Validity of Chronic Respiratory Disease Questionnaire Mastery at Baseline for Hospitalizations at Different Time Points After Hospital Discharge, Adjusted by Significant Covariates

End Point	P, Adjusted for Arm, Age, and mMRC
Any hospitalization at	
1 mo	.04
3 mo	.05
COPD hospitalization at	
1 mo	.01
3 mo	.01
6 mo	.02
12 mo	.04
Death or COPD hospitalization at	
1 mo	.01
3 mo	.01
6 mo	.03
12 mo	.03

mMRC = Modified Medical Research Council dyspnea scale

subject accrual, outcomes, complications, and protocol adherence.

Statistical Analysis

The a priori primary end point for this substudy was the change in Chronic Respiratory Disease Questionnaire mastery at 6 months of initiating the intervention (health coaching). Changes from baseline to 6 months were compared between the study arms by using 2-sample, 2-sided t tests with 5% type-1 error rates. Logistic models were used to assess the impact of treatment arm (health coaching) on 6-month Chronic Respiratory Disease Questionnaire mastery after adjusting for age and dyspnea (modified Medical Research Council dyspnea scale), the corresponding baseline measures with univariate significance. The sensitivity of these models was evaluated by using 10,000 bootstrapped samples. Because there were very few missing values and the results from intent-to-treat analyses were similar to the original analyses, no imputations were done. The predictive validity for the Chronic Respiratory Disease Questionnaire mastery was tested by measuring its independent association with a COPD re-hospitalization (Table 2). Multivariate models included the univariate predictors. Analyses were done by using SAS version 9.4 (SAS Institute, Cary, North Carolina).

Results

A total of 215 subjects hospitalized for a COPD exacerbation were randomized to the intervention or the control.

The baseline measures for the intervention and control groups are summarized in Table 3. The mean change in the Chronic Respiratory Disease Questionnaire mastery score from baseline to month 6 was $\Delta0.58$ 32 $\pm$ 1.29 in the intervention arm and $\Delta0.17$ 32 $\pm$ 1.14 in the other arm ($P = .02$) (Fig. 1). Of the intervention subjects, 55% had at least a 0.5 increase in Chronic Respiratory Disease Questionnaire mastery score compared with 38% of the control group (Number Needed to Treat = 5). At 12 months after the intervention initiation, there was no statistically significant difference in the score: $\Delta0.5$ 32 $\pm$ 1.3 in the intervention arm and $\Delta0.17$ 32 $\pm$ 1.1 in the control group ($P = .29$). In a logistic model that aimed to predict a ≥0.5 change in the Chronic Respiratory Disease Questionnaire mastery score at 6 months after the intervention's initiation, health coaching was as an independent predictor (odds ratio 1.95, 95% CI 1.01–3.79) after adjusting for age, lung function ($FEV_1\%$) and baseline Chronic Respiratory Disease Questionnaire dyspnea score (C statistic 0.66).

Predictive Validity of Chronic Respiratory Disease Questionnaire Mastery. At baseline, the Chronic Respiratory Disease Questionnaire mastery score was independently associated with hospitalizations (an outcome reported as associated with self-management[15]) and is detailed in Table 2. Being a nurse or a respiratory therapist made no difference in the success of the intervention.

Discussion

We recently reported the effectiveness of health coaching in decreasing re-hospitalizations and emergency department visits, and in improving the quality of life up to 12 months in subjects with COPD after the hospital discharge.[3,16] This report extended our initial publication by suggesting that health coaching delivered by a respiratory therapist or a nurse improved self-management abilities as measured by the Chronic Respiratory Disease Questionnaire mastery at 6-month after hospitalization. The improvement in self-management abilities was beyond the minimum clinically important difference (>0.5 points) at 6 months after hospital discharge. There are not many feasible and effective interventions that improve self-management abilities. For example: pulmonary rehabilitation improves self-management abilities but has poor uptake in the post-hospitalization setting. Jones et al[17] reported that only 10% of subjects referred to pulmonary rehabilitation after a hospital stay complete the program (even in a system that covers the costs and transportation). In the outpatient setting, many patients cannot access pulmonary rehabilitation because of transportation, cost, or frailty.[18]

In addition to the lack of effective self-management interventions, the process of self-management is not commonly measured in clinical trials as an outcome. The currently available scales, self-management ability scale[19] the

Table 3. Baseline Clinical and Demographic Characteristics

Characteristic	Control ($n = 107$)	Intervention ($n = 108$)
Age, mean ± SD y	68.1 ± 9.2	67.9 ± 9.8
Site, mean n (%)		
Health Partners	52 (49)	52 (48)
Mayo	55 (51)	56 (52)
Post-secondary education, mean n (%)	48 (48)	55 (54)
Married, mean n (%)	48 (46)	54 (50)
Men, mean n (%)	51 (48)	46 (43)
Continuous supplemental oxygen, mean (%)	32 (34)	40 (40)
Supplemental oxygen, mean (%)	49 (51)	54 (53)
Steroid and/or antibiotic use, mean (%)		
For COPD, in the past 3 mo	78 (87)	89 (91)
In the past 3 mo (≥2)	42 (48)	38 (40)
For COPD, in the past 12 mo	79 (90)	83 (86)
In the past 12 mo (≥2)	61 (71)	61 (69)
Health care utilization, mean (%)		
Hospitalization in the past 12 mo	55 (60)	56 (57)
ED visit in the past 12 mo	52 (59)	54 (56)
Hospitalized and/or ED visit in the past 3 mo	38 (43)	47 (48)
Hospitalized and/or ED visit, COPD related	27 (82)	37 (82)
FEV_1% predicted, mean ± SD	40.3 ± 17.2	40.5 ± 17.1
Total lung capacity, mean ± SD	115.2 ± 25.2	110.0 ± 24.4
Residual volume, mean ± SD	173.7 ± 58.0	174.6 ± 72.8
D_{LCO}, mean ± SD	38.7 ± 23.1	35.8 ± 19.3
mMRC score, mean (%)		
0	3 (3)	2 (2)
1	18 (20)	11 (12)
2	9 (10)	12 (13)
3	51 (57)	62 (67)
4	9 (10)	6 (6)
Comorbidity Index score, mean ± SD	2.4 ± 1.3	2.8 ± 1.5
Chronic Respiratory Disease Questionnaire score, mean ± SD		
Dyspnea	4.4 ± 1.4	4.4 ± 1.2
Fatigue	3.7 ± 1.3	3.6 ± 1.2
Emotional	4.7 ± 1.4	4.6 ± 1.2
Mastery	4.6 ± 1.5	4.4 ± 1.4
Physical	4.1 ± 1.2	4.1 ± 1.1
Daily steps, mean ± SD	2,789.9 (3,000.7)	2,448.0 (2,030.7)
Physical activity level, mean ± SD	1.3 (0.2)	1.3 (0.2)
Time sedentary (<2 METS), mean ± SD	1,220.5 (175.5)	1,239.8 (125.0)
Time light activity (2–4 METS), mean ± SD	130.0 (107.5)	133.4 (115.5)
Time mod activity (4–6 METS), mean ± SD	14.0 (29.0)	8.0 (12.6)
Time vigorous activity (>6 METS), mean ± SD	0.7 (2.5)	0.3 (0.9)
Resting metabolic rate, mean ± SD	1,590.3 (379.4)	1,529.8 (309.7)
Total energy expenditure, mean ± SD	2,069.8 (495.5)	2,016.7 (442.8)

ED = emergency department
FEV_1 = forced expiratory volume in the first second
D_{LCO} = diffusing capacity of the lung for carbon monoxide
mMRC = Modified Medical Research Council Dyspnea Scale
METS = metabolic equivalent

COPD self-efficacy scale,[20] the self-management for COPD scale,[21] and the PRAISE scale,[22] are not used consistently in the clinical trials that had positive results: measuring the self-management process is just missed, which creates a knowledge gap in this important outcome.[15] To promote a more prevalent measure of self-management, there is a need for a simpler and shorter valid self-management measure that can be used not only in research but in
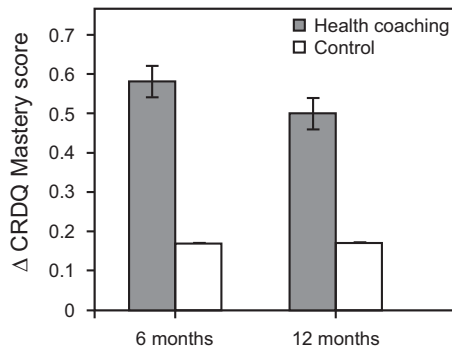
Fig. 1. Change in the Chronic Respiratory Disease Questionnaire (CRDQ) mastery score after hospital discharge in the health coaching arm and in the control arm.

daily practice. In summary, previous reports that documented the beneficial effect of self-management on health-care outcomes[15,23,24] have not been able to document a measure of the self-management process itself or its improvement.

Chronic Respiratory Disease Questionnaire mastery is a good candidate for a self-efficacy measure. It has face validity to measure the self-management process, since measure self-efficacy to deal with COPD, a key measure in the self-management theory.[8] The Chronic Respiratory Disease Questionnaire mastery also measures the ability to cope with difficult and clinically important emotions related to dyspnea. Emotions have been reported to be independently associated with several COPD outcomes, including hospitalizations.[10] We demonstrated that Chronic Respiratory Disease Questionnaire mastery had convergent validity in COPD as associated with hospitalizations (Table 2).

Why Is This Study Meaningful?

In light of the scarcity of feasible methods to improve self-management abilities in COPD, health coaching delivered by a respiratory therapist or a nurse seems a simple intervention that improves self-management. The universal availability of health coaching training and the simplicity of the self-management measure by Chronic Respiratory Disease Questionnaire mastery permits these results to be replicated.

Previous randomized controlled studies on COPD self-management either were unable to demonstrate a decrease in exacerbations or hospitalization rates, or were associated with an increase in mortality.[25-28] Several studies did not measure the process[15][29] which left the self-management process unknown, or there was no difference in self-management.[23,27,30] Importantly, the study by Bischoch et al,[30] which was unable to show a difference in hospitalization rates, used the same measure of self-management, the Chronic Respiratory Disease Questionnaire

mastery, and found no significant differences. In our study, health coaching not only showed effectiveness in decreasing re-hospitalizations and improving quality of life but also the meaningfully improved Chronic Respiratory Disease Questionnaire mastery score. Recently, it was reported that the implementation of a self-management program for patients with advanced COPD reduced exacerbations that required hospital care.[31] The latter indicates that health coaching may improve self-management abilities as we hypothesized. On the contrary, our results were opposed to a recent report that states that supported self-management did not reduce readmission rates at 3 months compared with usual care.[32] We hypothesized that the degree of engagement attained between the patient and the coach we found in our intervention,[16] perhaps supported by the style of communication used through motivational interviewing, was key to our success; however, we acknowledge that our results need replication, which continues to be a limitation in the evidence related to health coaching in COPD.

Limitations

We acknowledge that Chronic Respiratory Disease Questionnaire mastery is not as comprehensive as other measures of self-management, such as the COPD Self-Efficacy Scale[20] or the 30-item Self-Management Ability Scale.[33] However, the Chronic Respiratory Disease Questionnaire mastery construct includes 2 unquestionable self-management abilities: self-efficacy and coping with emotions indicating its face validity. The Chronic Respiratory Disease Questionnaire mastery association at baseline to short-term re-hospitalization (a well-reported outcome on self-management) indicated its predictive validity.

The lack of improvement of self-management abilities with health coaching at 12 months can be seen as a limitation. However, this was also observed with COPD re-hospitalization.[3] We believe that the decrease of health coaching frequency at 3-month after hospital discharge most likely explained the lack of effect at 12 months. Much like other behavioral interventions, for example, pulmonary rehabilitation, its effects fade with time when there is a lack of maintained support. It is possible, as we proposed in the original article,[3] that some individuals need prolonged self-management support through health coaching to maintain the benefits.

Lessons Learned

This work left specific and impactful lessons that were "transpired" in our previous publications about health coaching[3,16,34] but that we would like to summarize here for the benefit of the reader and the dissemination of health coaching itself as clinical practice in COPD. First, health

coaching is feasible. Second, motivational interviewing provides a solid structure to teach coaches to communicate kindly and effectively. Third, participants learn to recognize changes in COPD symptoms that might indicate onset of an exacerbation and, importantly, they learn through the conversations with the health coach to have an action plan to deal with exacerbations (the latter includes the use of mindful pursed-lip breathing for better breathing and relaxation, and a medication plan that includes nebulization antibiotics and prednisone). Fourth, we envision the implementation of health coaching in practice by using currently available "Complex Care Management Codes (CPT 99487, 99489, and 99490)" now supported by Medicare that can make health coaching feasible and at no or minimum cost for the patient. We are currently actively working on such implementation.

Conclusions

Health coaching based on motivational interviewing principles may improve clinically meaningful self-management abilities: self-efficacy to deal with COPD and to cope with difficult emotions. The reported improvement in self-management abilities, its feasibility, and its effectiveness make health coaching a candidate intervention to incorporate not only in the post-hospitalization period but in other settings, such as ambulatory COPD care and pulmonary rehabilitation. We propose the Chronic Respiratory Disease Questionnaire mastery as a simple measure of self-management abilities given its validity and frequency of use in many practice settings and clinical trials. Addressing mindful patient communication not only can improve health-care utilization outcomes but also emotional and social outcomes, for example, loneliness, which has become an important risk factor for morbidity in COPD and our society.[35]

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