Randomized Controlled Trial of Health Coaching for Vulnerable Patients with Chronic Obstructive Pulmonary Disease

David H. Thom¹, Rachel Willard-Grace¹, Stephanie Tsao², Danielle Hessler¹, Beatrice Huang¹, Denise DeVore¹, Chris Chirinos¹, Jessica Wolf¹, DorAnne Donesky³, Chris Garvey^{3,4}, and George Su⁵

¹Department of Family and Community Medicine, ⁴Department of Physiological Nursing, and ⁵Pulmonology, Critical Care, Allergy and Sleep Medicine Program, Department of Medicine, University of California, San Francisco, San Francisco, California; ²San Francisco Department of Public Health, San Francisco, California; and ³University of California San Francisco at Mount Zion Sleep Disorders Center, San Francisco, California

ORCID IDs: 0000-0002-8051-6757 (D.H.T.); 0000-0002-6425-681X (B.H.); 0000-0001-8526-2533 (C.G.); 0000-0001-7233-8981 (G.S.).

Abstract

Rationale: Socioeconomically disadvantaged patients with chronic obstructive pulmonary disease (COPD) often face barriers to evidence-based care that are difficult to address in public care settings with limited resources.

Objectives: To determine the benefit of health coaching for patients with moderate to severe COPD relative to usual care.

Methods: We conducted a randomized controlled trial of 9 months of health coaching versus usual care for English- or Spanish-speaking patients at least 40 years of age with moderate to severe COPD. Primary outcomes were COPD-related quality of life and the dyspnea subscale of the Chronic Respiratory Disease Questionnaire. Secondary outcomes were self-efficacy for managing COPD, exercise capacity (6-min walk test), and number of COPD exacerbations. Additional outcomes were COPD symptoms, lung function (forced expiratory volume in 1 s percent predicted), smoking status, bed days owing to COPD, quality of care (Patient Assessment of Chronic Illness Care), COPD knowledge, and symptoms of depression (Patient Health Questionnaire). Outpatient visits, emergency department visits, and hospitalizations were assessed by review of medical records.

Generalized linear modeling was used to adjust for baseline values and account for clustering by clinic.

Results: Of 192 patients enrolled, 158 (82%) completed 9 months of follow-up. There were no significant differences between study arms for the primary or secondary outcomes. At 9 months, patients in the coached group reported better quality of care (mean Patient Assessment of Chronic Illness Care score, 3.30 vs. 3.18; adjusted $P = 0.02$) and were less likely to report symptoms of moderate to severe depression (Patient Health Questionnaire score, ≥ 15) than those in the usual care arm (6% vs. 20%; adjusted $P = 0.01$). During the study, patients in the coaching arm had 48% fewer hospitalizations related to COPD (0.27/patient/yr vs. 0.52/patient/yr), but this difference was not significant in the adjusted analysis.

Conclusions: These results help inform expectations regarding the limitations and benefits of health coaching for patients with COPD. They may be useful to health policy experts in assessing the potential value of reimbursement and incentives for health coaching-type activities for patients with chronic disease.

Clinical trial registered with www.clinicaltrials.gov (NCT02234284).

Keywords: self-management; motivational interviewing; quality of life; hospitalization; depression

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Correspondence and requests for reprints should be addressed to David H. Thom, M.D., Ph.D., Department of Family and Community Medicine, University of California, San Francisco, 1001 Potrero Avenue, Building 80, Ward 83, San Francisco, CA 94110. E-mail: david.thom@ucsf.edu.

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Chronic obstructive pulmonary disease (COPD) is a common condition causing substantial morbidity and mortality (1). Evidence-based care can substantially reduce disease burden, improve quality of life, and prevent emergency visits and hospitalizations for disease exacerbations (2). Despite the widespread availability of internationally recognized recommendations for evidence-based care (3), more than one-third of patients with COPD do not receive the recommended care (4–6). These care gaps are even more pronounced for vulnerable low-income and minority patients (7) and likely contribute to disparities in COPD-related morbidity and mortality (8, 9).

Reasons for the gap between evidence-based and actual care include clinician, system, and patient factors. Primary care clinicians are often not aware of guideline recommendations (10) and lack the time necessary for the evaluation and tracking needed to deliver guideline-based care (2). System barriers include limited access to specialist consultation and lack of team support for management of patients with COPD. Patient barriers to better management include lack of knowledge, confidence, and personal support (9, 11, 12) and time and transportation barriers that make it difficult to attend classes or group support activities (13).

Although studies of integrated disease management programs for patients with COPD have shown benefit (14), such support programs are generally not sustainable in resource-limited federally qualified health centers (FQHCs) serving vulnerable low-income and minority patients. FQHCs generally do not have on-site access to pulmonary specialists, and most cannot afford to hire nurses or respiratory therapists to conduct patient education at the clinic level. Health coaching by unlicensed health workers trained as coaches could potentially provide similar benefits at lower cost. Health coaching has emerged as an effective model to improve management of other chronic conditions, particularly for low-income and vulnerable patients (15–23). Health coaching can potentially address several of the barriers to evidence-based care for patients with COPD, including limited access, poor coordination of care, distrust of and lack of engagement with the healthcare system (24), missed appointments,

inadequate adherence to treatment (25), and poor patient–provider communication (26). Although a small number of randomized trials have evaluated a health coaching–based intervention for patients with COPD (27–33), none has evaluated the impact of health coaching by nonlicensed health workers for low-income and vulnerable patients with COPD in the primary care setting. We therefore conducted a randomized controlled trial comparing health coaching plus usual care with usual care alone for low-income and vulnerable patients with COPD.

Methods

The Aides in Respiration Health Coaching for COPD (AIR) study was a randomized controlled trial of health coaching versus usual care for patients with moderate to severe COPD. A detailed description of the study protocol was previously published (34), and the protocol is available from www.clinicaltrials.gov. The study was approved by the University of California, San Francisco Committee on Human Research (14-12872). Informed consent was obtained from all study participants.

Setting

The AIR study was conducted between November 12, 2014, and May 6, 2017, at seven urban public health primary care clinics in San Francisco designated as “FQHC look-alikes” by the Health Resources and Services Administration. Five clinics were in the community, and two were located at the county hospital medical campus.

Participants

Patients were eligible for enrollment if they had been seen at least once in the past 12 months, were age 40 years or older, spoke Spanish or English, and had at least moderate COPD. A diagnosis of COPD was confirmed by the study pulmonologist (G.S.), blinded to allocation arm, on the basis of forced expiratory volume in 1 second (FEV₁)/forced vital capacity (FVC) ratio and other clinical criteria. A determination of having at least moderate COPD was made on the basis of meeting at least one of the following criteria: 1) one or more hospital admissions, two or more emergency department (ED) visits, or prescription of

oral steroids for a COPD exacerbation in the past 12 months; 2) a current prescription of an anticholinergic or combination inhaled corticosteroid and long-acting β -agonist; 3) ever having used home oxygen or meeting criteria for home oxygen; or 4) ever having an FEV₁ less than 80% predicted.

Recruitment, Enrollment, and Randomization

Potentially eligible patients were identified primarily through review of the electronic records from the previous 24 months for the seven clinics and the county hospital and ED. Patients with a COPD-related diagnosis (*International Classification of Diseases, Ninth Revision* [ICD-9], codes 491, 492, 496, 490 + 305.1, 493 + 305.1, 786 + 305.1; or ICD-10 codes J42, J43, J44, J40 + Z72, J45 + Z72, R06 + Z72) were assessed by review of electronic health record and their primary care provider (PCP) (Figure 1). A research assistant (RA) attempted to contact the patients not excluded to conduct additional eligibility screening. Eligible patients interested in the study met with the RA at their primary care clinic for informed consent provision and study enrollment. Patients were randomized individually, stratified by clinic, in permuted blocks of 10 for each clinic using the random number function in the Excel 2012 software program (Microsoft). Randomization by the individual, rather than by clinic, was chosen to enhance recruitment of clinics by being able to offer coaching for some patients at each participating clinic. After obtaining baseline measurements (survey, 6-min walk test, and spirometry if possible), the RA opened the next sequentially numbered envelope containing the study arm assignment.

Health Coaching Training and Fidelity

We used the health coaching model developed at our institution to train unlicensed health workers to support patient self-management using commonly recognized patient-centered techniques such as motivational interviewing and action planning (34, 35). The two study health coaches were college graduates bilingual in Spanish and English without medical training or certification. Coaches received approximately 100 hours of training over 3 months. COPD-specific training was delivered by two pulmonary specialists and covered the physiology of

Figure 1. Consolidated Standards of Reporting Trials diagram. COPD = chronic obstructive pulmonary disease.

COPD; related comorbidities; Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines; and COPD management, including lifestyle changes. Upon completion of training, coaches were

required to score at least 90% on three examinations assessing content knowledge and to demonstrate mastery of coaching skills through simulated role plays and observed health coaching sessions. The

project manager observed health coaches, both immediately after training and periodically during the study, using a standardized checklist and providing immediate feedback to the coaches.

Health Coaching Arm

Patients randomized to the health coaching arm received health coaching for 9 months. Each health coach worked with a total of 50 patients with a maximum caseload of 30 patients at any given time. Health coaches were expected to complete an initial visit within 2–3 weeks of enrollment; to meet in person with the patient at least three additional times over the course of the study; and to have a phone check-in call at least every 3 weeks, including within 2 weeks after each medical visit (minimum of 13 phone check-ins over 9 mo). In-person visits could be at the clinic, at the patient's home, or at a public location that afforded sufficient privacy. Additional contacts were guided by patient needs and preferences. Coaches were also expected to conduct at least one in-depth consultation with the study pulmonary nurse practitioner specialist and to attend medical visits between the patient and their PCP when possible. Health coaching focused on helping patients identify and achieve self-care goals for their COPD using techniques from motivational interviewing and adult learning models. Specific content included COPD education, action planning for exacerbations, teaching proper inhaler use, and facilitating consultation with a pulmonary nurse practitioner specialist. Further details are available in a previous paper (34).

Usual Care Arm

Patients randomized to usual care continued to have visits with their PCP over the course of the 9-month period. They received any resources their provider and their clinic offered as part of standard care, including access to COPD educators, respiratory therapists, COPD education classes, pulmonary rehabilitation, smoking cessation classes, and pulmonary specialist referrals by the primary care clinician.

Patient and Stakeholder Engagement

Study investigators and staff met with clinic leaders, clinicians, and staff at each clinic site during the planning and execution of the study. A study advisory board comprised of patients with COPD, clinicians, nurse educators, health coaches, and delivery system leaders met before the start of the study and every 6 months during the course of the study. In addition, the research team included a patient partner with COPD who participated in health coach training and

health coach support during the study and attended monthly meetings of the core research team.

Data and Safety Monitoring

A data and safety and monitoring board (DSMB) was established before recruitment. The DSMB consisted of a pulmonary nurse specialist, a primary care physician, and an epidemiologist. As directed by the DSMB, the research team reported ED visits and hospitalizations quarterly and participant deaths within 30 days over the course of the study.

Data Collection

The study survey, spirometry, and exercise capacity testing were administered in person by an RA at baseline and again at 9 months. In addition, patients completed a brief telephone survey at 3 and 6 months, which measured COPD-related quality of life, number of days in bed for all or most of the day in the past 4 weeks owing to COPD (bed days), and smoking status. Medical records were reviewed for the presence of comorbid conditions (alcohol abuse, substance abuse, coronary artery disease, heart failure, diabetes, asthma, and obstructive sleep apnea). Patients received a gift card for completion of measures at baseline (\$30), 3 and 6 months (\$10), and 9 months (\$60).

Outcome Measures

The primary outcomes were overall COPD-related quality of life (mean item score, 1–7; minimal clinically important difference [MCID], 1.0) and dyspnea domain score (mean item score, 1–7; MCID, 0.5) measured by the short form of the Chronic Respiratory Disease Questionnaire (CRQ-SF) (36, 37), which has been validated in multiple studies (38, 39). Secondary outcomes were the number of COPD exacerbations (defined as worsening of respiratory symptoms resulting in prescription of an antibiotic and steroid medication, an ED visit, or a hospitalization) (29), exercise capacity measured using the standardized 6-minute walk test (40, 41), and self-efficacy for COPD management measured using a validated six-item scale (mean item score, 1–10) (42).

Additional prespecified outcomes were COPD symptoms and functional capacity (COPD Assessment Test total score, 0–40; MCID, 2.0) (43–45), lung function measured by spirometry as the percent predicted FEV₁, current smoking status

defined as any self-reported cigarette use in the past 30 days, and number of bed days owing to respiratory problems in the past 4 weeks. Knowledge of COPD was measured as the percentage of correct responses to four questions developed for the present study. Patient-reported quality of care was measured using the Patient Assessment of Chronic Illness Care (mean item score, 1–8) (46, 47). ED visits and hospitalizations for COPD exacerbations and for other reasons were identified by review of participants' electronic medical records from the participating clinics and the county hospital, as well as from outside facilities for ED visits and hospitalizations identified by patients at baseline and over the course of the study. Records were reviewed by study co-principal investigators, a family physician (D.H.T.), and a pulmonologist (G.S.), blinded to study arm assignment. Symptoms of depression were assessed using the eight-item version of the Patient Health Questionnaire, with a score of 15 or greater indicating moderately severe depressive symptoms (48).

Blinding

Blinding of patients and clinical teams was not feasible, owing to the nature of the intervention. Although RAs were trained to gather unbiased data, it was not possible to completely blind them to study arm, because we could not prevent patients from revealing that they worked with a health coach. Initial data analyses, including all prespecified outcomes, were conducted blinded to study arm.

Sample Size

The target sample size of 190 patients provided approximately 80% power to detect an MCID of 0.5 in the CRQ-SF dyspnea domain score (37) and 22% for the number of COPD exacerbations (49) and a power greater than 90% for differences of 1.0 in the CRQ-SF total score (37) and of 50 m in the 6-minute walk test (50).

Analysis

Baseline participant characteristics were compared between study arms and tested for significance using chi-square tests for categorical variables, *t* tests for normally distributed continuous variables, and appropriate nonparametric tests for nonnormally distributed continuous variables. Outcomes were compared by

group assignment (intention to treat) using generalized linear models with a normal distribution with identity link for continuous outcomes, Poisson distribution with log link for count outcomes, and binomial distribution with logit link for binary outcomes. Hypothesis tests were two sided, with *P* values less than 0.05 considered statistically significant. A robust standard error was used to account for clustering and accommodate missing data under the assumption that the outcomes are missing at random (51–55). In all models, baseline levels of the outcome were entered as a predictor and follow-up levels as the dependent variable. Event rates (exacerbations, outpatient visits, ED visits, and hospitalizations) are reported as events per person per year and adjusted for baseline rate and for clustering by participant because patients could have more than one event.

The following planned sensitivity analyses were conducted: 1) repeating primary analyses with multiple imputation procedures; 2) limiting intervention participants to those who received a prespecified minimal amount of the intervention, defined as at least seven health coach contacts, at least three of which were in person; and 3) adjusting for season of enrollment, patient age, race, and sex as well as baseline variables that differed between study arms at *P* < 0.10. Heterogeneity of effects was examined for three prespecified subgroups: English versus Spanish as primary language, current smokers versus other, and GOLD category D COPD (high symptoms and high risk) versus other (3).

Results

Recruitment and enrollment flow are shown in the Consolidated Standards of Reporting Trials diagram (Figure 1). Of 2,504 patients identified as potentially having COPD on the basis of codes used for visits in the past 2 years, 1,478 (59%) were excluded, most often because they did not meet criteria for at least moderate-severity COPD. An RA was able to contact 661 (64%) of the 1,026 remaining patients, 282 of whom were determined to be eligible. Ninety either explicitly declined enrollment or missed their enrollment appointment(s) and could not be successfully rescheduled; the remaining 192 patients were enrolled. Over 93% (*n* = 179) had COPD confirmed by an FEV₁/FVC ratio less than 0.70; the

remaining 13 were diagnosed on the basis of a combination of other criteria (e.g., FEV₁/FVC ratio between 0.70 and 0.74 plus clinical history and highly suggestive of COPD) by the study pulmonologist. Outside hospitals responded to 91.5% of our requests for medical records.

Patients known to be eligible but not enrolled were significantly older than those enrolled (65.9 vs. 61.6 yr; *P* < 0.001), but they were similar on all other available measures. Attrition at 9-month follow-up was 9.8% in the usual care arm and 25% in the health coaching arm. There were no significant differences between study arms in baseline characteristics (including demographics and markers of disease severity) for patients who dropped out of the study. Baseline characteristics of participants and levels of outcome variables

were similar between the study arms (Tables 1 and 2), with the exception of the number of hospitalizations for COPD in the previous 12 months, which was more than twice as high in the usual care group (0.34/person/yr vs. 0.13/person/yr), though this difference was not significant after adjustment for individual clustering.

Overall, 95% of patients in the coached arm had at least 3 contacts with a health coach, and 77% met the goal of 13 or more contacts (Table 3). Over 80% had five or more in-person visits, and 82% had at least one visit, with their PCP at which their health coach was present. Eighty-nine percent of patients received a consultation from the pulmonary nurse practitioner specialist, either in person (19%) or via presentation of the patient by the health coach (70%).

Table 1. Characteristics of participants at baseline

Characteristic	All (<i>n</i> = 192)	Coaching Arm (<i>n</i> = 100)	Usual Care (<i>n</i> = 92)
Age, yr	61.3 (7.6)	60.7 (8.0)	61.9 (7.2)
Demographic and medical			
Male sex	126 (65.5%)	67 (67.0%)	59 (64.1%)
Less than high school education	61 (31.9%)	27 (27.0%)	34 (37.4%)
Married or long-term relationship	65 (34.0%)	36 (36.0%)	29 (31.9%)
Born outside United States	34 (17.8%)	13 (13.0%)	21 (23.1%)
Spanish speaker	18 (9.4%)	7 (7.0%)	11 (12.1%)
Employment status			
Works full/part time outside the home	34 (17.8%)	16 (16.0%)	18 (19.8%)
Retired	64 (33.5%)	32 (32.0%)	32 (35.2%)
On disability	69 (36.1%)	38 (38.0%)	31 (34.1%)
Other (homemaker, unemployed)	24 (12.6%)	14 (14.0%)	11 (12.0%)
Income <\$10,000/yr	84 (45.7%)	44 (45.8%)	40 (45.5%)
Race (detailed)			
White	41 (21.4%)	29 (29.0%)	12 (13.0%)
African American	109 (56.7%)	53 (53.0%)	56 (60.9%)
Asian	7 (3.7%)	2 (2.0%)	5 (5.4%)
Native American	4 (2.1%)	2 (2.0%)	2 (2.2%)
Pacific Islander	3 (1.6%)	1 (1.0%)	2 (2.2%)
Other	28 (14.6%)	13 (13.0%)	15 (16.3%)
Hispanic/Latino ethnicity	32 (16.7%)	13 (13.0%)	19 (20.7%)
Less than full health literacy*	71 (37.2%)	39 (39.0%)	32 (35.2%)
General health less than very good	162 (84.4%)	82 (83.0%)	79 (85.9%)
Medicaid only	108 (56.2%)	59 (59.0%)	49 (53.3%)
Lives alone	91 (47.6%)	49 (49.0%)	42 (46.2%)
Housing insecurity or homelessness	25 (13.0%)	13 (13.0%)	12 (13.0%)
Comorbid conditions			
Alcohol abuse	33 (17.2%)	17 (17.0%)	16 (17.4%)
Substance abuse	55 (28.7%)	26 (26.0%)	29 (31.5%)
Coronary artery disease	17 (8.9%)	8 (8.0%)	9 (9.8%)
Heart failure	23 (12.0%)	13 (13.0%)	10 (10.9%)
Diabetes	44 (22.9%)	19 (19.0%)	25 (27.2%)
Asthma	53 (27.6%)	29 (29.0%)	24 (26.1%)
Obstructive sleep apnea	19 (9.9%)	7 (7.0%)	12 (13.0%)

Note: Percentages may not add to 100%, owing to missing data. Data are presented as mean (standard deviation) or number (percent).

*Defined as needing someone help read medical information at least a little of the time (60).

Table 2. Baseline levels of outcome variables

Outcome	Coaching Arm (n = 100)	Usual Care Arm (n = 92)
Primary		
CRQ-SF total score	4.24 (1.22)	4.28 (1.23)
CRQ-SF dyspnea subscale score	4.39 (1.46)	4.63 (1.45)
Secondary		
Incidence of exacerbations per person-year	0.95 (1.57)	0.92 (1.34)
Exercise capacity, m	305.0 (83.1)	292 (77.5)
Self-efficacy for managing COPD score	6.36 (2.23)	6.45 (2.11)
Others prespecified		
COPD symptoms score	20.6 (8.34)	20.9 (7.41)
Lung function (FEV ₁ , % predicted)	0.55 (0.19)	0.60 (0.20)
Currently smoking	54 (54.6%)	45 (52.9%)
Bed days owing to COPD in past 4 wk	2.75 (6.44)	3.86 (6.86)
Knowledge of COPD score	3.23 (0.83)	3.07 (0.89)
Patient-reported quality of care score	3.58 (0.98)	3.29 (1.20)
Use 1 yr before enrollment per person-year		
Outpatient visits	6.62 (5.43)	6.53 (4.08)
ED visits for not for COPD	1.12 (2.52)	0.62 (1.29)
ED visits for COPD	0.54 (1.26)	0.62 (1.19)
Hospitalizations not for COPD	0.21 (0.57)	0.18 (0.44)
Hospitalizations for COPD	0.13 (0.39)	0.34 (0.77)
Reported <i>post hoc</i>		
Symptoms of moderate to severe depression	13 (13.0%)	17 (18.7%)

Definition of abbreviations: COPD = chronic obstructive pulmonary disease; CRQ-SF = short form of the Chronic Respiratory Questionnaire; ED = emergency department; FEV₁ = forced expiratory volume over 1 second.

Data are presented as mean (standard deviation) or number (percent).

There were no significant differences between study arms for any of the primary outcomes or for the secondary outcomes with the exception of patient-reported quality of care (Table 4). Over the course of the 9-month study period, the incidence of all ED visits, both related and not related to COPD, was similar in the two study arms, as was the incidence of non-COPD hospitalizations. COPD-related hospitalizations were nearly twice as common for patients in the usual care arm (0.52 vs. 0.27 per person per yr), but this difference was not significant once adjusted for differences in the hospitalizations for

COPD exacerbations in the 12 months before enrollment. At 9 months, usual care patients were over three times as likely to report symptoms of moderate or severe depression as were patients in the coached arm (19.5% vs. 5.6%; adjusted $P = 0.01$).

Table 5 shows outcomes tracked at 3, 6, and 9 months after enrollment. The proportion of current smokers declined somewhat more rapidly in the coached arm (Figure 2). Adjusting for baseline and clustering by site, this difference reached statistical significance at 3-month (adjusted difference, -37% ; 95% confidence interval,

-71% to -3.0% ; $P = 0.02$) and 6-month follow-up (adjusted difference, -26% ; 95% confidence interval, -52% to -1.0% ; $P = 0.05$), but it was no longer significant at 9 months. There was a trend for smokers in the coached arm being more likely to receive a prescription for tobacco cessation medications over the course of the study, controlling for baseline level of tobacco cessation medications (adjusted $P = 0.07$).

The patterns of results reported above remained essentially unchanged when analyses were repeated using imputation of missing data, using per-protocol analysis, or after adjustment for additional baseline variables as described in the METHODS section. There were no significant differences in treatment effect between the prespecified subgroups.

Discussion

Despite the promise of health coaching as a means to address barriers to care for patients with COPD, we did not find any significant differences between study arms for any of the primary or secondary outcomes, with the exception of patient-reported quality of care, which was higher in the coaching arm. In *post hoc* analyses, we found a significant reduction in the proportion of patients with symptoms of moderate to severe depression in the health coaching group. The proportion of current smokers decreased substantially in both study arms from baseline to 9 months, with the drop occurring earlier in the health coaching group.

To place our results in the context of previous research, we identified seven studies that examined the impact of individual coaching for patient self-management support based on one or more models for patient-centered behavioral change (e.g., transtheoretical model with motivational interviewing [56, 57] or self-regulation theory [58]). Three of these studies also reported essentially negative overall results (27–30), though one showed a *post hoc* subgroup effect (29, 30). A fourth study, in which the intervention was delivered by a clinical pharmacist, resulted in significantly fewer hospital admissions, ED visits, and unscheduled primary care appointments for COPD, as well as better disease-specific quality of life (31). Two studies using a multidisciplinary team found significant improvement in patient

Table 3. Intensity of health coaching (n = 100)

Coaching Activity	Median (Interquartile Range)	Goal	Meeting Goal (n [%])
All contacts	24 (15–41)	≥ 13	77 (77.0)
In-person visits	9 (6–14)	≥ 5	82 (82.0)
Medical visits with PCP	2 (1–4)	≥ 1	82 (82.0)
Consultation with PNPS	N/A	1	89 (89.0)

Definition of abbreviations: N/A = not applicable; PCP = primary care provider; PNPS = pulmonary nurse practitioner specialist.

Table 4. Outcomes at 9 months, by study arm

Outcomes	Coached	Usual Care	Difference	Adjusted* Difference	Adjusted* 95% CI	P Value
Primary						
CRQ-SF total score	4.58 (1.25)	4.43 (1.28)	0.15	0.14	−0.15 to 0.43	0.35
CRQ-SF dyspnea subscale score	4.98 (1.39)	4.78 (1.49)	0.20	0.26	−0.13 to 0.65	0.20
Secondary						
Incidence of exacerbations per person-year	1.17 (1.87)	1.44 (2.16)	−0.27	−0.21	−0.49 to 0.07	0.13
Exercise capacity, m	326 (68.3)	311 (73.8)	15.00	8.53	−8.18 to 25.28	0.32
Self-efficacy for managing COPD score	6.84 (2.01)	6.50 (2.00)	0.34	0.30	−0.23 to 0.83	0.27
Others prespecified						
COPD symptoms score	19.1 (8.80)	20.2 (9.25)	−1.10	−0.83	−2.78 to 1.12	0.40
Lung function (FEV ₁ , % predicted)	0.55 (0.20)	0.59 (0.21)	−0.04	0.00	−0.03 to 0.03	0.98
Currently smoking	29 (39.2%)	34 (42.0%)	−2.8%	−11.5%	−33.3% to 10.2%	0.30
Bed days owing to COPD in past 4 wk	2.15 (5.76)	3.64 (8.81)	−1.49	−0.73	−2.07 to 0.62	0.29
Knowledge of COPD score	3.30 (0.75)	3.18 (0.83)	0.12			
Patient-reported quality of care score	3.91 (0.95)	3.44 (1.17)	0.47	0.38	0.07 to 0.68	0.02
Use 1 yr before enrollment per person-year						
Outpatient visits	7.51 (5.64)	6.83 (4.73)	0.68	0.48	−0.32 to 1.28	0.52
ED visits for not for COPD	0.98 (1.89)	0.83 (2.33)	0.15	−0.08	−0.56 to 0.40	0.80
ED visits for COPD	0.80 (1.63)	0.89 (1.99)	−0.09	−0.05	−0.32 to 0.22	0.78
Hospitalizations not for COPD	0.16 (0.58)	0.21 (0.81)	−0.05	−0.08	−0.20 to 0.04	0.37
Hospitalizations for COPD	0.27 (0.77)	0.52 (1.25)	−0.25	−0.13	−0.32 to 0.06	0.35
Reported <i>post hoc</i>						
Symptoms of moderate to severe depression	4 (5.6%)	16 (19.5%)	−13.9%	−18.9%	−33.1% to −4.8%	0.01

Definition of abbreviations: CI = confidence interval; COPD = chronic obstructive pulmonary disease; CRQ-SF = short form of the Chronic Respiratory Questionnaire; ED = emergency department; FEV₁ = forced expiratory volume over 1 second.

Data are presented as mean (standard deviation) or number (percent).

*Adjusted for baseline levels of variable and for clustering.

COPD-related quality of life and in patient assessment of their knowledge about COPD (32, 59). The seventh study found that health coaching over eight weekly sessions by a registered nurse or respiratory therapist after hospitalization for a COPD exacerbation resulted in significantly fewer hospital admissions for COPD, better COPD-related quality of life, and fewer COPD exacerbations (33).

The improvement in patient-reported quality of chronic illness care seen in our study may be due to the emphasis of health coaching on several aspects of care quality measured by the Patient Assessment of Chronic Illness Care, specifically goal setting, shared decision making, care planning, and follow-up between visits. None of the seven studies reported on quality care. We also found a significant

decrease in the proportion of patients with symptoms of moderate to severe depression, in contrast to the one study that measured symptoms of depression (29), which found no difference between study arms.

Viewing the results from the AIR study in the context of previous studies of health coaching or similar interventions for patients with COPD suggests several implications. Although the

Table 5. Outcomes at baseline and at 3, 6, and 9 months, by study arm

	Health Coaching (Mean [SD] or n [%])				Usual Care (Mean [SD] or n [%])			
	Baseline	3 Mo	6 Mo	9 Mo	Baseline	3 Mo	6 Mo	9 Mo
CRQ-SF total score	4.24 (1.22)	4.42 (1.44)	4.69 (1.38)	4.58 (1.2)	4.28 (1.23)	4.41 (1.37)	4.47 (1.34)	4.43 (1.28)
CRQ-SF dyspnea score	4.39 (1.46)	4.62 (1.64)	4.83 (1.66)	4.98 (1.39)	4.63 (1.45)	5.00 (1.50)	4.72 (1.60)	4.78 (1.49)
Bed days owing to COPD in past 4 wk	2.75 (6.44)	4.82 (8.56)	3.38 (6.52)	2.15 (5.76)	3.86 (6.86)	3.44 (6.09)	4.02 (6.39)	3.64 (6.81)
Currently smoking	54 (54.6%)	28 (39.4%)*	31 (40.3%)*	29 (39.2%)	45 (52.9%)	34 (48.6%)*	34 (48.6%)*	34 (42.0%)

Definition of abbreviations: COPD = chronic obstructive pulmonary disease; CRQ-SF = short form of the Chronic Respiratory Questionnaire; SD = standard deviation.

*Difference by study arm significant at $P < 0.05$.

Figure 2. Percentage of patients currently smoking by self-report over the course of the study.

impact on disease-specific quality of life and dyspnea trended in favor of the health coaching group, the results suggest that any quality of life–related benefit of health coaching in our model is likely to be small. It is notable that all four previous studies showing a benefit used licensed health professionals, and two used a team rather than a single coach. In contrast, our study used a single unlicensed health worker as a health coach. These results suggest that healthcare professionals may be more effective at improving quality of life for patients with COPD than coaching provided by a single unlicensed health worker.

Limitations

A potentially important limitation of our study design was that patients, rather than PCPs or clinics, were randomized. As a result, many PCPs had patients in both study arms, creating a potential “halo effect” whereby patients in the usual care group may have benefited from the presence of health coaching. For example, PCPs received recommendations to improve medication regimens in accordance with international guidelines, and this may have caused them to change their care of other patients with COPD. In addition, the differences in rates of smoking cessation

should be interpreted with caution because the study did not include biochemical verification. We did not find any difference between study arms in the characteristics of patients who dropped out of the study, which is reassuring that the differential dropout rate did not bias our results. The higher dropout rate in the coached arm may be due in part to a higher participation burden in the coached group.

Conclusions

After 9 months, patients in the coached group reported receiving higher quality of care and were less likely to report symptoms of moderate to severe depression, but they did not significantly differ from the usual care group for other outcomes. The nearly 50% lower incidence of hospitalizations for COPD in the coached group in the present study is encouraging, particularly given its potential impact on healthcare cost, but it was not significant when adjusted for baseline difference in this outcome. These results should be helpful to FQHCs that already use health coaching or that are interested in implementing a health coaching program at their clinic for patients with COPD, and they may be useful to health policy experts in assessing the

potential value of reimbursement and incentives for health coaching–type activities for patients with chronic disease. A future study should examine if health coaching is more effective if delivered by a licensed professional. ■

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