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Improving asthma self-efficacy: Developing and testing a pilot community-based asthma intervention for African American adults

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Abstract

Background—Low-income African American adults in Chicago have disproportionately high asthma morbidity and mortality rates. Interventions that improve asthma self-efficacy for appropriate self-management behaviors may ultimately improve asthma control in this population.

Objective—To pilot test an intervention to improve asthma self-efficacy for appropriate self-management behaviors.

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Key Messages

• A behavioral randomized controlled pilot trial of a community intervention that includes home visits and group sessions is acceptable and feasible in this high-risk population.

• Asthma self-efficacy and asthma self-management skills can be improved in low income African-American adults with symptomatic asthma. These changes could result in reduced asthma morbidity.

Methods—Participants for this trial were recruited through two primary care clinics located in the largest African American community in Chicago. Participants were then randomized into two groups. The control group received mailed asthma education. The intervention group was offered 4 group sessions lead by a community social worker and 6 home visits by community health workers. Telephone interviews were conducted at baseline (pre-intervention), 3 months (post-intervention), and 6 months (maintenance).

Results—The 42 participants were predominantly African American, low income, and had poorly controlled persistent asthma. The intervention group had significantly higher asthma self-efficacy at 3 months ($p<0.001$) after the completion of the intervention. Asthma action plans were more common in the intervention group at 3 months ($p=0.06$). At 6 months, the intervention group had improved asthma quality of life ($p=0.002$), and improved coping ($p=0.01$) compared to controls. Trends in behavioral and clinical outcomes favored the intervention group but were not statistically significant.

Conclusions—This community-based asthma intervention improved asthma self-efficacy, self-perceived coping skills, and asthma quality of life for low income African American adults. Larger trials are needed to test the efficacy of this intervention to reduce asthma morbidity in similar high-risk populations.

Keywords

Adult asthma; Asthma self-efficacy; Behavioral randomized controlled trial; African-American; Low income; Community Health Worker

Introduction

Asthma is a common and costly disease which disproportionately affects African Americans. In Chicago, the problem has reached epidemic proportions with prevalence, morbidity, and mortality rates significantly higher than the national average, especially for minorities.[1-4] A recent assessment of health care utilization data in Chicago from 1992-2004 showed little improvement in these disparities over the past decade.[4] African American residents of Chicago are nearly eight times more likely to die from asthma than White residents and asthma hospitalization rates in African American neighborhoods from 1992-2001 remained more than three times higher than in White neighborhoods.[4]

Despite the evidence that asthma self-management interventions improve asthma morbidity,[5-8] rigorous studies of asthma self-management interventions in high risk minority populations are lacking. In addition, the actual mechanism of how to induce behavioral change for improved disease management remains poorly understood. Asthma knowledge is important for effective self management[9] but alone is insufficient to change behavior.[10-11] Self-efficacy, or the belief that one will be effective at performing a behavior or mechanical skill, is theorized to be an important requisite for health behavioral change in asthma.[12-14]

The Chicago Initiative to Raise Asthma Health Equity (CHIRAH) investigators designed this community-based intervention specifically to improve asthma self-efficacy in an understudied high risk population. We describe the intervention development process, the pilot behavioral randomized controlled trial that tested the intervention, and the intervention impact on asthma self-efficacy for African American adults with poorly controlled persistent asthma. We also explore the influence of the intervention on asthma self-management behaviors and clinical outcomes, and the relationship between changes in asthma self-efficacy and these outcomes.

Methods

Intervention Development

The intervention was informed by self-efficacy and social learning theory[14] in which social/group persuasion, peer modeling, and repeated practice build self-efficacy. We chose group education sessions because peer-led group sessions focusing on adaptive behaviors in chronic conditions have been shown to decrease hospital visits and improve self-efficacy in a well-educated, insured adult population.[15-16] We selected a social worker to lead these group sessions based on outcomes from the National Cooperative Inner-City Asthma Study (NCICAS).[17] We also included a community health worker (CHW) component because CHW interventions have shown improved asthma outcomes in minority populations.[18-21]

The CHIRAH intervention was developed using focus groups and several pilot attempts which resulted in modifications to the intervention prior to conducting the final pilot. The first pilot, conducted from August of 2004 to January of 2005, consisted of sessions led by a former teacher who was certified to deliver the Lorig curriculum of chronic disease self-management through the established 24 hour training.[15-16] Focus groups with participants (n=12) confirmed that the group format provided support for behavioral change, but they also showed that participants maintained a deficit in asthma-specific knowledge which might interfere with active self-management of their condition. We then conducted a second pilot, a randomized controlled trial of the modified intervention, which started February of 2006 but was prematurely stopped in April of 2006. The second pilot intervention consisted of 6 group sessions and 8 CHW home visits. The group sessions combined asthma-specific self-management skills with sessions to enhance asthma knowledge. Home visits from CHWs were designed to tailor the intervention to the needs of each participant. Participants included African American adults with asthma and parents of children with asthma (n=47) recruited from the larger CHIRAH cohort. This effort was stopped prematurely because of low attendance at group sessions and difficulty scheduling home visits. Debriefing with the intervention team suggested that financial compensation for participants' time and effort was necessary, the intervention was too complex, and it required an unrealistic time commitment from participants. Concerns were raised that participants lacked a common bond, thus the group sessions were “convening strangers”, and that this inhibited more active participation. Finally, the CHWs expressed their belief that some participants were apprehensive about meeting the CHWs for the first time in their homes.

This feedback resulted in further modifications to the intervention which was tested with the final randomized controlled trial. The final intervention consisted of 4 group sessions and 4-6 CHW home visits. Recruitment and group sessions took place in primary care clinics which provided a familiar shared social context. Home visits began after a social bond had been allowed to develop between participants and CHWs at a group session. The intervention integrated environmental restructuring, problem-solving, and asthma-related goal-setting as mechanisms for improving self-management skills.

The institutional review boards of Northwestern University, the Cook County Bureau of Health Services, Rush University Medical Center, and the University of Illinois at Chicago approved all study activities.

Recruitment and Randomization

Recruitment occurred between September and November of 2006. Participants were eligible if they were: 1) between the ages of 18 and 50 years, 2) diagnosed with persistent asthma (defined as > 2 days bothered by asthma symptoms on recall of past 14 days *and* 1 or more urgent care or emergency room visit or requirement for oral corticosteroid in the past 12

months), 3) not currently pregnant, and 4) residing within the target clinic area. Potential participants were identified by two primary care clinics using pharmacy records and chronic disease registries. Clinic staff contacted patients to assess interest in the study. Patients who gave permission to be contacted were then called by a study research assistant who performed eligibility screening over the telephone and obtained verbal consent. Written consent and Health Insurance Portability and Accountability Act authorization were obtained at the first group session or the research assistant went to the home. Randomization was done in pairs (intervention – control) and in 2 groups representing the clinics (Arcus QuickStat Biomedical. Research Solutions. Cambridge, UK).

Intervention Staff Training

Three CHWs were trained to establish relationships with participants, successfully implement home visits, and teach basic asthma facts, skills and self-management techniques. The social worker was trained to effectively lead self management group sessions and to supervise the CHWs. The CHWs and social worker each completed a total of 113 hours of training which included formal asthma courses from the American Lung Association, specific training by investigators, and hands-on experience in asthma education in an asthma clinic. Before starting the intervention, CHWs were evaluated by study investigators using a standardized role play to determine their achievement of the study objectives and readiness for the field. The social worker, CHWs, and investigators met weekly throughout the study implementation phase to review objectives, discuss participant progress, and review documentation.

Intervention Content

A detailed description of the final intervention curriculum is provided in the Online Repository. Four different group sessions were offered over a 12 week period. Group sessions, which averaged 2 hours each, were held on Saturdays at the two recruitment clinics. The larger clinic site offered each group session in the morning and repeated them in the afternoon. The smaller group site offered the same sessions on alternating Saturdays in the morning only. The group sessions were led by the social worker, with the CHWs and a member of the study team in attendance. Breakfast or lunch was provided and participants received $25 for attending.

Concurrently, the CHWs planned 6 home visits with each intervention participant, although 4 visits were considered sufficient if the participant demonstrated acceptable content mastery in all subject areas. Home visits included a general assessment of the participant's asthma status and support system and then addressed general asthma facts, controller medications, spacers, inhaler technique, symptom monitoring, communication with providers, asthma triggers, and cigarette smoke avoidance. The content of home visits was flexible and responsive to the participants' asthma-related needs, while reinforcing content that was presented in the group sessions. Participants received $10 by mail following each home visit. The intervention did not involve any direct communication between the intervention team and the participants' primary care physicians or clinics, although CHWs did encourage proactive communications between study participants and their health care providers.

Control group

The control group received two mailings during the three month study period. The mailings consisted of the same asthma education information presented at group sessions for the intervention participants. Control group participants received a $30 check in the mail following the second mailing as compensation for their time.

Instruments

A telephone survey (average length 37 minutes) was administered to participants at baseline, at 3 months and then at 6 months. We collected data on sociodemographic characteristics, comorbidities, personal and family asthma history, asthma knowledge, and social desirability.[22] Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression scale (CES-D).[23-24] Asthma self-management behavior variables were defined as inhaled corticosteroid use, use of a spacer, and receipt of asthma action plans from a doctor. (Participants in both study groups were encouraged to request these from their providers.) Clinical outcomes were defined as asthma quality of life (measured using the 15 item Juniper Mini-Asthma Quality of Life Questionnaire, minimal clinically important difference 0.5),[25] day and night symptoms, and health service use. Coping, a construct related to self-efficacy, was measured using the Coping Orientations to Problems Experienced Scale (COPE)[26] which measures subjects' perceived ability to incorporate several strategies to successfully deal with general problems in life. Six items from this scale were chosen for use based on their favorable psychometric properties in this population.[27]

Development of Asthma Self-efficacy Measure

A pulmonologist, two allergists, two pediatricians, a medical sociologist, and a health psychologist used an iterative process to identify 21 items with strong face validity for assessing asthma self-efficacy, adapted from existing self-efficacy scales.[28-31] A factor analysis with varimax rotation identified 5 underlying dimensions of asthma self-efficacy: managing an acute attack (6 items), asthma control (5 items), emotions and environment (4 items), doctor relationship (4 items), and regular controller medicine use (1 item). For each of the multi-item dimensions, items had factor loadings of at least 0.40. The reliability coefficients (Cronbach's alpha) ranged from 0.77 to 0.82, indicating strong internal reliability. A total self-efficacy score was calculated by averaging the scores for the 5 dimensions. The final instrument is available in the Online Repository.

Analysis

We planned for a total sample size of 40 to 50 subjects, which provided over 80 percent power to detect an effect size of 1.0 standard deviation units or greater in our primary outcome of asthma self-efficacy (assuming a two-sided alpha of 5 percent). We anticipated that this pilot study would be underpowered to detect small differences in asthma self-management behaviors and clinical outcomes.

In small studies, baseline balance between intervention and control groups cannot be guaranteed by randomization. Therefore, we controlled for all potential confounders measured at baseline where there was at least modest evidence ($P < 0.3$) for unequal distribution between groups using a propensity score method.[32-33] We used the propensity score as a continuous covariate in regression models when appropriate or as a trichotomized score to capture nonlinear relationships.[33]

Bivariate analyses were performed using Fisher's exact test for categorical variables and 2-sided Wilcoxon tests for continuous variables, as appropriate. Regression models were used to assess for differences in study groups at 3 months and 6 months of follow-up for all outcomes, controlling for the propensity score and baseline values. A linear regression model was used for the primary outcome of total self-efficacy score and its 5 dimensions. A logistic regression model was used for dichotomous outcomes while a negative binomial model was used for count data. No adjustments were made for multiple comparisons.

Results

Participant Characteristics

The two clinics generated a list of 107 patients with asthma: 39 were not eligible for the study, 14 could not be reached, 10 declined, and 2 withdrew before randomization. Forty-two patients were randomized. The study ran from November of 2006 to March of 2007. Follow-up data were missing for 6 participants (14%) at 3 months (2 intervention; 4 control) and 4 participants (10%) at 6 months (1 intervention; 3 control).

Table 1 displays the baseline sociodemographic characteristics of participants in the two groups. Despite randomization, the two groups differed on several characteristics, including education level and household income. Table 2 describes the baseline clinical characteristics and demonstrates that most participants had poorly controlled persistent asthma. More than half the participants had been admitted to a hospital for asthma (over a quarter to an intensive care unit), most had been prescribed oral corticosteroids in the past, and over half had required urgent medical care for a severe asthma exacerbation in the last 6 months. Most baseline clinical characteristics were similar between groups, except for perceived general health. Both groups had significant depressive symptoms.

Despite these asthma history profiles, study participants reported relatively high asthma self-efficacy at baseline, with mean total scores of 4 (possible range: 1 to 5; higher is better) (Table 2).

Intervention "Dose" Received

Seventy percent of the intervention group (N=20) attended 2 or more group sessions; 20% attended all 4. Attendance was highest at the first session (60%) and then decreased (45% for the last session). The average number of home visits was 4. Nine participants (45%) had 6 home visits, while 2 (10%) had none. Home visits lasted an average of 57 minutes, ranging from 20 minutes to 2.5 hours. CHWs reported covering all the required areas of asthma education, with the most emphasis on controller medications and taking medications correctly (details in the Online Repository). They also reported that over half of visits specifically targeted the self-management skills of self-monitoring and problem solving.

In the control group, two packets of education materials were returned with no forwarding address.

Primary Outcome: Asthma Self-Efficacy

At the completion of the intervention period (3 month follow-up), self-efficacy increased in the intervention group and either remained the same or decreased in the control group, controlling for baseline self-efficacy and other baseline characteristics (Figure). The adjusted difference in the total summary self-efficacy score between the two groups was 0.8 ($P < 0.001$, 95% CI 0.4,1.3). Similar differences were noted for the 5 self-efficacy dimensions separately (all $P < 0.05$). The self-efficacy scores increased or remained stable in the intervention group at the 6 month follow-up while the scores of the control group increased, resulting in a loss of statistical significance between the groups except for self-efficacy in "managing an acute attack" ($P = 0.02$).

Secondary Outcomes: Asthma Behaviors and Clinical Outcomes (Table 3)

A greater percentage of intervention participants had received an asthma action plan from their doctor at the 3 month follow-up. (Control group: 18%, Intervention group: 45%, $P = 0.06$) This difference was gone at the 6 month follow-up. (Control group: 23%, Intervention group: 20%, $P = 0.17$) Participants with a spacer did not differ at either follow-up. (3 month: Control group:

61%, Intervention group: 78%, P = 0.11. 6 month: Control group: 58%, Intervention group: 89%, P = 0.13.) Asthma quality of life was significantly better in the intervention group at the 6 month follow-up (adjusted difference: 1.8; 95% CI: 0.8, 2.9; P = 0.002). The intervention group reported higher coping skills (a concept related to self-efficacy) at the 6 month follow-up (adjusted difference: 0.7; 95% CI: 0.2, 1.2; P = 0.01). For other asthma clinical outcomes, the differences favored the intervention group but did not reach statistical significance.

Increases in asthma self-efficacy over the 6 month study were weakly associated with improvements in coping, increases in knowledge, change from no spacer to having a spacer, improvements in asthma quality of life, and reductions in day symptoms (P = 0.10-0.13). Changing from no action plan to having an action plan and changes in inhaled corticosteroid use were not associated with changes in asthma self-efficacy.

Discussion

In a pilot randomized controlled trial among low income African American adults with asthma, we demonstrated that our community-based asthma intervention was feasible, improved asthma self-efficacy, and improved some aspects of asthma self-management and quality of life.

Implementing this intervention was a tremendous challenge in an urban minority community setting where distrust of academic institutions and research is common.[34-35] While the components of the intervention had been successful in other populations,[15,18-19] we were unsure how they would perform in this urban minority community with low education levels, limited access to care, and poor housing conditions. Ultimately we found that the majority of participants participated in the group sessions and home visits, with slightly better adherence to home visits. Perhaps not unexpectedly, the greatest barrier to group session attendance was time, as participants frequently reported conflicts with work (qualitative data not detailed in this manuscript). The combination of group sessions and home visits allowed multiple venues for trust-building, education, and support, which is consistent with results of another multi-component intervention for African American children.[36]

This intervention was associated with a significant improvement in asthma self-efficacy immediately post-intervention. Self-efficacy, a person's confidence in being able to perform a specific behavior in a specific situation, is postulated to accrue through four mechanisms: 1) observation of role models, particularly peers; 2) progressive mastery through repeated efforts; 3) accurate, repetitive performance feedback; and 4) encouragement and support.[14,37] For many chronic diseases, interventions targeting self-efficacy have improved health status.[15, 37-38] Among patients with asthma, low self-efficacy has been associated with worse pulmonary function and lower quality of life, possibly because of self-efficacy's relationship to emotional stress which in turn has direct adverse physiologic effects. [12-13] It is notable that these self-efficacy increases occurred despite striking levels of depressive symptoms among the participants. At the 6-month follow-up, there was no longer a significant difference in self-efficacy between study groups. Self-efficacy scores remained similar at 3 and 6 months follow-up for the intervention group. However, control group self-efficacy scores decreased at 3 months and then began to increase by 6 months. We suspect this initial drop in scores is due to a panel effect which is a phenomenon where initial responses are artificially inflated while subsequent responses are more accurate. This phenomenon has been described in the economic and social science literature,[39] and was also documented in the longitudinal component of the CHIRAH observational study.[40] It is also possible that the limited intervention received by the control group raised their awareness of their problems but did not provide them with skills to address these problems leading to decreased self-efficacy. This may have prompted them to ultimately seek assistance from other sources, improving their self-efficacy. Finally, control

group participants may have benefited from the increased contract provided by the data collection calls. The stability in the intervention group at 6 months is notable since the intervention did not include a maintenance component which is usually necessary for sustaining changes over time.[41-42]

Self-efficacy models generally show that improved self-efficacy leads to behavior changes, which in turn improve clinical outcomes.[12-14,43] This small trial was not powered to detect differences in self-management behaviors or clinical outcomes. While a slight increase was noted in receipt of action plans, intervention participants did not have significant improvements in the other self-management behaviors of controller medication use and spacer use. Changes in self-efficacy were marginally associated with changes in spacer use but not the other behaviors. It is possible these behaviors were not adequately measured by self-report. It may be that the intervention was not strong enough, the sample size was too small, or the study was not long enough to show an effect on behavior.

While behaviors did not change significantly, intervention participants were more likely to have better coping skills and report a meaningful increase in asthma quality of life. Symptom frequency was lower in the intervention group at follow-up, with an average difference of 1 or 2 symptomatic days or nights over the past 2 weeks. While this is not a statistically significant difference, the results from NCICAS demonstrating success of their intervention were primarily based on a difference in 2-week symptom frequency of only 0.6 days (95% CI: 0.2 to 0.9 days).[17] Our exploratory analyses (not presented) also showed that improvements in total self-efficacy were associated with increases in quality of life, decreases in total symptoms, and reduced odds of exacerbations. Therefore, while behavior changes were not captured in this study, the results suggest that changes in asthma self-efficacy may influence important asthma outcomes.

There are some limitations worth noting. Self-efficacy instruments should be situation- and population-specific [14] which required the investigators to create a new instrument. Psychometric analyses were employed to ensure optimal scalar construction, however comparison of the results to other self-efficacy studies is limited. Responses to instrument items may reflect a ceiling effect since most scores were in the scale's upper range, or a Hawthorne effect because of the increased contact received by the intervention group. In addition, participant responses may reflect social desirability although we did control for that in the propensity score. Because of the high asthma morbidity in the study population, investigators prioritized the provision of service to both groups of participants. As such, those in the control group received a low intensity intervention which may result in a diminished ability to detect a difference between groups. Finally, the small sample size and single intervention community raise concerns about the play of chance and unique effects due to local social, environmental, and healthcare factors.

The experience of this trial suggests several next steps. Future intervention studies in communities with limited resources will likely need to continue providing a low level of intervention to controls to meet community ethical standards.[44] This requires a strong intervention effect size. The intervention in this pilot could be strengthened by increasing the emphasis on behavior change skills. Objective measurements using medication actuators and home inspections would also be helpful. Future trials should include a larger sample size to ensure greater precision of results. Future research should also consider integrating the intervention with the emerging “patient centered medical home” (PCMH)[45] approach to provide more comprehensive primary care.

Conclusions

Asthma exacerbations in the U.S. account for 4000 deaths, 500,000 hospitalizations, and 10 million missed days of work annually.[46] To combat this terrific burden will require effective asthma management focused on reducing exposure to triggers, using appropriate controller medications, ongoing disease self-monitoring, and proactive partnerships with health care providers.[47] We have described a feasible community-based asthma self-management intervention specifically targeted to the highest-risk population. These results support a larger efficacy trial to quantify the clinical benefits and costs in more diverse settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

CHW
community health worker

CHIRAH
Chicago Initiative to Raise Asthma Health Equity

NCICAS
National Cooperative Inner-City Asthma Study

PCAQ
Perceived Control of Asthma Questionnaire

PSS
Perceived Stress Scale

COPE
Coping Orientations of Problems Experienced Scale

CES-D
Center for Epidemiologic Studies Depression Scale

PCMH
Patient Centered Medical Home

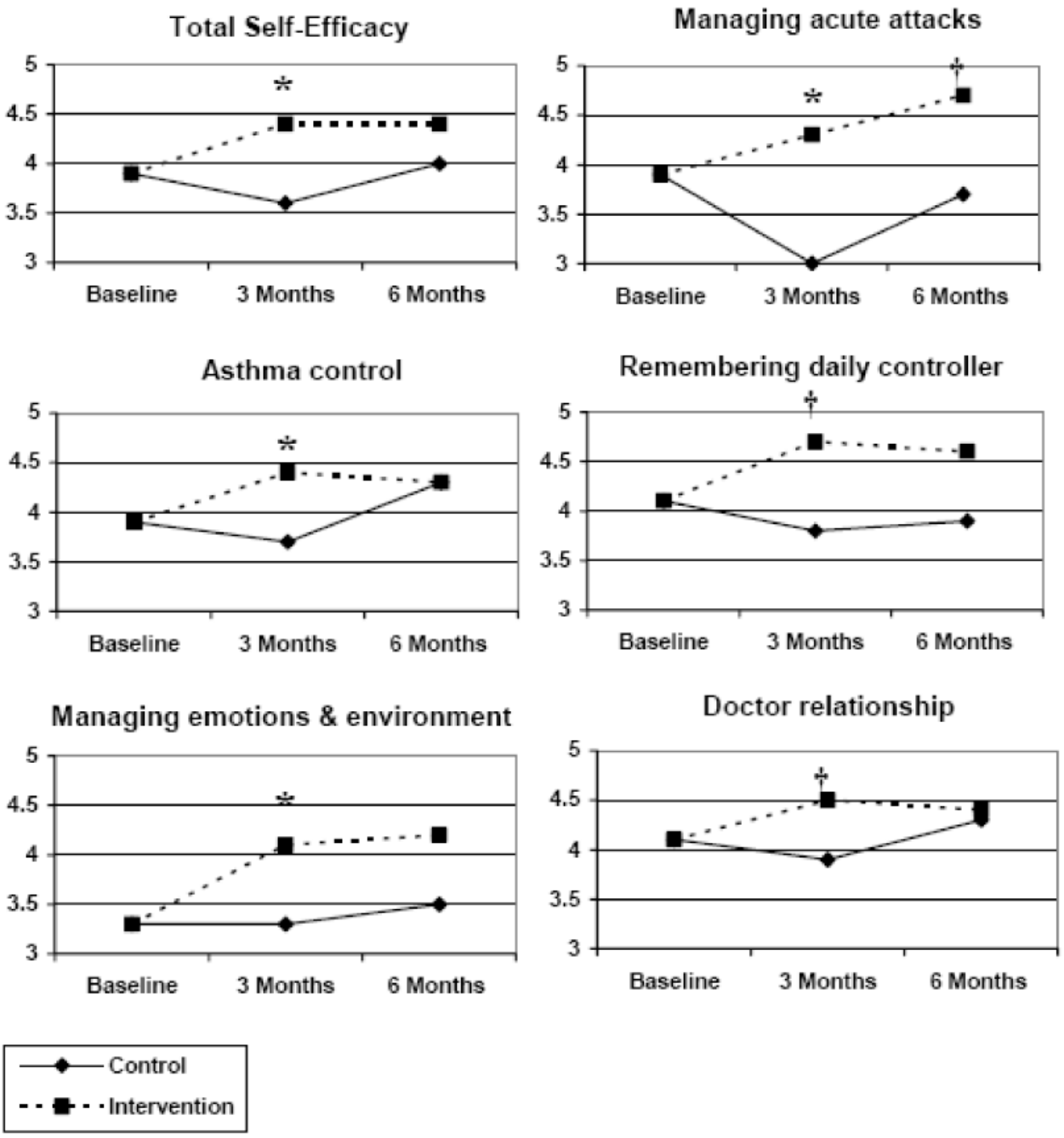

Figure. Asthma self-efficacy total and dimension scores at baseline, intervention completion (3 months), and follow-up (6 months)

Notes: Self-efficacy scores range from 1-5; higher is better. Baseline scores are adjusted for propensity score. 3 and 6 month scores are adjusted for baseline score and propensity score.
* = $P < 0.01$, † = $P < 0.05$

Table 1

Sociodemographic characteristics of study participants at baseline

Variables	Control (n=22)	Intervention (n=20)	P value
Age, mean±SD (range)	37±8 (21–50)	33±9 (18–50)	0.24
Women (%)	17 (77)	12 (60)	0.32
Black/African American (%)	19 (86)	20 (100)	0.23
Education (%)			0.04
Some high school	9 (41)	4 (20)	
High school graduate/GED	3 (14)	10 (50)	
More than high school	10 (45)	6 (30)	
Household Income, annual (%)*			0.03
< $15,000	13 (59)	4 (20)	
$15,000-$30,000	5 (23)	7 (35)	
> $30,000	4 (18)	5 (25)	
Lives with spouse/partner (%)	10 (45)	6 (30)	0.35
Home Ownership (%)			0.52
Own	3 (14)	2 (10)	
Rent	16 (73)	12 (60)	
Lives with friends	3 (14)	6 (30)	
Health Insurance (%)			0.06
Medicaid	15 (68)	11 (55)	
Private	3 (14)	0 (0)	
No insurance	4 (18)	9 (45)	

* Four (20%) intervention group participants were unable to answer household income.

Table 2
Clinical characteristics of study participants at baseline

	Control (n=22)	Intervention (n=20)	P value
General health (%) *			0.04
Excellent or Very Good	2 (9)	4 (20)	
Good	5 (23)	9 (45)	
Fair or Poor	15 (68)	7 (35)	
Current smoker (%)	8 (36)	4 (20)	0.32
Depressive symptoms, † mean (SD)	22 (14)	17 (14)	0.28
Asthma history			
Admitted to hospital for asthma (%)	14 (64)	13 (65)	1.0
In intensive care for asthma (%)	6 (27)	7 (35)	0.74
Prescribed oral corticosteroids for asthma (%)	18 (82)	14 (70)	0.48
At least one exacerbation requiring urgent medical care in past 6 months (%)	15 (68)	12 (60)	0.75
Asthma medications (%)			
Inhaled corticosteroids ‡	17 (77)	14 (70)	0.43
Short-acting B2-agnoist §	21 (95)	19 (95)	0.73
Ipratropium bromide	2 (9)	1 (5)	0.54
Salmeterol	3 (14)	2 (10)	0.55
Asthma self-efficacy, // mean (SD)			
Total summary score	4.0 (0.7)	4.0 (0.6)	0.62
Managing an acute attack	4.0 (0.8)	4.0 (0.8)	0.79
Asthma control	3.9 (1.1)	4.2 (0.7)	0.60
Remembering daily controller	4.4 (1.0)	4.1 (1.0)	0.16
Managing emotions/environment	3.5 (1.0)	3.4 (1.1)	0.92
Doctor relationship	4.1 (0.9)	4.3 (0.8)	0.40

* From the MOS 36-item Short-Form Health Survey[48]

† Clinical Epidemiologic Survey of Depression (CES-D)[23-24] Scores above 15 have been shown to reflect clinically significant symptoms of depression.[49]

‡ Includes flunisolide, triamcinolone acetonide, fluticasone propionate, beclomethasone dipropionate, and salmeterol/fluticasone dipropionate

§ Includes inhaled or nebulized albuterol and levalbuterol

// Self-efficacy scores range from 1-5; higher is better

Table 3

Asthma behavioral and clinical outcomes at baseline, and associations between receipt of intervention and outcomes at completion of intervention (3 months) and follow-up (6 months)

	Unadjusted Baseline		P value	Intervention Completion (3 months) Adjusted Associations *	Follow-up Completion (6 months) Adjusted Associations *
Asthma self-management behaviors	Control n=22 Intervention n=20			*Odds Ratio (95% CI)*	*Odds Ratio (95% CI)*
Have a spacer	Control: Intervention:	12 (55%) 12 (60%)	0.76	16.9 (0.5, 556.8)	40.7 (0.3, 4792.2)
Received action plan from doctor †	Control: Intervention:	7 (32%) 6 (30%)	1.0	14.3 (0.9, 224)	4.6 (0.5, 40.6)
Number of times used inhaled steroids in past 14 days	*Mean (SD)*			*Adjusted difference (P value)*	*Adjusted difference (P value)*
	Control: Intervention:	10.0 (7.8) 6.6 (6.9)	0.21	3.5 (0.48)	4.4 (0.49)
Asthma clinical outcomes	*Mean (SD)*			*Adjusted difference (P value)*	*Adjusted difference (P value)*
Asthma quality of life ‡	Control: Intervention:	3.7 (1.5) 4.2 (1.2)	0.15	0.7 (0.27)	1.8 (0.002)
Symptomatic days over past 14 days	Control: Intervention:	5.5 (5.0) 5.9 (4.2)	0.40	-1.9 (0.27)	-0.9 (0.68)
Symptomatic nights over past 14 days	Control: Intervention:	5.1 (4.8) 2.5 (2.2)	0.10	-1.8 (0.36)	-1.5 (0.30)
Other	*Mean (SD)*			*Adjusted difference (P value)*	*Adjusted difference (P value)*
Coping skills §	Control: Intervention:	3.1 (0.6) 2.9 (0.6)	0.61	0.2 (0.60)	0.7 (0.01)

		Unadjusted Baseline	P value	Intervention Completion (3 months) Adjusted Associations *	Follow-up Completion (6 months) Adjusted Associations *
Asthma knowledge //	Control:	7.0 (1.4)	0.46	-0.3 (0.71)	0.8 (0.31)
	Intervention:	6.6 (1.5)			

*Analyses are adjusted for the baseline value of the outcome variable and the propensity score. Odds ratios describe the odds of the outcome in the intervention group compared to the odds in the control group. Adjusted differences refer to the values of the outcomes at the 3 or 6 month time point in the intervention group minus the associated values for the control group.

†Participants interviewed at follow-up who reported not seeing a doctor were considered not to have gotten an action plan from their doctor.

‡Juniper Mini-Asthma Quality of Life Questionnaire, range 1-7, higher is better[25]

§Coping Orientations to Problems Experienced Scale (COPE), range 1-6, higher is better[26-27]

//Correct out of 10