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The Development of a Motivational Interviewing Intervention to Promote Medication Adherence among Inner-City, African-American Adolescents with Asthma

Kristin A. Riekert, PhD¹, Belinda Borrelli, PhD², Andrew Bilderback, MS¹, and Cynthia S. Rand, PhD¹

¹ Division of Pulmonary & Critical Care Medicine, Johns Hopkins School of Medicine, Baltimore MD

² Centers for Behavioral and Preventive Medicine, Brown Medical School & The Miriam Hospital, Providence RI

Abstract

Objectives—To develop and assess the feasibility of a motivational interviewing (MI) based asthma self-management program for inner-city, African-American, adolescents with asthma.

Methods—37 African-American adolescents (age 10-15 years) recently seen in an inner-city emergency department for asthma and prescribed an asthma controller medication participated in the newly developed program consisting of 5 home visits. Adolescents and their caregivers completed phone-based surveys before and after the intervention.

Results—95% of the adolescents completed all 5 sessions; 89% of caregivers and 76% of adolescents believed other families would benefit from the intervention. Caregivers were more likely to report 100% adherence post-intervention compared to pre-intervention and reported a trend for adolescents taking greater responsibility for their asthma. There were no pre-post differences in adolescent-reported medication adherence, but adolescents did report increased motivation and readiness to adhere to treatment. Caregivers and adolescents each reported statistically significant increases in their asthma quality of life.

Conclusions—The findings from this pilot study suggest that MI is a feasible and promising approach for increasing medication adherence among inner-city adolescents with asthma and is worthy of further evaluation in a randomized trial.

Keywords

adherence; asthma; African-American; motivational interviewing

Corresponding Author & Author To Whom Requests For Reprints Should Be Addressed: Kristin Riekert, Ph.D., Assistant Professor, Division of Pulmonary & Critical Care Medicine, Johns Hopkins University, 5501 Hopkins Bayview Circle, JHAAC Rm 3B.37, Baltimore, MD 21224, TEL: 410-550-7755, FAX: 410-550-2612, krierk1@jhmi.edu.

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1. Introduction

Minority adolescents have disproportionately high morbidity and mortality for asthma compared to white adolescents. Mortality rates for 11-17 year-old children are higher than younger children based on national data, and African-American children have a significantly higher rate of emergency room visits, hospitalizations and mortality than white children [1]. Many studies have found that adolescents with asthma have poorer adherence than younger children and that the decline begins around age 10 years [2;3]. Studies also find that minority children have significantly lower adherence than Caucasian children [3]. Non-adherence to asthma controller therapy therefore may be related to excess morbidity and mortality from asthma in adolescent inner-city predominantly minority populations.

Recent meta-analyses concluded that pediatric self-management interventions have demonstrated efficacy and should be considered standard in routine asthma care [4;5]. Such interventions, however, do not usually assess adherence, include a wide age range, or evaluate the efficacy of the intervention specifically for minority participants. It is therefore difficult to draw conclusions about the efficacy of existing asthma self-management interventions for minority adolescents. We identified only six studies that focused exclusively on adolescent participants. Three “tailored” the intervention for adolescents by having teenage peers deliver asthma education [6;7] or allowing the adolescent to bring a friend to an asthma intervention at a mall [8]. Of the remaining three [9-11], all acknowledged the need for tailoring but none specified how their intervention was customized for adolescents. While three of these six studies showed improvement for at least one health outcome [6;10;11], only two studies assessed medication adherence. van Es et al. [9] tested the effectiveness of a 1-year clinic-based intervention involving individual asthma education and group sessions that focused on coping with asthma, communication, and problem-solving, compared to a usual care group. At 24 months, self-reported adherence was higher in the treatment group; however, these results were not significant at the 12-month assessment and are limited by poor follow-up rates. The second study targeted urban African-American adolescents and tested a 4-session computer-based education intervention focusing on controller medication adherence, rescue inhaler availability, and smoking, compared to an attention control group receiving generic asthma information [11]. Although the authors reported a trend for “positive changes” in self-reported controller medication adherence, the term was never defined. Taken together, these studies suggest that developmentally appropriate, culturally sensitive, innovative approaches to assist African-American adolescents to follow medication regimens are needed.

Social Cognitive Theory (SCT) is widely used in health promotion [12]. SCT proposes that motivation and behavior are functions of an individual's motivation, outcome expectancies, and perceived self-efficacy. Research supports the hypothesis that high self-efficacy is associated with better asthma medication adherence, and studies have shown that interventions targeting self-efficacy improve short-term adherence [13-16]. Most SCT-based interventions use education and behavior modification techniques to improving adherence and are predicated on the questionable assumption that participants are motivated to change: they rarely attempt to build motivation. High self-efficacy without comparable levels of motivation to change can lead to decreased likelihood of change [17]. Interventions taking a prescriptive, educative stance may paradoxically increase resistance among participants who are not ready to change [18;19]. Motivation to adhere to asthma medications has received little research attention, particularly among adolescents. Studies have found that adolescents with higher motivation to take medication self-report higher adherence across a variety of chronic illness groups, including asthma [20-24].

Motivational Interviewing (MI) is a patient-centered approach to health behavior change that helps patients to resolve ambivalence about change and enhances intrinsic motivation [25;26]. MI helps the individual weigh the pros and cons for change, build intrinsic motivation for change, and facilitate collaborative decision-making prior to implementing education and problem-solving strategies. MI may be developmentally appropriate for adolescents because it promotes personal control and autonomous decision-making for change, focuses on individualized goals and values and their relation to the target behavior, and calibrates the approach to the teen's readiness to change. MI does not assume that health is the most important factor motivating the adolescent, but rather acknowledges and incorporates other motivators within the unique context of the teen's life. Because the adolescent is integral to deciding whether to change, selecting goals, determining and implementing the plan to achieve the goals, MI is developmentally supportive of the adolescent's emerging independence in self-care, yet sensitive to the cultural and social needs of the adolescent and family. Several studies have tested MI in adolescents across a variety of health behaviors, including smoking, alcohol/drug use, diet, physical activity, and diabetes management and have demonstrated improvements in outcomes [27-33].

Only one study in adults has evaluated MI as a strategy to promote asthma medication adherence [34]. In this study [34], 25 adults with asthma were randomly assigned to one of two conditions: a brief educational intervention, or education plus MI. While the education condition significantly increased knowledge scores, participants demonstrated a reduction in motivation for change. Participants receiving MI, however, showed significant increases in motivation compared to those in the education condition. No adherence or asthma morbidity data were collected.

The purpose of our non-randomized pilot study was to develop an MI-based self-management intervention to improve asthma medication adherence among inner city, African-American adolescents. We gathered data on the acceptability and satisfaction of the intervention from the families and tested whether this pilot intervention resulted in pre-post changes in caregiver- and adolescent-reported adherence and mediator variables of theoretical relevance to MI and medication adherence, including the motivation, readiness, and self-efficacy to adhere to an asthma regimen. We hypothesized that adolescents post-intervention would have higher levels of adherence and motivation, increased readiness to change, and greater self-efficacy to adhere to their asthma medication regimen compared to baseline. We also examined change in caregiver-adolescent responsibility for treatment to evaluate unintended negative consequences (e.g., the caregiver abdicating responsibility for asthma-management without the adolescent assuming responsibility).

2. Methods

2.1. Participants

Potential participants were identified from an urban pediatric Emergency Department (ED). Adolescents were eligible for the study if they were age 10-15 years old at the time of the ED visit, lived in the city, were treated in the ED or hospitalized for an asthma exacerbation, and were prescribed a daily asthma controller medication (either an inhaled corticosteroid (ICS) or a leukotriene modifier (LM)). Exclusion criteria included foster care or incarceration, not English speaking, or participating in another asthma intervention study. Between June 2004 and January 2005, 134 adolescents met the age, residency, and ED criteria; 99 completed the telephone screening and 65 were eligible. The primary reason for ineligibility was not being prescribed a controller medication (94% of those ineligible). Forty families (62% of those eligible) consented to join the study; the remaining families could not be contacted or declined to participate in the study. Thirty-seven families (93%) completed baseline assessment, 35 (95%) completed all intervention visits, and 37

completed the post-intervention assessment 2 weeks after the intervention was completed, or three months from enrollment if the teen did not complete the intervention. The mean age of participants was 12.5 years (SD= 1.6, Range = 10.1-16.0: one child turned 16 years old between joining the study and completing the baseline survey). All were African American; the majority were male (59%) and Medicaid-insured (81%). Eighty-four percent of caregivers were the adolescent's mother; the remaining caregivers were a grandmother or aunt. Twenty-two percent of caregivers had less than a high school education and approximately half were employed (48%). Thirty-eight percent of the households included a smoker and 72% had an annual income <\$20,000. All adolescents were prescribed an ICS and an additional 38% were prescribed an LM.

2.2. Procedures

This uncontrolled pilot study utilized a pre-post-evaluation of the MI intervention. Caregivers of eligible adolescents received a letter about the study and could choose not to be contacted. One week after sending the letter, a research assistant telephoned the caregiver to assess eligibility and conduct an informed consent discussion with the caregiver and adolescent. Caregivers provided written consent by mail, while adolescents provided oral assent by telephone. The study protocol was approved by the Johns Hopkins Institutional Review Board. Baseline and post-intervention surveys were conducted by telephone. The caregiver and adolescent were each compensated \$25 per survey completed and the adolescent was given \$75 if s/he completed all five intervention visits.

2.3. Intervention description

The intervention consisted of five, 30 to 40-minute sessions in participants' homes at 1, 2, 3, 4, and 8 weeks post-baseline. The intervention was manualized (to preserve treatment fidelity) and adapted from a previous study [35]. The Home Visitor (HV) focused on building the adolescent's motivation and exploring and resolving ambivalence regarding asthma medication adherence. The HV used patient-centered communication techniques including open-ended questions, reflective listening, empathy, and support for the adolescent's autonomy in decision-making. MI strategies to increase motivation for change were used, such as "Typical day" exercise (allowing the adolescent to talk about medication use in a non-pathological framework), collaborative agenda-setting, decisional balance (helping to weigh the pros and cons of change), developing discrepancy (building a discrepancy between the adolescent's current asthma management strategy and his/her goals and values), eliciting barriers to change, and self-motivational statements [26]. We also explored motivation and confidence for change. For example, participants were asked to rate their motivation to adhere to their asthma medication on a scale of 1 to 10 (1= not at all motivated and 10= completely motivated). The HV then explored the reasons for the answer ("why not a lower number?" and "what would it take to get you up to a higher number?"). Goal setting, problem-solving, and other behavior strategies were initiated only when the adolescent expressed an interest in changing the medication adherence pattern or discussing this information. Asthma education was provided in a non-directive, non-prescriptive manner, using the Elicit-Provide-Elicit process [26;36].

The HV was a respiratory therapist with 20 years of experience in providing asthma care and 3 years of experience providing home-based asthma education and adherence counseling to inner-city families. MI training included two days with a co-investigator who is a member of the Motivational Interviewing Network of Trainers (B.B.) and included readings, didactics, video, and role-plays. Each HV visit was audio-taped and reviewed at biweekly supervision sessions with the first author.

2.4. Measures

2.4.1. Adherence—Caregivers and adolescents were asked about the frequency of medication adherence (“In the past two weeks, I [*my child*] used his/her [*name of ICS medicine*]...”), choosing from responses ranging from 1=“not at all (0 days)” to 6=“every single day (14 days)”. They were also asked to respond to the following statement “Some days I (my child) forgets to take one of the doses of [*name of ICS medicine*]” and were given choices ranging from 1=“strongly agree” to 5=“strongly disagree”.

2.4.2. Motivation—Adolescents were asked “On a scale of 1 to 10, where 1 is not motivated at all and 10 is very motivated, how motivated are you to take your [*name of ICS medicine*] everyday?”

2.4.3. Readiness to change—The adolescent chose one of five statements from the Asthma Readiness to Change Questionnaire to characterize his/her stage of readiness to change based on the Stages of Change Model [37]. The Readiness to Change rating has been shown to be correlated with asthma medication adherence and is responsive to an MI intervention [34;38].

2.4.4. Self efficacy—The Child Asthma Self Efficacy Scale (CASES; [39]) contains 14 items developed to assess children's (age 7-15 years) Attack Prevention self-efficacy (e.g., confidence that one can learn self management skills, correctly use medications, etc.) and Attack Management self-efficacy (e.g., confidence one can control symptoms, decide which medications to use, etc.). Items are rated on a 5-point Likert scale. Previous studies have found Cronbach alphas of .75 and .82 for the Attack Prevention and Attack Management subscales, respectively [39]. In this study, Cronbach alpha was .36 for Attack Prevention and .43 for Attack Management.

2.4.5. Knowledge—To assess their knowledge about asthma controller medication, the caregiver and adolescent were each asked: “Which of the following choices best describes what [*name of ICS medicine*] is supposed to do for you? (1) Works within minutes to help me breathe better or (2) Works over days or weeks to stop asthma symptoms or attacks from starting?”

2.4.6. Responsibility for treatment—We used the Asthma Responsibility Interview (ARI; [40]) as a measure of caregiver and adolescent asthma management behaviors and perceptions of the responsibility for asthma management tasks in the family. Scores range from 0 (“Never take responsibility”) to 3 (“Take responsibility most of the time”). In a previous study the Cronbach alpha was 0.70 for the adolescents' self-report and .76 for caregivers' report of adolescent responsibility-taking [41]. In the current sample, Cronbach alpha was .67 for the adolescents' self report, .74 for the adolescents' report of caregiver responsibility, .45 for the caregivers' self report, and .75 for the caregivers' report of adolescent responsibility.

2.4.7. Asthma morbidity

2.4.7.1. Adolescent quality of life: The Pediatric Asthma Quality-of-Life Questionnaire (PAQLQ) was designed for children age 7-17 years; it is one of the most widely used asthma-specific quality-of-life measures, having good construct validity, responsiveness to change over time, and test-retest reliability [42;43]. We administered the Symptoms (9 items) and Emotional Function (8 items) domains. Response choices were modified from the original 7-point Likert scale to a 5-point scale to facilitate completing the measure by telephone. Scores of items on each domain were averaged and ranged from 1 to 5, with lower scores representing more severe impairment in quality of life. For our sample,

Cronbach alpha was .83 for the Symptom domain and .85 for the Emotional Function domain.

2.4.7.2. Caregiver quality of life: The Pediatric Asthma Caregiver's Quality of Life Questionnaire (PACQLQ) [44] measures activity limitations (4 items) and emotional function (9 items) experienced by caregivers of asthmatic children. Response choices were modified from the original 7-point Likert scale to a 5-point scale to facilitate completing the measure by telephone. Scores of items on each domain were averaged and ranged from 1 to 5, with lower scores representing more severe impairment in quality of life. For our sample, Cronbach alpha was .83 for the Activity Limitations domain and .89 for the Emotional Function domain.

2.4.7.3. Asthma symptoms: Symptom-free days (SFD) is well-recognized as an index of asthma morbidity and is used frequently to assess new therapies in children [45;46]. Caregivers and adolescents were asked "Over the past 30 days, on how many days did you [your child] have asthma symptoms during the day? Asthma symptoms include: cough, sputum (phlegm when coughing) chest tightness, difficulty taking a deep breath, wheezy or whistling sound in the chest, or shortness of breath." and "Over the past 30 days, on how many nights did your [your child's] asthma keep you [him/her] from sleeping or wake you [him/her] up?" Scores could vary from 0 to 30 days. A measure of SFD was calculated by subtracting the numbers of reported days or nights with asthma symptoms from 30.

2.5. Statistical Analyses

Descriptive statistics included means (SD) and proportions. Paired t tests and chi-square tests were used in bivariate analyses. A two-sided p-value less than 0.05 was used to detect a statistically significant difference for all analyses. Computations were performed using STATA version 9.2 (College Station, TX).

3. Results

3.1. Adherence

At baseline, 46% of caregivers and 32% of adolescents reported the adolescent took her/his ICS every day during the 2 previous weeks. At post-intervention, the caregiver report of perfect medication adherence increased from baseline (62%), but adolescent report did not change (27%; $\chi^2=5.5$, $p=.02$ for caregivers and $\chi^2=1.9$, $p=.17$ for adolescents). There were no significant changes in mean ratings of ICS medication doses taken in the previous 2 weeks by either caregiver or teen report ($p=.14$ and $p=.96$, respectively; Tables 1 & 2) or the degree of agreement between caregivers and adolescents about forgetting to take the ICS ($p=.99$ and $p=.96$, respectively).

3.2. Motivation and readiness to change

Adolescents reported a statistically significant increase in motivation to take their controller medication; mean ratings increased from 7.0 at baseline to 8.3 post-intervention ($t=2.58$, $p=0.01$; Table 2). Similarly, there was a statistically significant improvement on Readiness to Change scores ($t=2.35$, $p=.03$).

3.3. Self-Efficacy

Adolescent's self-efficacy to manage asthma attacks increased pre-to-post-intervention but this difference was not statistically significant ($t=1.73$, $p=.09$). There were no pre-post intervention differences in the adolescents' self-efficacy to prevent asthma attacks ($t=1.18$, $p=.24$).

3.4. Knowledge

Baseline knowledge that the ICS medication was for preventing, not treating, asthma symptoms was uniformly high among both caregivers and adolescents (92% and 89%, respectively) and did not change post intervention (95% caregivers and 95% adolescents).

3.5. Responsibility for treatment

There were no statistically significant differences between the pre- and post- intervention ratings of adolescent and caregiver responsibility for treatment (Tables 1 & 2). There was a trend for the caregiver to report that the adolescent took greater responsibility for his/her asthma post-intervention ($t=1.81$, $p=.08$). We examined the four items related to medication use and found no statistically significant pre-post differences, with two exceptions: adolescents reported that caregivers were less likely to administer their medicine (Pre: $M=1.6$ ($SD=1.2$), Post: $M=1.1$ ($SD=1.4$); $p = 0.03$) and caregivers reported that adolescents were more likely to remember take medicine post-intervention (Pre: $M=2.1$ ($SD=0.8$), Post: $M=2.5$ ($SD=0.7$); $p = 0.02$).

3.6. Asthma morbidity

Both caregivers and adolescents reported statistically significant improvements in quality of life post-intervention on all quality of life subscales (Table 1 & 2). Compared with pre-intervention, caregivers reported an improvement in mean number of daytime SFD post-intervention ($t= -2.35$, $p=.02$), but not nighttime SFD ($t= -1.57$, $p=.13$). Adolescents did not report statistically significant changes in SFD for either daytime or nighttime asthma symptoms.

3.7. Qualitative evaluation of the efficacy and acceptability of intervention

Ninety-five percent of caregivers reported that they and their child learned something new about asthma, with 49% indicating they learned something new about asthma medications. Typical statements included “[We] learned how important it was to take asthma medicine” and “[Child learned] taking medicines will help him feel better”. Eighty-nine percent of caregivers reported that other families with children with asthma would benefit from the intervention. The adolescents responded similarly: 76% reported that they learned something new about asthma, with 68% indicating they learned something new about asthma medications. Typical statements included “[I learned] that taking Flovent helps in the long run” and “[I learned] how to use Advair correctly”. Seventy-six percent of the teenagers felt other families would benefit from the intervention.

4. Discussion and Conclusion

4.1 Discussion

MI has been successfully used to promote health behavior change across a wide variety of illnesses, but only one study [34] used MI to motivate asthma medication adherence and this was among adults. Moreover, only a handful of studies have focused on increasing asthma medication adherence in adolescents [6-11]. Intervention strategies of prior studies assume that adolescents are ready and willing to change. MI does not make these assumptions, but rather targets these constructs with intervention strategies. The current pilot study found that MI is feasible and acceptable to minority adolescents and their caregivers, and provides preliminary support for its efficacy. We found high acceptability (95% completed all visits), high face validity of the intervention content with 95% of caregivers and 76% of adolescents reported that they learned about the importance of medication adherence, and high satisfaction (89% of caregivers and 76% of adolescents would recommend the intervention to others).

Although caregivers were significantly more likely to report perfect adherence post intervention, there were no improvements in adolescent-reported adherence. However, both caregivers and teenagers reported higher baseline adherence than expected based on objective data in the literature where African-American adolescents have been found to take only 32-37% of their medication [3;47]. It may be that the ceiling effect on the self-reported adherence items prevented us from finding a difference post-intervention. Because self-report is known to overestimate true levels of adherence [48;49], we cannot determine if the lack of change was due to self-report bias, lack of statistical power, or failure of the intervention to effect behavior change. These results highlight the need for future studies to include objective measures of adherence (e.g., electronic medication monitoring or pharmacy refill records) to avoid the pitfalls of using self-report measures.

We found that adolescent motivation and readiness to adhere to asthma medication increased after receiving an MI adherence promotion intervention. These results suggest that MI may influence constructs previously shown to be central to predicting asthma medication adherence, and further support the importance of measuring these mediators in adherence-promoting interventions. While many asthma education interventions focus heavily on increasing patient knowledge of asthma and asthma medications as a strategy for improving asthma self-management [4], our study found that both caregivers and adolescents could accurately state the regimen and the purpose of the controller medication yet still reported frequent non-adherence with ICS therapy. This finding highlights that focusing only on education and skill-building may have little effect on adherence. That we found no difference on the self-efficacy measure likely reflects its poor reliability in our sample, emphasizing the need to pilot measures as well as interventions prior to launching a full-scale randomized trial.

As with most MI interventions, this intervention focused almost exclusively on encouraging the adolescent's self-responsibility for adherence. Because the literature suggests the importance of family involvement in illness management [50;51], we measured how families distributed responsibility for asthma management. There was some evidence that adolescents assumed more responsibility post intervention, but more importantly, there was no evidence that the intervention resulted in decreased caregiver involvement by either caregiver or adolescent report.

Consistent with other asthma self-management interventions with adolescents [6;10;11], we found improvements in asthma morbidity; both caregiver and adolescent quality of life increased and caregivers reported improvement in symptom-free days. In contrast, we observed no improvement in adolescent-reported symptom-free days. Absent a control group, we hesitate to conclude that the improvements are attributable to the intervention. Indeed, many studies that recruit participants from the ED find that asthma morbidity improves significantly for both intervention and control groups and may reflect a natural regression to the mean after an asthma exacerbation [52;53].

Based on early participant feedback, several modifications were made to our original intervention during the course of this pilot study to enhance the developmental appropriateness of the sessions, while maintaining the spirit of MI. While we originally planned for the decisional balance exercise to assess the traditional four cells (pro/not taking medicine, con/not taking medicine, pro/taking medicine, con/taking medicine), it became evident that this task was difficult for the adolescents. The task was modified to assess only two cells (pro/con of taking medicine). Additionally, we initially met only with the adolescents and learned that once the adolescents starting using their ICS more regularly, they ran out of medication and often did not get refills. Therefore, we added a component to each visit that focused on motivating the caregiver to obtain refills. Because caregivers exert

significant control over adolescents' access to medication by scheduling physician visits, refilling prescriptions, and maintaining health insurance for them, we suggest that future interventions meet directly with caregivers on these topics.

The largest limitation of this pilot study is the absence of a control group so we cannot state with certainty that our positive results can be attributed to the intervention. However, because an MI intervention had not been conducted previously with children as young as 10 years of age or exclusively in an inner-city asthma population, we determined it was best to conduct a feasibility study prior to embarking on a large-scale randomized control trial.

4.2 Conclusion

The results of this pilot study demonstrate that with minor modifications a Motivational Interviewing intervention is feasible to implement and acceptable to inner-city African-American adolescents and their caregiver. This study adds to the growing literature of the use of MI to improve medication adherence and health outcomes. An important next step is conducting a randomized controlled trial to evaluate whether an MI-based adherence promotion intervention positively affects objectively measured adherence to medications and asthma morbidity in this high-risk population to address the asthma disparities faced by inner-city African-American adolescents with asthma.

4.3 Practice Implications

Increasingly managed health care plans and disease management programs are offering self-management services to patients with asthma who frequently use the emergency department. This study demonstrates that motivational interviewing can be successfully implemented with younger adolescents at high risk for nonadherence and increased morbidity. Incorporating MI into disease management programs may enhance their effectiveness.

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Table 1

Caregiver Reported Variables Pre- and Post-Intervention (N=37).

	Pre-Intervention M(SD)	Post-Intervention M(SD)
Adherence		
ICS Medication Adherence past 2 weeks	4.5 (1.8)	5.1 (1.4)
Some days forgets to take ICS medicine	3.7 (1.6)	3.7 (1.7)
Morbidity		
modified PACQLQ – Activity Domain	4.5 (0.8)	4.8 (0.4) *
modified PACQLQ – Emotional Domain	4.2 (1.0)	4.6 (0.7) *
SFD - Daytime Symptoms	25.0 (7.2)	27.4 (2.5) *
SFD - Nighttime Symptoms	26.5 (6.1)	28.3 (2.6)
Responsibility for Treatment		
ARI - Teen	1.9 (0.6)	2.1 (0.6) †
ARI - Caregiver	2.6 (0.3)	2.5 (0.4)

Note: ICS = Inhaled Corticosteroid; PACQLQ = Pediatric Asthma Caregiver's Quality of Life Questionnaire; SFD = Symptom Free Days; ARI = Asthma Responsibility Interview

†
p<.10

*
p<.05

Table 2

Adolescent Reported Variables Pre- and Post-Intervention (N=37).

	Pre-Intervention M(SD)	Post-Intervention M(SD)
Adherence		
ICS Medication Adherence past 2 weeks	4.4 (1.7)	4.3 (1.6)
Some days I forget to take ICS medicine	2.2 (1.4)	2.1 (1.6)
Medication Motivation	7.0 (2.7)	8.3 (2.2) *
Readiness To Change	3.9 (1.1)	4.4 (0.9) *
CASES – Attack Prevention	4.4 (0.4)	4.5 (0.4)
CASES – Attack Management	3.8 (0.7)	4.0 (0.7) †
Morbidity		
modified PAQLQ – Symptoms	4.3 (0.7)	4.6 (0.5) *
modified PAQLQ – Emotional	4.3 (0.9)	4.7 (0.4) *
SFD - Daytime Symptoms	26.8 (3.5)	27.2 (4.1)
SFD - Nighttime Symptoms	28.6 (2.1)	28.1 (4.0)
Responsibility for Treatment		
ARI - Teen	2.1 (0.5)	2.2 (0.5)
ARI - Caregiver	2.5 (0.3)	2.4 (0.5)

Note: ICS = Inhaled Corticosteroid; CASES = Child Asthma Self Efficacy Scale; PAQLQ = Pediatric Asthma Quality of Life Questionnaire; SFD = Symptom Free Days; ARI = Asthma Responsibility Interview

†
p<.10

*
p<.05