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The impact of asthma self-management education programs on the health outcomes: A meta-analysis (systemic review) of randomized controlled trials

Surender Gaddam

THE IMPACT OF ASTHMA SELF-MANAGEMENT EDUCATION PROGRAMS ON THE HEALTH OUTCOMES: A META-ANALYSIS (SYSTEMIC REVIEW) OF RANDOMIZED CONTROLLED TRIALS

A Thesis

Presented to the

Faculty of

California State University

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

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ABSTRACT

Background: Asthma self-management educational programs form the backbone for the management of the both pediatric and adult asthma. Several studies in many countries have revealed this fact and the evidence-based practitioners have been using the evidence in the routine practice.

Objectives: This study was designed to examine the impact of asthma self-management educational programs on the health outcomes in pediatric and adult subjects of United States. Further an attempt has been made to find the difference in impact in children and adults, group and individual education, and other sub-groups.

Methodology: All the trials included in the meta-analysis (systemic review) were retrieved from MEDLINE, CINAHL, Cochrane Controlled Trials Register, and by hand searching after they satisfied the inclusion criteria. The quality of the studies was assessed by validated quality scale. Following this the trials were critically appraised and evidence tables created with the key information in the studies. The pooled effect size was calculated using inverse variance weight method.

Results: The literature search had retrieved 60 clinical trials but only 17 were included in the study. Ten of the 17 studies were of 'poor quality'. On pooling the effects of the individual studies though there was an improvement in health outcomes it was only a negligible to small effect {(hospitalizations: ES=-0.13(-0.30,0.04); hospital days: ES=-0.21(-0.56,0.14); subjects requiring ED visits: OR=0.67(0.35,1.30); ED visits (number): (ES=-0.16(-0.28, -0.04); unscheduled doctor visits:(ES=-0.17(-0.31, -0.03); days lost from school:(ES=-0.05(-0.26, 0.16); asthma attacks: ES-0.23 (-0.52,0.06); AM and PM asthma attacks: ES=0.04(-0.32, 0.40), (ES=-0.37(-0.72, -0.02); daily average AM and PM PFER measurements: ES=0.04(-0.25, 0.33), (ES=0.14(-0.15, 0.43)}. In overall the educational interventions in adults were more effective than in children but only with a negligible to small effect {(hospitalizations: (ES=-0.28(-0.85, 0.29), (ES)=-0.12(-0.30,0.06); ED visits: (ES=-0.22(-0.42, -0.02), (ES=-0.11(-0.27,0.05); unscheduled doctor visits: (ES=-0.36(-0.56, -0.16), (ES=-0.03(-0.20,0.15)}. The same was the case when individualized education compared with the group education.

Conclusion: self-management teaching programs seems to have negligible to small effect in reducing the morbidity

outcomes that may be due to inadequate or limited number of studies under study or 'poor quality' of studies or non-adherence to the national guidelines. Further research with standard criteria (both in design and interventions) is recommended to come to firm conclusion in this regard.

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"To my Guru and

my Parents"

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CHAPTER ONE

INTRODUCTION TO THE STUDY

Background

Asthma is one of the major public health problems in United States today. It has been estimated that this disease affects approximately 15 million people, nearly five million of who are under the age of 18. The victims of asthma experience over 100 million days of restricted activity annually and the total annual costs of the condition are estimated to be $11.3 billion. This clinical entity is also responsible for about 500,000 hospitalizations and 5,000 deaths a year. It is the number one cause of school absenteeism. Number of people with asthma has been increased[19] by 102 percent between 1979-80 and 1993-94. In a study[18] released by the Pew Environmental Health Commission at the John Hopkins School of Public Health it is expected that the victims of asthma would be more than double by 2020. The commission added that if the rates were not slowed, asthma would strike 1 in 14 Americans and 1 in 5 U.S families by the year 2020

Though the reasons for the increases in the morbidity and mortality with asthma are not clear, much asthma

related hospitalizations and the deaths are preventable. Most of the asthma affected population are unable to avoid the environmental factors that make asthma worse, recognize early warning signs of worsening asthma, appreciate the severity of the asthma exacerbation, take appropriate medication, or get prompt medical help when problems occur. The clinician may not diagnose asthma, initiate appropriate therapy, adequately monitor the patient's condition, recognize serious exacerbations, or educate the patient to prevent symptoms and develop a crisis plan for emergencies.

All the above issues give a clear indication of the need for asthma education (for both patients and the health professionals). In 1988 National Heart, Lung and Blood Institute (NHLBI) sponsored a workshop titled "Asthma Education: A National Strategy". The recommendations made at the workshop when combined with results of research demonstrating the benefits of the asthma education on disease outcome, became the stimulus for the development of the National Asthma Education and Prevention Program (NAEPP) that recommends an effective control of asthma by encouraging a partnership among patients, physicians and other health professionals through modern treatment and education programs.

The first significant achievement was the development of "Expert Panel Report: Guidelines for the Diagnosis and Management of Asthma." Experts convened by the NAEPP coordinated by the NHLBI of National Institutes of Health (NIH) offered recommendations for managing asthma. "The Expert Panel Report 2:Guidelines for the Diagnosis and Management of Asthma" identified the four disease-management strategies and guidelines for the implementation that would keep asthma under control and greatly improve the quality of life (QOL) for people with disease. The four strategies include: measures of assessment and monitoring, control of factors contributing to asthma severity, pharmacologic therapy, and education for a partnership in asthma care. Though the former three strategies have their own significance in managing the condition the last one remains the cornerstone of the asthma management.

Education should start at the start of asthma diagnosis and be integrated into every step of clinical asthma care, in the context of the medical appointments and other clinician-patient communication. Asthma self-management education should be tailored to the needs of each patient, maintaining sensitivity to the cultural

beliefs and practices, and involving the family members, particularly for pediatric and elderly patients.

Self-management, as the term indicates is the active participation of the patient in the management of the disease, which involves acquiring certain basic knowledge about the disease and its symptoms, recognizing early signs of deterioration and taking early steps to prevent the disease from worsening. Thus, helping the physician treat better. The NAEPP Expert Panel recommend (under the component four) the clinicians teach patients and families the essential information (patient and family should understand the rationale for needed action, brief verbal description of what asthma is and the intended role of each medication), medical skills (teach the patient necessary medical skills, such as correct use of inhaler and space/holding chamber and knowing when and how to take quick-relief medications), self-monitoring techniques (symptom monitoring, peak flow monitoring as appropriate, and recognizing early signs of deterioration) and environmental control measures (teach how environmental precipitants or exposures can make the patients asthma worse).

Statement of the Problem

Many trials (Randomized Controlled Trials and Controlled Clinical Trials) have been conducted in different settings in United States to measure the effectiveness of the self-management education on the outcomes of health both for the adults and pediatric age groups. Most of the educational programs increase the knowledge, but their impact on the health outcomes is not well established. Moreover, it is not clear that which type of educational program (intervention) would have the maximum impact on the positive health outcomes.

Purpose of the Study

Many systemic reviews and meta-analysis were conducted in regard to the impact of asthma self-management education on the health outcomes in various countries. There was no study identified specific to United States of America. Moreover, no study had tried to find the difference in the impact of self-management education on outcome measures for adults and pediatrics, and individualized and group education. The present study helps to find out the quality of trials conducted and recommend for expected standard of trials. The results from this meta-analysis (systemic

review) have significant implications for further research recommendations. The results of the study are of utmost importance to the evidence based practitioners.

An attempt has been made in this study to critically appraise, systematically review and aggregate the results obtained in the individual trials and examine the strength of evidence supporting the component four (Education for a Partnership in Asthma Care) of NAEPP to test whether health outcomes are influenced by education and self-management programs.

Limitations of the Study

1. All the trials used in this review were conducted in United States of America only. Hence generalizibility in USA context only.
2. The study did not consider all the possible health outcome variables that have an impact due to self-management education of asthma. Similar (positive health outcomes) results in case of other variables are questionable.
3. Some of the outcome variables (eg.hospital days) were measured either in children or adults but not in both the age groups. The study results of those outcome

variables cannot be generalized for both the age groups.

4. Most of the results in this study are based on very few trials. Therefore, one cannot reach to a strong conclusion regarding the practical application of the findings by the evidence-based practitioners.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Poor self-management may be a key factor in the high morbidity of patients with asthma. Though the guidelines for management of asthma developed for National Asthma Education and Prevention Program includes 'Asthma Education' as an essential component of the management, formal education is not a routine part of the medical care at any age level. There is sufficient evidence to prove that self-management (control of trigger factors, improvement in skills, adherence to medication, and self-monitoring of symptoms and flow rates) decreases both the morbidity and mortality due to asthma[1,4,17,42]. However, a meta-analysis[41] conducted to evaluate the impact of self-management teaching programs on the morbidity of pediatric asthma, found no reduction in morbidity.

The improvements in the outcomes following asthma self-management are due to the acquisition and performance of self-management skills rather than improved medical management, which is in concurrent with the self-management training or component of the training[9]. The health care

costs are on enormous rise and needs a check. This involves either rationing medicine or adapting self-management techniques that involves individuals' greater responsibility for own health-care thereby reducing their need to utilize health-care services. There has been a tremendous improvement in the drug availability in management of asthma, on contrary there had been an increase in mortality as well as morbidity that is attributed to the delays in implementation of appropriate therapy and under treatment than the drug toxicity thus, making the education and skills training important in the appropriate management of the condition.

Knowledge and Skill

Snyder and Winder[23] noticed an improvement in knowledge both in experimental and control group following asthma education. The improvement in control group was without the educational sessions. The investigators concluded that mere filling of the questionnaires (asking the asthmatics about asthma) make the individuals aware of, and understand the disorder which means that Americans are poorly informed about Asthma. The similar results were also found in another study[8] strongly in agreement with Snyder and Winder.

Bailey et al[1] also found a large decrease in health care utilization in control groups that may be due to availability of comparable amount of information about asthma. However, this is questionable as the groups differed on adherence and two of the measures of functional status. Alternately it may be a selection bias because subjects were recruited during clinic visits and baseline clinic visits may have been more likely immediately following an ED visit or hospitalization. Taking into consideration this explanation, the baseline utilization measures would have been artificially inflated, and the decrease would represent a return to normal base state. Moreover, the research was conducted in a university medical center and such settings are likely to provide an unusually favorable context, due to number and type of professional support personnel available to implement the program[1]. The demonstration of similar results are however questionable in other healthcare settings (community clinical settings) due to lack of resources and cost of the intervention[24].

Development of the self-care behaviors play a vital role in implementing the self-management skills. There were not many studies found that studied the self-care behaviors

of the asthmatics in management of the disease. Avery and his colleagues[19] in 1980 when assessed the fundamental self-care behaviors (have bronchodialater medication available, use an inhaler effectively, maintain regular physician contact and when asthma symptoms increase, start medication promptly, use appropriate medication, and seek professional assistance for persistent symptoms) found that a substantial proportion of asthmatics' had inappropriate self-care behaviors. However, it would be inappropriate to conclude with the findings of a single study.

Health Outcomes

Self-management educational programs not only improve the knowledge of the asthmatic individuals but also have a positive impact on the symptoms and morbidity outcomes (hospitalizations, emergency department visits, loss of school days, acute doctor visits, asthma attacks, and PEFR measurements) and the impact seemed to be directly proportion to the intensity and quality of design of the educational program. Kotses et al[9] reported an improvement in asthma symptoms *($p<0.05$ in morning and $p<0.01$ in evening)* following educational program. In another study[2] there was no improvement in asthma symptoms in the

intervention group contradicting the findings of Kotses et al[9]. However this finding possibly is attributed to the lack of sufficient measurement sensitivity or short duration of follow up.

In a study[18] with simple informational educational program as intervention, improved knowledge *($p<0.05$)* and patient satisfaction were accompanied by a reduction in emergency attendance at hospital in intervention groups. However the change in asthma morbidity was not significant. Self-Management practices show a significant decrease in emergency department visits and hospitalizations both in adults and pediatric age group[1,11,27,24,32]. Similar results *($p<0.005$)* were also noticed in a study [22] but the effects were evident in the initial four months (short term) of the intervention that contradicts the conclusions of the study carried on by Wilson SR[17] et al in 1993. However this contradiction may not be generalized, because the population under the study in former was exclusively adults while in the latter was the age group between 5 and 70 years of age. Moreover, there were statistically significant differences in the baseline parameters of the experimental and control groups, and a significant numbers of the intervention group did not attend the educational

programs and more patients lost the follow up in Bolton et al[22] study. In a randomized controlled study[6] the patients enrolled in the inpatient asthma education (IEP) program had significantly fewer ED visits *(P=0.04)* and hospitalizations *(P=0.04)* for asthma in the six months following IEP intervention, as compared to control patients. But, the study had several limitations.

Clark et al[3] when studied the impact of health education on frequency and cost of health care use by low-income children with asthma, found no significant difference in subsequent health care use in the experimental and the controlled group without regard to the previous hospitalization. But when the comparison was restricted to the children who had been hospitalized during the preceding year the experimental group was found to have decreased its use of the emergency room significantly more than the control group *(P<0.05)* and was found to have experienced a significantly greater reduction in the mean number of hospitalizations *(p<0.05)* during the following year.

In an asthma self-management program (individualized, instructional asthma education and peak flow monitoring of 8 weeks duration) for children, Persaud and his co-

investigators reported no significant differences in the number of post-intervention emergency room visits and days absent from school. Population-based-programs can improve functional status, increase self-monitoring and knowledge about asthma, and decrease absenteeism and hospitalization *($p<0.01$)* for asthma by directly providing asthmatic patients with educational materials and self-monitoring tools[28]. Homer et al[8] reported a substantial decline in ED visits of children in intervention group with asthma (mean of 2.14 pre and 0.86 post intervention, $p<0.01$). Educational interventions do have impact on children's knowledge of asthma and also have effects on hospitalizations and emergency room and medical utilization, daily activities, and school absenteeism[14].

The reported numbers of limited activity days due to asthma followed a pattern similar to that found for emergency department visits. In a recently conducted study to assess the effectiveness of an interactive device program for the management of pediatric asthma[7] the authors found a decrease in limitation in activity in both the groups (experimental and control). However, the decline in control group was less than that of intervention group.

In a study[9] the subjects in the self-management group exhibited a decrease in frequency of physician visits over a short-term period of two months where as the subjects in the control group did not. There was no change noticed in either emergency room visits and the frequency and duration of hospitalizations. In the same study subjects both in the control and intervention group did not demonstrate any change in the healthcare utilization over the long term indicating that subjects' asthma was under control at the beginning of the study.

Self-management of asthma shows improvements in patients A.M. PEFR (peak expiratory flow meter) however, a statistically significant difference was not found in P.M. PEFR[10]. In contrast to this there was no improvement seen in the peak flow measurements in the intervention group in a study conducted by Berg et al. Wilson et al also reported this finding in 1993 and there continues to be controversy regarding the sensitivity of peak flow measurements.

Though all the methods (verbal, written, software, charts, pictures etc.) of education have a positive impact on the knowledge, skills and the morbidity outcomes in patients with asthma, different methods would have different levels of impact. Self-study workbook, as a

method of education was not associated with significant changes in behaviors and skills or alternations in patient's condition. Although some of the patients in the above study benefited from receiving the workbook, many clearly did not, despite the fact that the workbook incorporated many of the same behavior change strategies as the other programs and was written at a level appropriate for the population indicating that the method or the type of educational intervention has something to do with the outcomes of the clinical entity.

Interactive educational software program properly designed is effective in conveying information and in providing opportunities for children to safely experience the consequences of different self-management activities[8]. Rubin DH and his co-investigators in 1986 reported that an interactive program between the child and computer without direct interaction with the health professional declined the unscheduled doctor visits.

Bailey[25] and his associates conducted a study in 1999 comparing the three standard self-management treatments in a randomized controlled trial: (1) a replication of the self-management program developed at a university medical center that was previously shown to be efficacious; (2) a

modified version of this program including only the core elements (a revised shortened workbook briefed in a 15-20 minute one to one counseling session, patients trained to use peak flow meters and inhalers, follow up telephone counseling session after one week later to review patients medication regimen and inhaler and peak flow meter skills, and a follow up letter was sent two weeks later) developed by a focus group methodology; and (3) a usual care program On analysis, the results of all the three groups demonstrated an improvement in measures of respiratory illnesses, use of health care services, and functional status. Neither of the asthma self-management programs was superior to usual care. With regard to the functional impairment, the core elements group had a higher proportion experiencing functional impairment relative to the usual group.

Simplicity of the asthma self-management plan and the systematic approach has a strong relation with the patient compliance. Mayo et al[21] in their study reported that the improvement in control of asthma in their patient group may well have been simply because the availability of clinic and its personnel was strongly emphasized.

Wilson SR et al in 1993[17] concluded that the small group education and individual education were associated with significant benefits, but the group program was simpler to administer, better received by the patients, and most cost effective. A relatively greater reduction in medical care utilization was observed among patients who received group education and was not observed in individual education.

The educational procedures and the development of self-management behavior have a significant role in improvements in asthma severity[9]. The educational programs that optimize the communication and learning are effective as seen in the Kotses et al study[9]. In the same study it was evident that teaching the patients the aspects of records, the patients maintain prompted asthma self-management measures. The effective educational programs and the use of records served as the striking tools for the strong results obtained in the study suggesting that results of a self-management program very much depend on the educational and the behavioral principles incorporated in the design of the study.

The impact of the asthma education program on the patient outcomes depends on multiple variables (method of

education, duration of education, individual or group, number of sessions and the severity of asthma). The investigators must consider as many variables as possible for a well-designed education program that results in better patient outcomes

Face-to-face interaction of the medical care provider and patient results in most meaningful transfer of information[24]. In a recently conducted study[7] the authors found a decrease in morbidity outcomes following asthma education and self-monitoring with nurse coordinator as the educator. It is assumed that physicians or nurse practitioners, as the educators in a self-management education program would yield better results. However, there are not many studies or sufficient documented evidence present to make a firm conclusion.

In addition to the method of education and the educator, the follow up period too plays a significant role in the effectiveness of the program. A randomized controlled study[17] found that the evaluation of educational and behavioral interventions, especially for adults with long-standing disease, requires long term follow up (1 to 2 years) if the benefits of improved management and symptom control are to be detected.

Self-management tools are the backbone of the asthma self-management educational programs. Educational workshops for families, individualized counseling sessions, and using asthma diary as the primary tool of intervention have a significant effect on the positive outcomes (prophylactic use of antibiotics ($p<0.05$), symptom persistence ($p<0.01$), and activity restrictions ($p<0.001$)) of the disease in pediatric age group however, the study[31] has several limitations. The asthma diary in this study helped patients notice the persistence of asthma, was conceived as an educational tool for the family rather than a data source for the clinician, helped families associate daily medications at adherence with improved health outcomes, and was useful for alerting parents when symptoms or peak flow indicated the need to adjust medication using their stepped action plans. The educational intervention with family's phase of asthma self-regulation helps in greater improvement in the children's' health outcomes[31].

The available evidence is insufficient to demonstrate that the asthma outcomes are improved by use of a written action plan, with or without peak flow monitoring[30]. Lefevre and his colleagues[30] in their evidence based analysis (qualitative meta-analysis) concluded that though the

written action plans as intervention are not ineffective they will not have a large effect on the health outcomes when applied to the general asthmatic population. In an other study it was found that education of patients and families, including the development of a written action plan for at-home management increases the symptom free days in children[33].

A retrospective study [26] determined that PART (medical management, peak flow monitoring (PFM) and an action plan) and FULL (all those in PART and multidisciplinary education program stressing on trigger identification and avoidance, environmental control and proactive adjustment of anti-inflammatory drugs) programs can significantly impact the frequency with which hospital-based asthma care is required and thus reduce the over all cost of caring for patients with asthma.

The patients of bronchial asthma treated in different clinical settings have different degrees of the disease (patients treated in emergency department are usually of severe degree while that in outpatient set up would have a milder form of the disease). Hence, the improvement in the patients with regard to symptoms or the morbidity outcomes would be different. Patients attending the acute care

setting have a greater desire to know more about asthma than those get treated in preventive care setting and thus show more interest in self-management of the disorder[23] suggesting that the development of educational interventions targeted to the acute care settings where a substantial number of patients seek care would be beneficial.

Hypothesis

It is hypothesized that:

1. Asthma self-management education has a positive impact on the various morbidity variables (hospital admissions, emergency department visits, days lost from school/work, unscheduled doctor visits, and spirometric outcomes (PEFR)).
2. The educational interventions with asthma action plans and asthma self-management plans and regular practitioner review will have optimal results.
3. The educational intervention involving clinician as educator; active involvement of family member (in case of children and elderly) and a team approach would be more effective.

CHAPTER THREE

METHODOLOGY

Search Strategy

A literature search was performed for the articles published in English with key words 'asthma education', 'self-management practices', and 'self-management programs' on MEDLINE database. The search was restricted to randomized controlled trials and controlled clinical trials. The other databases searched for the literature were CINAHL and Cochrane Controlled Trials Register. The electronic searches were supplemented by the hand searching. All the hand searches were carried out in Del E.Webb Memorial Library, Loma Linda University, Loma Linda. In addition, the reference lists of all the articles retrieved were examined for their potential inclusion in the study. Some of the authors of the articles were contacted by an electronic mail however response was received from none.

Study Inclusion Criteria

Only Randomized controlled trials (RCTs) or Controlled clinical trials (CCTs) conducted in United States of America and published in English that studied the effects

of the asthma education and self-management on health outcomes in adult or pediatric age group or both were included in meta-analysis. The outcomes of interest had to relate to one of the morbidity variables (hospital admissions, emergency department visits, days lost from school/work, unscheduled doctor visits, and spiro metric outcomes (PEFR). The studies had to be conducted in Hospitals, Emergency departments, Out- patient clinic, General Practitioners, or Community settings.

Study Exclusion Criteria

All the studies with patient disorders other than bronchial asthma, studies measuring only the patient compliance outcomes, economic evaluation/ cost benefit analysis, studies with major methodological problems, non RCT or non CCT and significant absence of study methodology were excluded from the study. Those studies in which the results were not presented in a favorable way to use in meta-analysis were also excluded. All letters, reviews, editorials and comments were excluded from analysis.

Qualitative Assessment of Studies

The quality of all the studies was assessed using validated quality scale[38]. The scale was used by many other

investigators who have confirmed that it was easy and quick to use and also has construct validity[39,40]. The scale uses three (description of randomization, double blinding, and dropouts/withdrawals) items that are directly related to bias reduction and are presented as questions to elicit 'yes' or 'no' answers. The scale produces scores from 0 to 5. One point is given to each 'yes' if the study is described as randomized, double blind, and if the description of dropouts/withdrawals is present. Further one additional point is given if randomization/blinding is appropriate and one point is deducted if randomization/blinding is inappropriate. Any score below 3 is considered as a poor hence the study labeled as 'poor quality' study. The assessment of the studies included in meta-analysis is shown in APPENDIX A

Various Interventions and Their Characteristics

Various interventions that are seen in the asthma self-management teaching programs included in meta-analysis (systemic review) are:

- Patient asthma education
- Use of self-monitoring tools
- Self-monitoring of PEFR, symptoms, and medications

Optimal self-management included all the three components along with regular medical review (asthma education of any type, involvement of action plan, and/or asthma self-management plan, self-monitoring and regular medical review)

Patient Asthma Education

This is the transfer of information about asthma in any of the forms (written, verbal, visual, audio, software or may be a combination of these). Education was either interactive or non interactive, structured or unstructured. Some of the other educational materials used in the self-management programs were stickers, cartoons, games, anatomic models, balloons, stories etc. Education was delivered either by clinician or a non-clinician. Education was either an individualized education or a group education depending on the number of subjects involved. The content of education dealt with the basic facts about asthma, roles of medication, skills (inhaler/spacer/holding chamber use, self-monitoring), environmental control measures, and when and how to take rescue medications. It was delivered either in a single session or in multiple sessions.

Minimal Education. This is characterized by the provision of written material alone or the conduct of the

short unstructured verbal interaction between the health provider and the patient where the basic idea is to improve the knowledge and the understanding of asthma.

Optimal Education. Optimal education is considered as the structured with the use of interactive and/or non-interactive mode of delivery.

Self-Monitoring Tools

Self-monitoring is the regular measurement of either peak expiratory flow or symptoms. Various self-monitoring tools used were:

- Written action plan
- Written individualized self-management plan
- Asthma diary
- Peak flow meter
- Others (Journal of daily asthma concerns, MDI chronology)

Written Action Plan. This tool helps the patient manage asthma exacerbations and important for patients with moderate-to-severe persistent asthma and patients with history of severe exacerbations. The action plan is characterized by being individualized to the patients underlying asthma severity and treatment. Action plan directs the patient to adjust medicines at home in response

to particular signs, symptoms, and peak flow measurements. It also lists the PEF levels and symptoms indicating for acute care and emergency telephone numbers for physician, emergency department, rapid transportation, and family friend for aid and support.

Written Individualized Self-Management Plan. This includes the recommended doses and frequencies of daily medications and the daily self-management activities needed to achieve the agreed on goals.

Asthma Diary. It is meant for self-monitoring symptoms, peak flow measurements, frequency of daily quick relief medication use, and activity restrictions

Peak Flow Meter. To measure the peak flow rates

Regular Medical Review

This is regular consultation with a doctor during the intervention period for the purpose of reviewing the patient's asthma status and medications. This may occur either as a formal part of the intervention or the patients may be advised to see their own doctor on a regular basis. Interventions are classified as having "regular review" either inside the program (if the patients were seen as a part of the program) or outside the program (if the

patients were merely advised to seek regular medical review)

Patient Outcomes of Interest

1. Number of hospitalizations
2. Number of emergency departments visits
3. Number of Subjects visited emergency departments
4. Number of unscheduled doctor visits
5. Hospital days due to asthma
6. Number of days lost from school/work
7. Number of asthma attacks (AM and PM)
8. Spiro metric outcomes (AM and PM PEFR measurements)

Critical Appraisal of Studies

All the studies were critically appraised and the key information was tabulated to form evidence tables. Following this all the possible comparisons (primary and sub-group) were derived and the results obtained using the standard statistical techniques.

The key information that is summarized in the evidence tables (APPENDIX:C) include:

1. Study reference

2. Methods including the study design, method of randomization, concealment of allocation, and outcome assessor blinding.
3. Details of the participants including the number eligible, participated, randomized, dropouts and dropout rate, method of patient recruitment, inclusion and exclusion criteria, and study baseline characteristics.
4. Educational intervention in detail
5. Statistical techniques used in the study along with the methods of data collection
6. Results/Outcome measures
7. Limitations of the study and
8. Conclusions and remarks

The qualitative grading of the studies was done based on validated quality scale (*Jadad AR et al* 1996):APPENDIX B *Note*: All the *p*-values mentioned in the studies unless otherwise relate to between group comparisons.

Statistical Analyses

The outcomes reported in the studies were categorized either as dichotomous or the continuous. Continuous data was further categorized as with standard deviations or

missing standard deviations. The outcomes presented in two were dichotomous, 15 studies were continuous. Of those 15 studies seven of them had missing standard deviations. Since the exclusion of these studies from pooled analyses results in systemic biases the estimates of standard deviations were imputed[43]. For this purpose pooled standard deviations were estimated using the standard formula for t-statistic. The same standard deviation was used for both the control and the experimental group. When the t-statistic was not reported, the critical t-value corresponding to the exact p-value with appropriate degrees of freedom was used. When both the t-statistic and the p-value were not reported then the t-statistic with appropriate degrees of freedom corresponding to $p=0.05$ (for $p<0.05$) or $p=0.50$ (for a non-significant or pure chance result) was used.

For dichotomous outcomes odds ratio was calculated with 95% confidence intervals and pooled by inverse variance weight method[44]. For all the continuous outcomes after computing the missing standard deviations the effect sizes (standard mean differences) with 95% confidence intervals were calculated. The effect sizes were combined by inverse variance weight method and were interpreted as ≤

0.15(negligible effect); ≥ 0.15 and ≤ 0.40(small effect); ≥ 0.40 and ≤ 0.75(medium effect); ≥ 0.75 and ≤ 1.10 (large effect); ≥ 1.10 and ≤ 1.45(very large effect);>1.45(huge effect). Negative effect size favors the experimental group while the positive favors the control group except in case of the PEFR measurements. Q - the homogeneity statistic that is distributed as a Chi-Square was used for examining the homogeneity. If the calculated Q-statistic value is less than the critical Chi-Square with particular degrees of freedom at p=0.05 then we fail to reject the null hypothesis of homogeneity. Thus the variability of across the effect sizes does not exceed what would be expected based on sampling error.

CHAPTER FOUR

FINDINGS AND RESULTS

Introduction and Selection of Trials

An initial literature search retrieved 60 clinical trials out of which 21 were excluded because the studies were conducted in countries other than United States of America. Of the remaining 39 on more detailed review 13 were excluded because the outcomes measured were not of interest (knowledge and behavior towards self-management, compliance). Further on evaluation five of the 26 remaining studies were excluded, as the numerical data of outcomes of interest was not provided. 21 studies were finally included in the study for meta-analysis (systemic review) but four the studies though provided numerical data the data presented was not in a way for consideration for statistical analysis resulting in including 17 studies for meta-analysis. Of 17 studies included 16 were randomized controlled studies and one was controlled clinical trial. (Flow diagram: APPENDIX: A). When categorized depending on the age group ten were pediatric (≤18 years) studies and seven belonged to adult (≥18 years) age group.

Qualitative Review

On assessing the quality of each study based on validated quality scale it was found that ten studies (includes one CCT) were in the category of 'poor quality' while seven acquired a score of three. None of the studies had a score of more than three. Though the authors described the studies as randomized most of the studies either did not describe the method of randomization or adapted an inappropriate method. Allocation concealment (prevents selection bias, protects randomization sequence before and until the interventions are given to study participants) was seen in only three of the studies[1, 7, 8]. All the three investigators used closed opaque envelope technique. No asthma education intervention studies were conducted using the double blinding. Single blinding was seen in only very few studies. True placebo comparison is also difficult to obtain in educational intervention study settings because of the ethical considerations. In some of the studies[1,7-9,11,16] usual care from a medical practitioner involving some limited level of education was used in control group. All the subjects in the studies either had a confirmed asthma diagnosis from a physician or were diagnosed based on certain objective criteria, as per the

standards established by the American Thoracic Society, as per National Heart Lung and Blood Institute clinical practice guidelines. Four [6,8,10,13] of the studies did not have a mention in the article that how the diagnosis of asthma was made. The patients were recruited from a variety of settings (outpatient clinics, community, Emergency departments, general practitioners, or hospitals). The eligible subjects were recruited by contacting them by telephone, advertisement in the newspapers, distributing the brochures in the community or directly from the clinics, emergency departments, and hospitals.

All the studies except four [6,9,10,14] (no mention of inclusion criteria) had well defined inclusion criteria based on which the patients were recruited. The most common inclusion criteria were age, severity of asthma, objective evidence of asthma, emergency department visits due to asthma, hospitalizations due to asthma, and medication usage. Some of the studies had verbal fluency in English as one of the inclusion criteria.

The patients were excluded if they had other pulmonary or debilitating diseases that would hamper the results, earlier involved in asthma education program, intellectual deficits, or other co-existing conditions like alcohol or

drug abuse, smokers at the time of study. Many studies[3-5,10-14,16] did not mention the exclusion criteria.

A total of 2003 subjects were randomized into 17 studies and 19 study groups of which 1113 were in experimental group and 890 in control group. The dropout/withdrawal rate was as low as 0% seen in some of the studies and as high[14] as 30.8%, the average being 9.76%. While 11 of the studies gave the description of the withdrawals/dropouts the remaining just mentioned the dropout number. Six[3,5,6,12,15,16] studies had a dropout rate of zero. Only in two[2, 17] of the remaining studies was analyses carried on an 'intention to treat' basis. Four[1, 2,7,17] of the 17 studies included in meta-analysis mentioned the adequacy of the statistical power. There were no statistically significant differences in the baseline characteristics of the control and the experimental group in thirteen studies. A statistically significant difference in the baseline characteristics (greater severity and early onset of illness in control group) between both the study groups was seen in one[15] of the studies. The investigators in three[7, 10,16] studies did not report about the differences in the baseline characteristics of the intervention and the control group.

Two[10,17] of the studies had two intervention groups (one individualized intervention and the other group intervention) and a control group. For the purpose of analysis both the intervention groups were compared with the control group separately resulting in 19 study groups for comparison from 17 studies.

Interventions and Comparisons

The 17 studies described several interventions with the content of intervention included asthma education, self-monitoring of symptoms/peak flow/medication or any combination of the three, asthma action plan, asthma self-management plan, and asthma diary.

1) Self-Management and Regular Medical Review Vs. Usual Care

1.1) Optimal Self-Management

1.2) Optimal Education and Self-Monitoring

1.3) Optimal Education Only

2) Optimal Education and Self-Monitoring Vs. Self-Monitoring

2) Optimal Education and Self-Monitoring Vs. Minimal Education

4) Optimal Education Vs. Minimal Education

Control Comparisons

All the control patients did not typically have usual care. While eleven studies had usual care as the management, four had minimal education, and two had self-monitoring. None of the control groups had either asthma action plan or asthma self-management plan as intervention.

Outcome Measures

Five (1 adult and 4 pediatric) studies reported number of hospitalizations as the morbidity outcome, two (both pediatric) reported the hospital days, and two (1 each in adult and pediatric) studies reported number of subjects visited to the emergency departments as the morbidity outcome. While a total of ten studies measured and reported number of emergency department visits four of them were adult and the remaining pediatric age group. Six (2 adult and 4 pediatric) studies measured unscheduled/acute doctor visits. While four pediatric trials reported the number of days lost from schools due to asthma two of them also reported the number of asthma attacks. Three adult clinical trials reported the AM and PM asthma attacks and three reported the AM and PM PEFR measurements.

Hospitalizations

Asthma self-management was associated with decrease in number of hospitalizations. However there was a negligible effect (Effect size (ES)=-0.13(-0.30,0.04), (n=5), Q-statistic=1.67,χ^2=9.49 at p=0.05-table5, 123). The intervention had more influence in the adult patients with a small effect ((ES=-0.28(-0.85, 0.29), (n=1)-table6, 123) than that in children with a negligible effect (ES)=-0.12(-0.30,0.06), (n=4), Q-statistic=1.49,χ^2=7.81 at p=0.05-table10, 125).

Self-Management and Regular Medical Review *Versus* Usual Care. Pooled effect size of all studies in this category was (ES=-0.18 (-0.39, 0.03), (n=3), Q-statistic=0.14, (χ^2=5.99 at p=0.05-table3, 122). The effect was more evident when it was optimal self-management with a small effect (ES=-0.28(-0.85, 0.29) (n=1)- table1, 121) followed by a negligible effect in both optimal education only (ES=-0.17(-0.40, 0.06), (n=1)-table3, 122) and optimal education and self-monitoring (ES=-0.13 (-0.90, 0.64), (n=1)-table2, 121).

Further when the difference in the effect was seen for adult and pediatric age groups the intervention was more effective in the adults with a small effect (ES=-0.28(-

0.85, 0.29), (n=1)-table6, 123) than the children with a negligible effect (ES=-0.17 (-0.39, 0.05), (n=2), Q-statistic=0.01, χ^2= 3.841 at p=0.05)-table8, 124). All the studies in the pediatric age group had group self-management education and that in the adult group had individual self-management education.

Optimal Education *Versus* Minimal Education. Only a single pediatric group study had this category of intervention where a small effect (ES=-0.23(-0.69,0.24), (n=1)-table4, 122) was noticed relative to the comparison group. No study with this type of intervention was noticed in adult age group.

Optimal Education and Self-Monitoring *Versus* Self-Monitoring. There was no decline in hospitalizations. When the effectiveness was quantified it was found to be (ES=0.06(-0.29,0.42), (n=1), table-5, 123) favoring the control group.

Hospital Days

Optimal Education *Versus* Minimal Education. There were two studies (pediatric category) that examined the effect of self-management on the number of hospital days. The intervention was associated with a decrease in number of hospital days due to asthma and a small effect (ES=-0.21(-

0.56,0.14), (n=2), Q-statistic=0.33,χ^2=3.84 at p=0.05-table36, 138) was noticed.

Group self-management educational intervention had more impact (ES=-0.30(-0.77, 0.17), (n=1), table36, 138) than the individual (ES=-0.09(-0.63, 0.44), (n=1), table36, 138) intervention

There was no other study in either (pediatric and adult) of the categories that reported hospital days as the morbidity outcome.

Emergency Department Visits (Number of Subjects)

There were two studies that examined the impact of self-management educational program on number of subjects attending the ED. Overall the self-management reduced the proportion of the asthmatics needing the ED visits (OR=0.67(0.35,1.30), (n=2), Q-statistic=12.10, χ^2=3.841 at p=0.05-table26, 133).

Optimal self-management and regular medical review vs. usual care led to a significant reduction (OR=0.28 (0.06,1.21)-table26, 133) in the proportion requiring the ED visits than in optimal self-management vs. minimal education category (OR=0.84 (0.40,1.77)-table25, 133). The

former was a pediatric trial while the latter examined the effect in adults.

Further sub-group analysis of any kind was practically not possible because of the non-availability of the studies.

Emergency Department Visits (Number)

Ten studies have reported number of emergency department visits as the outcome measure. Though self-management interventions were associated with a decline in the ER visits there was a negligible effect (ES=-0.16(-0.28, -0.04), (n=10), Q-statistic=31.01, χ^2=16.919 at p=0.05-table16, 128, indicating a heterogeneity amongst the studies). It was found that the influence of the interventions on the adult population (ES=-0.22(-0.42, -0.02), (n=4), Q-statistic=29.04, χ^2 =7.81 at p=0.05-table20, 130)-indicating heterogeneity among the studies) was more than that on the pediatric population (ES=-0.11(-0.27,0.05), (n=6), Q-statistic=1.28, χ^2 =11.07 at p=0.05-table24, 132). In two of the studies[8,10] there was no effect and the results favored the comparison groups. When one of the studies[10] was excluded from the analyses there was an increase in effect size (ES=-0.19(-0.32, -0.06), (n=9), Q-statistic=5.12, χ^2 =15.51 at p=0.05-table16, 128) and when

both the studies were excluded the effect increased to (ES=-0.22(-0.29, -0.16), (n=8), Q-statistic=3.02, χ^2 =14.07 at p=0.05- table16-128). Post exclusion results of the adult and the pediatric studies were (ES=-0.33(-0.53, -0.12), (n=3), Q-statistic=1.39, χ^2 =5.99 at p=0.05-table20, 130) and (ES=-0.16(-0.33,0.02), (n=5), Q-statistic=0.12, χ^2 =9.49 at p=0.05-table24, 132) respectively.

Self-Management and Regular Medical Review *Versus* Usual Care. Self-management education over the usual care patients had a small effect on the emergency department visits (ES=-0.20 (-0.36, -0.04), (n=6), Q-statistic=29.02, χ^2 =11.07 at p=0.05-table14, 127). On excluding one of the studies[10] from analyses there was an increase (ES=-0.26(-0.42, -0.10), (n=5), Q-statistic=2.13, χ^2 =9.48 at p=0.05-table14, 127) in effect size but the increase was not significant.

When looked for the influence of the intervention in adult and pediatric patients separately the results were encouraging in adult (ES=-0.26(-0.49, -0.02), (n=3), Q-statistic=28.55, χ^2 =5.99 at p=0.05-table19, 130 indicating heterogeneity) rather than the pediatric (ES=-0.15(-0.17, -0.12), (n=3), Q-statistic=0.001, χ^2 =5.99 at p=0.05-table22, 131) age group. The effect size after excluding the study

from analysis that had no influence on the ED visits in adult group was almost medium (ES=-0.39(-0.62, -0.16), (n=2), Q-statistic=-0.07, χ^2 =3.84 at p=0.05-table18, 129).

Further on sub-group analysis of the self-management vs. usual care it was found that optimal education was more effective than the optimal self-management and optimal education combined with self-monitoring in case of adults. The same was the finding noticed in pediatric trials. However there was only one study in each sub group.

When looked for the difference in the effect of the intervention in group and individual educational groups though a small effect was observed in both the categories it was higher in individual education (ES=-0.26 (-0.38, -0.13), (n=2), Q-statistic=0.02, χ^2=3.84 at p=0.05-table14, 127) than the group education (ES=-0.20(-0.37, -0.03), (n=4), Q-statistic=28.95,χ^2 =7.81 at p=0.05-table14, 127 indicating heterogeneity amongst the studies). But the difference was not significant. Further on an attempt to see for the same differences in adult and pediatric groups separately there was no significant difference noted.

Optimal Education *Versus* Minimal Education. There were two studies (both pediatric) that reported the ED visits as outcome with this category of intervention. One of them had

impact on the outcome measure while the other did not. The effect size was (ES=-0.04(-0.33,0.25)), (n=2), Q-statistic=0.96, χ^2=3.84 at p=0.05-table16, 128) on pooling the results. After exclusion of the study[8] from meta-analysis there was a small effect size (ES=-0.23(-0.69, 0.24), (n=1)-table16, 128) noticed.

Optimal Education and Self-Monitoring *Versus* Self-Monitoring. Two trials (one adult and one pediatric) have examined the effect of this intervention on ED visits. While the pooled effect size was (ES=-0.11(-0.38, 0.61), (n=2), Q-statistic=0.03, χ^2=3.84 at p=0.05-table 15, 128) the individual effect sizes were (ES=-0.08(-0.53,0.37), (n=1)-table15, 128) and (ES=-0.13(-0.48,0.23) (n=1)-table15, 128) in adult and pediatric study respectively.

Unscheduled Doctor Visits

Unscheduled doctor visits as a morbidity outcome was measured by six (two adult and four pediatric) clinical trials. In these six trials there were seven different types of intervention, one[17] of them with group and individual self-management compared with the control group. Though the self-management educational intervention was associated with decrease in number of acute visits there was a negligible effect (ES=-0.17(-0.31, -0.03), (n=7), Q-

statistic=26.68, χ^2=12.592 at p=0.05-table30, 135 indicating a heterogeneity amongst the studies). It was more effective in adult asthmatics (ES=-0.36(-0.56, -0.16), (n=3), Q-statistic=18.01, χ^2=5.99 at p=0.05-table32, 136 indicating a heterogeneity amongst the studies) than the pediatric asthmatics (ES=-0.03(-0.20,0.15), (n=4), Q-statistic=1.90, χ^2=7.81 at p=0.05-table35, 138)

Self-Management and Regular Medical Review *Versus* Usual Care. The pooled effect of self-management over the usual care patients was of a small size (SE=-0.23(-0.41,0.05), (n=3), Q-statistic=23.31, χ^2=5.99 at p=0.05-table28, 134 indicating a heterogeneity amongst the studies). Optimal education alone had no effect (ES=0.06(-0.22,0.33), (n=1)-table27, 134) on the acute visits but optimal education combined with self-monitoring had a medium effect (ES=-0.44(-0.67, -0.20), (n=2), Q-statistic=15.88, χ^2 =3.84 at p=0.05-table28, 134 indicating a heterogeneity amongst the studies). Of the two studies in this category one had large effect (ES=-0.93(-1.25, -0.59)-table28, 134 and the other had zero effect.

The intervention had no effect in the pediatric age group (ES=0.06(-0.22,0.33), (n=1)-table33, 137 but a medium effect in the adult asthmatics (ES=-0.44(-0.67, -0.20),

(n=2), Q-statistic=15.88, χ^2 =3.84 at p=0.05-table31, 136 indicating a heterogeneity amongst the studies).

There was a significant difference noticed in the effect of the intervention between group (ES=-0.34(-0.55, -0.13), (n=2), Q-statistic=3.09, χ^2=3.84 at p=0.05-table28, 134) and the individual education (ES=0.00), (n=1)-table28, 134.

Optimal Education *Versus* Minimal Education. Two trials (both pediatric) that studied the impact of self-management on health outcomes have measured acute (unscheduled) doctor visits and no significant effect was found (ES=-0.03(-0.32,0.26), (n=2), Q-statistic=0.81, χ^2 = 3.84 at p=0.05-table29, 135).

Optimal Education and Self-Monitoring *Versus* Self-Monitoring. Both (pediatric and adult) group of studies were associated with decrease in acute visits when compared to the comparison group however was more in the pediatric trial (ES=-0.18(-0.54,0.17), (n=1)-table35, 138) than the adult (ES=-0.06(-0.51,0.39), (n=1)-table32, 136) and the mean effect size was (ES=-0.13(-0.40,0.14), (n=2), Q-statistic=1.16, χ^2 =3.84 at p=0.05-table30, 135)

Days Lost From School/Work

Four pediatric studies reported number of days lost from the school due to asthma as an outcome measure. There was no adult study reported the days lost from work.

A negligible effect (ES=-0.05(-0.26, 0.16), (n=4), Q-statistic=0.90, χ^2=7.81 at p=0.05-table39, 140) of asthma self-management intervention on days lost from school was observed.

Self-Management and Regular Medical Review *Versus* Usual Care. Asthma self-management education had a negligible effect (ES=-0.04(-0.27,0.19), (n=3), Q-statistic=0.88, χ^2 =5.99 at p=0.05-table38, 139) on days lost from school when compared to the usual care subjects. In this category of intervention, on sub analysis optimal education combined with self-monitoring had a medium effect (ES=-0.40(-1.17,0.38), (n=1)- table38, 139) but optimal education alone had a negligible effect (ES=-0.01(-0.24,0.22), (n=2), Q-statistic=0.02, χ^2=3.84 at p=0.05-table37, 139).

Optimal Education *Versus* Minimal Education. This intervention type hardly had any influence on school days lost (ES=-0.09(-0.63,0.44), (n=1), table39, 140).

Asthma Attacks (number)

A small effect (ES-0.23 (-0.52,0.06), (n=2), Q-statistic=0.73, χ^2=3.84 at p=0.05-table41, 141) was noticed on pooling the results of the individual studies that measured the number of asthma attacks as the morbidity outcome.

Self-Management and Regular Medical Review *Versus* Usual Care. Similar to the results associated with the days lost from school, optimal education combined with self-monitoring had more impact on asthma attacks than the optimal education alone. The former had a medium effect (ES-0.55 (-1.31,0.25), (n=1)-table41, 141) while the latter intervention had a smaller effect (ES=-0.18(-0.49,0.13), (n=1)-table40, 141)

AM and PM Asthma Attacks

Asthma self-management intervention had no effect on the AM asthma attacks (ES=0.04(-0.32, 0.40), (n=3), Q-statistic=2.96, χ^2=5.99 at p=0.05-table43, 142). A small effect (ES=-0.37(-0.72, -0.02), (n=3), Q-statistic=2.60, χ^2=5.99 at p=0.05-table45, 143) was noticed in case of the PM asthma attacks.

Self-Management and Regular Medical Review *Versus* Usual Care. There were two intervention groups (individual

and group) in a single study (adult). In case of AM asthma attacks when individual self-management intervention was compared to the group self-management intervention there was a medium effect (ES=-0.45(-1.27, 0.39), (n=1)-table42, 142) seen in the former and a small effect (ES=-0.26(-1.08,0.57), (n=1)- table42, 142) in the latter case. On pooling the results the effect was small (ES=-0.35(-0.94,0.24), (n=2), Q-statistic=0.10, χ^2=3.84 at p=0.05-table42, 142).

On the other hand in case of PM asthma attacks the individual self-management intervention (ES=0.05(-0.77,0.86), (n=1)-table44, 143) favored the comparison group and the group self-management intervention had a negligible effect (ES=-0.04(-0.86,0.78), (n=1)-table44, 143). On pooling, the results (ES=0.004(0.003, 0.005), (n=2), Q-statistic=0.02, χ^2=3.84 at p=0.05-table44, 143) favored the comparison group.

Optimal Education and Self-Monitoring *Versus* Self-Monitoring. There was no effect of this intervention on AM asthma attacks. On the contrary the result had favored the comparison group (ER=0.28(-0.17,0.73), (n=1), table43, 142). Surprisingly there was a medium effect (ES=-0.60(-1.06, -0.14), (n=1), table45, 143) on PM asthma attacks.

Daily Average AM and PM Peak Expiratory Flow Rate Measurements

Both AM and PM PEFR measurements were little influenced by asthma self-management education. The educational interventions had a negligible effect on both AM PEFR (ES=0.04(-0.25, 0.33), (n=4), Q-statistic=3.93, χ^2=7.81 at p=0.05-table47, 144) and PM PEFR (ES=0.14(-0.15, 0.43), (n=4), Q-statistic=3.33, χ^2=7.81 at p=0.05-table49, 145) measurements.

Self-Management and Regular Medical Review *Versus* Usual Care. Asthma self-management education (optimal education and self-monitoring) had an equal impact on the AM and PM PEFR measurements. The effect was negligible in both AM ES=0.16(-0.23,0.55), (n=3), Q-statistic=3.09, χ^2=5.99 at p=0.05-table46, 144) and PM (ES=0.18(-0.21, 0.57), (n=3), Q-statistic=3.27, χ^2=5.99 at p=0.05-table48, 145) PEFR measurements.

There was no significant difference between the group (ES=0.20(0.10,0.30), (n=1)-table46, 144) and individual (ES=0.21(-0.61,1.03), (n=1)-table46, 144) educational interventions in AM PEFR measurements but there was a difference seen in case of PM PEFR measurements (ES (group)=0.14(0.59, -0.31), (n=1)-table48, 145) ES

(individual)=0.31(-0.53,1.12), (n=1)-table48, 145) favoring the individual educational intervention.

Optimal Education and Self-Monitoring *Versus* Self-Monitoring. The comparison group had advantage ES=-0.12(-0.56,0.34), (n=1)- table47, 144) over the intervention group in AM PEFR measurements and there was a negligible effect ES=0.09(-0.36,0.54), (n=1)-table48, 145) in case of PM PEFR measurements.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Asthma self-management education results in improvement of the health outcomes in both children and the adults but with the negligible effect.

The educational interventions were more effective in individual rather than group intervention, adults than the children although not with a significant effect.

Optimal Self-management was more effective than the other less intensive interventions in self-management and regular medical review vs. usual care group. In some of the studies optimal education alone was more effective than when combined with self-monitoring.

The hypothesis that subjects attending the asthma self-management educational program involving action plans and individualized self-management plans would experience a decrease in morbidity through noticed could not be concluded because of insufficient number of trials addressing in this regard.

Similarly, the hypothesis that a clinician as an educator and a team approach will be more effective also

could not be concluded for the same reason that an insufficient (only two) number of studies were seen to have this method of delivery of education.

Discussion

This meta-analysis (systemic review) appraised 17 trials (ten were of pediatric age group and seven of adult category) of self-management education with asthma and found that this type of intervention results in improvement of the health outcomes. Not all the studies measured all the morbidity outcomes selected for the review. There was a reduction in the number of hospitalizations, number of hospital days, emergency department visits, subjects visiting the emergency departments, unscheduled doctor visits, days lost from school, and episodes of asthma attacks and improvement in lung function. Though the study showed an improvement in the morbidity variables effect was negligible and was not large enough to be clinically significant. This negligible impact may be due to multiple confounding factors not directly amenable to change by education. The other factors that may be responsible may be the 'poor quality' of studies and less number of studies in the analysis.

On sub-analysis of the self-management educational intervention and regular medical review vs. usual care more effect was seen in patients with optimal self-management followed by optimal education or optimal education and self-monitoring together.

The same educational intervention in adults was more effective than in the children and the individual education was more influential than the group education though with a negligible or a small effect. The possible reasons for the effect in adults was more than in children was unexplainable. Most of the pediatric studies also involved actively the family members in the educational program but does not seem to have encouraging results. However, the number of studies in each category was very few restricting the generalization of the results.

Only two of the studies[6,11] had clinician as educator and one[6] of those had encouraging results when compared many studies. May be a clinician can educate the patients in a more efficient way than a non-clinician. Again the results cannot be generalized due to the limitation of the number of studies.

It was practically not possible to further stratify the studies within one specific morbidity outcome, because

the number of pooled studies under each stratum would have become smaller and inappropriate for the estimation of an overall effect size. Stratification of studies according to the sociodemographic characteristics might have provided more information on the impact of the teaching programs. The control groups of all the studies were not true placebos. They were exposed to a variable self-management educational intervention (minimal education, self-monitoring of the symptoms, peak expiratory flow monitoring). In spite of the contamination of the control subjects there was effect noticed in many of the outcome variables however the effects either were negligible or small.

Some of the studies showed no intervention effect that may be probably due to the inappropriate use of the continuous measures for outcomes, which are not normally distributed such as hospitalizations, ER visits, doctor visits and days off work or school. Moreover the disease severity of the subjects at the time of the recruitment was different from study to study and some of the studies had no mention of it. The investigators of a study[3] had clearly demonstrated that comparison of groups stratified according to the severity of the disease resulted in significant

results though there was no effect when the sample was considered as a whole. This study demonstrated that when the experimental group was compared with the control group without regarding to the severity of the morbidity there was no significant reduction or morbidity found. However, when the comparison was made with the children with previous hospitalizations, the teaching program had a significant effect. Moreover, in the children with the high baseline numbers of hospitalizations and emergency visits there was greatest reduction in the morbidity. This was the only study that stratified with regard to the disease severity, it was not possible to pool from other studies subgroups of children who had more severe asthma.

In complete agreement with the Bernard-Bonnin et al[41] certain morbidity outcomes like hospitalizations, emergency department visits, and school absenteeism are not reliable indicators of the success of the intervention because for the same asthmatic condition, one family may come to the emergency room, whereas another family will manage at home with advice on phone.

Heterogeneity was found in emergency department visits, unscheduled doctor visits. This may be due to the combination of groups of differing severity.

Recommendations

1. More randomized controlled trials with a 'good quality' (Adequate and appropriate randomization, concealment of allocation, and adequate statistical power and relevant statistical techniques) that study the effect of asthma self-management education on the health outcomes are to be carried out both in pediatric and adult age group to estimate the true effect with various sub-group analysis
2. The educational programs should focuses on the target population for the optimum and accurate results.
3. Asthma educational programs with action plans and individual self-management plans, involvement of clinicians and family members should be seriously considered
4. There was almost no study in this review that adhered strictly to the NAEPP guidelines in delivering the education that might be a possible reason for the negligible effect of the interventions. Hence it is recommended that studies should be conducted with NAEPP guidelines to obtain the optimal effect of the interventions under all sub-groups.

5. Since a subtle difference in effect was found in this study between the pediatric and adult (more effective in adults) age groups with a limited number of trials there is a further need of research to come to a strong conclusion in this regard.
6. More trials with specific educational intervention with perfect placebo (no contamination) control groups are to be conducted to find the impact of that intervention on different morbidity variables.
7. Further research is recommended to evaluate the health outcome measures with respect to the duration of intervention, number of sessions of education, clinician involvement, group and individual education, and team approach.
8. It was quite a disappointment to notice that when this clinical entity (bronchial asthma) in the present day situation in United States requires an utmost attention for its chronicity and high rates of morbidity and mortality, there is a very poor and far from encouraging research is conducted to know the impact of self-management educational (back bone of the asthma management) programs on the morbidity outcomes. It is strongly recommended that a systematic

clinical trials be conducted to both use and produce the evidence that may help the health services policy makers and the evidence based practitioners.

Limitations of the Study Design and Procedures

1. Articles were selected from three databases and by hand search as mentioned earlier. Therefore, it is possible that certain articles that were perfectly relevant in this context might have been missed while searching or wrongly rejected while studying the abstract without going into the complete details of the study.
2. All the trials irrespective of their quality are included in the study. Ten of 17 studies were poor quality and none of the other studies acquired a score more than three. The poor quality of the studies is certainly a limiting factor in generalizing the results
3. All the trials were critically appraised and reviewed by a single reviewer. Any inappropriate decision in inclusion of studies or analysis of the trials is a potential bias.

4. Publication bias: Only published trials are included in the this study .It is a tendency that studies with only positive results (either valid or may be invalid) are published and there may be quite a good number of studies that might be relevant in this context and not published.
5. Language bias: Only trials published in English are considered for review. Relevant trials published / unpublished in other languages are not ruled out.
6. Participants in some of the studies were of specific population (eg. Medicaid, low-income group) hence, generalizibility of the results is questionable.
7. While evaluating the studies, aspects of the statistical methodology (appropriateness of data collected and statistical techniques used) were not covered.
8. Age was not controlled while pooling the effect sizes of both age groups. So the validity of the combined effect size is a matter of concern.
9. The limitations of the individual studies which would have an indirect influence on the meta-analysis are
   i. Absence or inappropriate randomization
   ii. Absence of concealment of allocation

iii. Inadequate statistical power

iv. Unacceptable dropout rates

v. Absence of intention to treat analysis

vi. Recruitment bias (patients recruited from the outpatient clinic would have mild form of asthma while that from the emergency department have severe form of asthma)

APPENDIX A:

STUDY SELECTION FLOW DIAGRAM

APPENDIX B:

VALIDATED QUALITY ASSESSMENT OF STUDIES

VALIDATED QUALITY ASSESSMENT OF STUDIES (FROM *Jadad AR et al* 1996)

Quality scale components	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17
Described as Randomized (Yes=1; No=0)	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
Described as Double Blind (Yes=1; No=0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Description of Withdrawals and Dropouts (Yes=1; No=0)	1	1	1	0	1	1	0	1	0	0	1	1	1	0	1	1	0
Randomization Appropriate=1; Inappropriate=0)	1	1	0	0	0	1	0	1	-1	-1	1	1	0	0	0	1	1
Blinding (Appropriate=1; Inappropriate=0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total score	**3**	**3**	2	1	**1**	**3**	**1**	**3**	**0**	0	**3**	**3**	2	**1**	2	**3**	2

1. Was the study described as randomized?
2. Was the study described as double blind?
3. Was there a description of withdrawal and dropouts?

(Give a score of 1 for each 'yes' or 0 points for each 'no')

1. If randomization/blinding appropriate (Give 1 additional point each)
2. If randomization/blinding inappropriate (Deduct 1 point each)

Scoring range: 0-5

Poor quality < 3

APPENDIX C:

EVIDENCE TABLES

<table>
<tr><td>Author and Study source</td><td>Bailey WC et al. A randomized trail to improve self-management practices of adults with asthma. Arch Intern Med 1990 Aug; 150 (8): 1664-1668</td></tr>
<tr><td>Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td></td><td>Method of Randomization:
Eleven physicians with three asthma severity levels stratified patients. This resulted in 33 strata. Blocking procedures were used to ensure that every two of the four subjects in a given stratum were assigned to intervention. A separate randomization schedule for all the 33 strata (prepared in advance) however, method of randomization is not stated.</td></tr>
<tr><td></td><td>Concealment/Concealment of Allocation:
Closed envelope technique</td></tr>
<tr><td></td><td>Outcome Assessor Blinding:
Not stated</td></tr>
<tr><td>Participants</td><td>
<table>
<tr><td>Eligible</td><td>Not mentioned</td></tr>
<tr><td>Declined/Accepted but not Participate</td><td>Not mentioned</td></tr>
<tr><td>Randomized</td><td>267 patients (135 Usual Care and 132 Self-Management patients)</td></tr>
<tr><td>Dropouts</td><td>42 (34 usual care and 8 self-management patients were unavailable for follow up)</td></tr>
<tr><td>Completed</td><td>225 (101 Usual Care and 124 Self-Management patients)</td></tr>
<tr><td>Dropout Rate</td><td>42/267 (15.7%)</td></tr>
</table>
Age Group and Sex Distribution:
<table>
<tr><th colspan="2">Characteristic</th><th>Control</th><th>Intervention</th></tr>
<tr><td rowspan="3">Age (years)</td><td>< 20</td><td>5.1%</td><td>1.6%</td></tr>
<tr><td>20-39</td><td>31.6%</td><td>27.4%</td></tr>
<tr><td>40-59</td><td>30.6%</td><td>37.1%</td></tr>
<tr><td rowspan="2">Sex</td><td>Male</td><td>29</td><td>39</td></tr>
<tr><td>Female</td><td>71</td><td>61</td></tr>
</table>
How was Asthma Diagnosed?
Doctor's diagnosis with objective criteria

Method of Patient Recruitment:
From a Pulmonary Medicine Clinic

Inclusion Criteria:
1) Recurrent episode of wheezing or dyspnea 2) objective evidence of significantly increased resistance to airflow during episodes 3) objective evidence of improvement of airflow when symptom free

Other Diseases Excluded:
Another pulmonary or severely debilitating disease that might confuse the interpretation of results (emphysema, cystic fibrosis, Life threatening cancer, severe RA)

Other Exclusions (if any):
1) Age under 18 years 2) Refusal to participate

Baseline Characteristics:
<table>
<tr><th>Asthma Severity</th><th>Intervention</th><th>Control</th></tr>
<tr><td>Mild</td><td>37.1%</td><td>38.6%</td></tr>
<tr><td>Moderate</td><td>47.6%</td><td>44.6%</td></tr>
<tr><td>Severe</td><td>16.3%</td><td>16.8%</td></tr>
</table>
There were no statistically significant differences between the control and the experimental group in the baseline characteristics before the intervention</td></tr>
</table>

Interventions	Setting: Out-Patient Pulmonary Medicine Clinic
	Intervention in detail: <u>Type</u> (Individual, verbal, written, interactive, family member involved, non clinician educator, action plan, PEFR monitoring, medical review Vs written education, usual medical care) <u>Intervention Group</u> Characteristics: One to one counseling for one-hour duration. Session focused on use of self-care workbook and other program components, proper use of medication and self-monitoring and self-evaluation techniques, early detection of impending attacks and attack management. *Work book:* For home use, and contains seven sections designed to provide the basic information that patients need to improve their self-management skills. Additional strategies: Asthma support group participation (health educator + 4 to 6 patients + asthma control partner for each patient) Telephone calls: 2 and 4 weeks following asthma support group meetings (encouraging self-management and enhance self monitoring). Duration: One-hour duration one to one counseling session. Subjects were not provided with written action plan. Educator: Health Educator <u>Control Group</u> Standardized set of asthma pamphlets (comprehensive information about information asthma, but this information was not part of an integrated patient education program). No other steps taken to read, counsel or support the groups.
Statistical Analysis	Data Collection: By interview and filling the observational check list Analysis: • Analysis of baseline data indicated that dropouts were highly similar to subjects who persisted in the study, and that there was no dropout by condition interaction. Therefore no statistical adjustments for attrition were applied • The significances of differences between groups were assessed by analysis of covariance adjusting the follow-up scores for several covariates (Logistic regression procedures were used to in making these adjustments) • Adequate statistical power (224 subjects needed for 85% power and 196 subjects for 80% power)

<table>
<tr><td>Results/ Outcomes</td><td colspan="4">Skills (inhaler use and inhaler adherence), medication adherence, severity of symptoms, bothered by asthma, five or more days of coughing or dyspnea, emergency department visits, visit or hospitalizations for asthma.
<table>
<tr><td colspan="2">Outcome measures</td><td>Usual Care (n=101)</td><td>Self-Management (n=124)</td><td>P</td></tr>
<tr><td rowspan="2">Emergency Dept. visits</td><td>Baseline</td><td>52.5%</td><td>43.9%</td><td rowspan="2">0.993</td></tr>
<tr><td>After 12 months</td><td>16.2%</td><td>13.8%</td></tr>
</table></td></tr>
<tr><td>Limitations of the Study</td><td colspan="4">• Inadequate blinding
• Analysis not done on intention to treat basis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="4">• A comprehensive effort to improve self-management practices of adults with asthma can substantially improve adherence to treatment regimens and as a result can improve the functional status.
• Unexpected large decrease in healthcare utilization in both groups, which may due to comparable amount of educational material with both groups. However, it may be due to selection bias (subjects recruited during clinic visits and clinic visits may have been followed by the hospitalization or ED visits)</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td>Berg J et al An evaluation of a self-management program for adults with asthma. Clinical Nursing Research 1997 Aug; 6 (3): 225-238</td></tr>
<tr><td>Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td></td><td>Method of Randomization:
Subjects were stratified on asthma severity due to the possible influence of severity on compliance behavior and a stratified random permuted block scheme was employed for generation of treatment assignments for subjects with moderate or severe asthma.</td></tr>
<tr><td></td><td>Concealment/Concealment of Allocation:
Not stated</td></tr>
<tr><td></td><td>Outcome Assessor Blinding:
Not mentioned</td></tr>
<tr><td>Participants</td><td>
<table>
<tr><td>Eligible</td><td>84 were eligible and 68 signed consent forms</td></tr>
<tr><td>Declined/Accepted but not Participate</td><td>16/13</td></tr>
<tr><td>Randomized</td><td>55</td></tr>
<tr><td>Dropouts</td><td>One but included in the analysis</td></tr>
<tr><td>Completed</td><td>54</td></tr>
<tr><td>Dropout Rate</td><td>1/55 (1.8%)</td></tr>
</table>
Age group and sex distribution
<table>
<tr><th colspan="2">Characteristic</th><th>Overall</th><th>Treatment</th><th>Control</th><th>$\chi 2$ (df)</th></tr>
<tr><td rowspan="2">Gender</td><td>Male</td><td>19</td><td>10</td><td>9</td><td rowspan="2">0.164 (1) {P=0.05}</td></tr>
<tr><td>Female</td><td>36</td><td>21</td><td>15</td></tr>
<tr><td>Age</td><td colspan="4">18 years or older</td></tr>
</table>
Note: There were no significant differences found in characteristics of two groups.
How was Asthma Diagnosed?
Doctors' diagnosis of asthma and who were being treated with prescribed with, regularly administered, inhaled medications other than needed bronchodilaters.
Method of Patient Recruitment:
Brochures were placed in physician offices and pharmacies, and information about the study was announced on the radio and in local newspapers. Potential subjects were called after they indicated an interest in participation and were recruited after screening.
Inclusion Criteria:
1) Rural dwelling adults age 18 years and older with medical diagnosis of asthma 2) treated with prescribed regularly administered, inhaled medications other than as-needed bronchodialaters
Other Diseases Excluded:
Other respiratory disorders
Other Exclusions (if any):
Current smokers
Baseline Characteristics:
Baseline measures were assessed daily for one week and included
1) Daily peak flow determinations (using peak flow meter and recorded in an asthma dairy)
2) Compliance with inhaler use (using both the MDI Chronolog and self-report with the dairy)
3) Asthma symptoms (as self reported in the dairy)
4) Questionnaires to assess asthma self-management and self-efficacy
5) Classified into mild, moderate and severe based on based on NAEPP 1991</td></tr>
</table>

	There were no statistically significant differences between the control and the experimental group in the baseline characteristics before the intervention
Interventions	Setting: Community setting
	Intervention in Detail: <u>Type</u> (Group, verbal, interactive, structured, non clinician educator, peak flow meter used, asthma diary, other instruments (journal of daily asthma concerns, asthma self-management assessment tool, self-efficacy for asthma management scale), peak flow monitoring Vs usual *medical care)* <u>Intervention Group</u> Characteristics: *Adapted from a program designed by *Creer, Reynolds, and Kotses* (1992) that consisted of six sessions conducted in community setting included information about the self-management behaviors and skills, asthma medication, asthma triggers, prevention of asthma attacks, relaxation techniques, psychological responses to asthma, and problem solving skills. All the information that was given to the subjects was scripted in a 204-page book to the group leaders. There were five groups with ten subjects in each group. Instruments Used: • MDI Chronolog • Journal of daily asthma concerns • Spirometric peak-flow meter • The Self-Efficacy for Asthma Management Scale (SEAMS) • The Asthma Self-Management Assessment Tool (ASMAT) Duration: Each session lasted for two hours Educator: Registered nurses who were knowledge about asthma. <u>Control Group</u> Recorded information daily for 1 week following randomization and again at follow-up for treated subjects. No other intervention apart from usual care from physicians.
Statistical Analysis	Data Collection: From the instruments used and by interview Analysis: • All Analysis were done on intention to treat basis • Adequate statistical power/sample • Analysis of covariance with asthma severity as a covariate was a primary statistical procedure used for the Analysis.

<table>
<tr><td>Results/ Outcomes</td><td>Compliance at outcome, average total daily symptoms, percentage of symptom free days, morning and evening peak flow measurements, self-efficacy or self-management.
<table>
<tr><td colspan="2" rowspan="2">Outcome measures</td><td colspan="2">Treatment (n=31)</td><td colspan="2">Control (n=24)</td><td>Stat * (df)</td></tr>
<tr><td>Pre</td><td>Post</td><td>Pre</td><td>Post</td><td></td></tr>
<tr><td rowspan="2">Average peak flow (Morning)</td><td>Mean</td><td>360</td><td>359</td><td>365</td><td>364</td><td rowspan="2">F= 0.084 (1)</td></tr>
<tr><td>SD</td><td>105</td><td>108</td><td>137</td><td>142</td></tr>
<tr><td rowspan="2">Average peak flow (Evening)</td><td>Mean</td><td>347</td><td>366</td><td>371</td><td>381</td><td rowspan="2">F= 0.000 (1)</td></tr>
<tr><td>SD</td><td>107</td><td>118</td><td>140</td><td>150</td></tr>
</table>
There was no significant difference existed at baseline or post treatment for two groups for average total daily symptoms, percentage of symptom free days, morning or evening peak-flow measurements. However post treatment chronolog compliance revealed a significant difference between the two groups, the experimental group showing a greater increase in compliance at outcome.</td></tr>
<tr><td>Limitations of the Study</td><td>• Lack of concealment of allocation
• No blinding
• Sensitivity of the instruments used</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>1) The hypothesis that subjects who attended a self-management program would experience a decrease in the frequency of daily symptoms and an increase in the percentage of symptom free days was not found.
2) The hypothesis that airway obstruction would decrease with improved compliance was also not seen.
3) Neither the self-efficacy nor the self-management behaviors were modified after the six-week program.</td></tr>
</table>

Author and Study Source	Clark NM et al. The Impact of health education on frequency and cost of healthcare use by low-income children with asthma. *Journal of Allergy and Clinical Immunology* 1986; 78: 108-115	
Methods	Study Design: Randomized controlled	
	Method of Randomization: Not mentioned	
	Concealment/Concealment of Allocation: Not mentioned	
	Outcome Assessor Blinding: Not mentioned	
Participants	Eligible	558
	Declined/Accepted but not Participate	248
	Randomized	310 subjects (Intervention 207; control 103 – randomized in 2:1 ratio)
	Dropouts	Not mentioned
	Completed	Not mentioned. All were considered in analysis
	Dropout Rate	Zero
	Age group and sex distribution: Mean age of 9.2 years 64% males	
	How was Asthma Diagnosed? Physicians diagnosis	
	Method of Patient Recruitment: During the regularly scheduled clinic visit	
	Inclusion Criteria: 1) A diagnosis made by a physician by use of commonly accepted clinical criteria 2) One or more visits made to the clinic in the previous two months 3) One or more episodes of wheezing reported in the prior year 4) Aged between 4 and 17 years 5) No major handicap that would prevent benefit from an educational program	
	Other Diseases Excluded: Not mentioned	
	Other exclusions (if any): Not mentioned	
	Baseline Characteristics: There were no statistically significant differences between both the groups before the educational program	

<table>
<tr><td>Interventions</td><td>Setting:
Regularly scheduled outpatient clinic visit

Intervention in Detail:
<u>Type</u>
(Group, verbal, interactive, family member involved, non clinician educator, regular medical review Vs usual medical care)
<u>Intervention Group</u>
Characteristics:
The educational program emphasized on the management steps to be taken by the child with asthma and child's parents. Areas of discussion were managing the asthma attack, taking medicine, communicating with the physician, improving school performance, maintaining a healthy home environment, and establishing guidelines for the child's physical activities. The program was delivered to groups of 10-15 families and the learning process was a group discussion and problem solving
Duration:
Six one-hour sessions offered monthly in English and Spanish. Of six sessions in five sessions parents and children met separately, and in one session they met together.
Educator:
Health educator
<u>Control group</u>
Regular medical review</td></tr>
<tr><td>Statistical Analysis</td><td>Data Collection:
Interviewing the families and review of the records
Analysis:
• All the Analysis were done on intention to treat basis
• The hypotheses were tested by one-tailed t tests.
To evaluate changes regardless of the children's previous health care use, the mean and the change scores of the entire experimental group were compared to mean and change scores of the entire control group to test whether there was a statistically significant effect for the health education program</td></tr>
<tr><td>Results/ Outcomes</td><td>
<table>
<tr><td rowspan="2">Outcome measure</td><td colspan="2">Follow up</td><td colspan="2">Change</td><td rowspan="2">P<</td></tr>
<tr><td>Control (N=207)</td><td>Intervention (N=103)</td><td>Control (N=207)</td><td>Intervention (N=103)</td></tr>
<tr><td>Hospitalizations</td><td>0.21 ± 0.85</td><td>0.11 ± 0.43</td><td>-0.04 ± 1.00</td><td>-0.02 ± 0.60</td><td rowspan="2">N.S</td></tr>
<tr><td>Emergency room visits</td><td>2.49 ± 6.26</td><td>1.72 ± 4.20</td><td>-0.15 ± 8.00</td><td>-0.54 ± 5.60</td></tr>
</table>
</td></tr>
</table>

Limitations of the Study	• Though the patients represent the general community population of low-income urban children with asthma, it is an untestable assumption because no community-wide survey was conducted. • Inadequate randomization • No mention of concealment • No blinding • No mention of adequacy of statistical power
Conclusions/ Other Remarks	1) The difference in hospitalizations and ER visits of both groups (all the children under study) was not statistically significant after the asthma education program though both the groups showed fewer rates of hospitalizations and ER visits compared to the baseline. 2) Among those children who made use of health care facilities before the program there was a significant effect of the health education program. 3) The study indicates demonstrates that the evidence that asthma management training for low-income parents and their children with one or more hospitalizations can yield cost-savings.

Author and study Source	Evans D et al. A School Health Education Program for Children with Asthma Aged 8-11 Years. Health Education Quarterly (Fall) 1987; 267-279	
Methods	Study Design: Randomized controlled	
	Method of Randomization: 12 schools under study paired according to ethnic composition and size. One school in each pair was randomly selected as an intervention group. However the method of randomization is not mentioned.	
	Concealment/Concealment of Allocation: Not mentioned	
	Outcome Assessor Blinding: Not mentioned	
Participants	Eligible	Not mentioned (12 schools)
	Declined/Accepted but not Participate	Not mentioned
	Randomized	239 (Intervention 134; Control 105) 6 schools in intervention and 6 schools in control group
	Dropouts	35
	Completed	204 (Intervention 117; Control 87)
	Dropout Rate	35/239 (14.6%)
	Age Group and sex Distribution: *Mean age of children was 9.1 years *59% were males	
	How was Asthma Diagnosed? Physician diagnosis	
	Method of Patient Recruitment: Parents whose children had asthma and wanted them to take part in education program were invited to the school. Upon the child met the criteria for participation in the study, the children were enrolled in the study after baseline telephonic interview and a written consent.	
	Inclusion Criteria: Enrollment in the third, fourth and fifth grade, parental report of at least three episodes of asthma in the past year, and written parent consent for participation	
	Other Diseases Excluded: Not stated	
	Other Exclusions (if any): Not stated	
	Baseline Characteristics: *Baseline measures that might reflect differences between schools (ethnicity, grades, absences, classroom behavior ratings by teachers and scores on standardized tests) were examined and no statistically significant differences were found between intervention and control groups, except for slightly higher classroom behavior ratings for the experimental group (+5%; $p<0.005$) *Control group children had higher scores on asthma index of self-management skills (+13%; $p<0.05$). Baseline differences were adjusted by analysis of covariance.	

Interventions	Setting: In the district school premises
	Intervention in Detail: Type (Group, verbal, other educational interventions (games, stories, role plays), interactive, structured, family member involved, non clinician educator, medical review Vs Usual medical care) Intervention Group Characteristics: *The education focused on a) Basic information and feelings about asthma b) To recognize and respond to symptoms of asthma c) Using asthma medicines and deciding when to seek help d) how to keep active physically e) Identifying and controlling triggers to asthma symptoms and f) handling problem related to asthma and school *The program focused on children's independent actions as self-managers, emphasizing the child's responsibility for recognizing asthma symptoms and initiating appropriate management steps whether or not parent was present. Descriptive materials---sent home to parents to familiarize them with management skills their children were learning Educational methods---use of stories to initiate discussion of problems with asthma, games to practice decision making, role play to rehearse asthma management skills, and physical and activities that were developmentally appropriate for 8-11 year old children Duration: Six 60-minute sessions in which groups of 8-12 children learned asthma management skills. All the six program sessions were held to ensure that the children completed the entire program. Make up sessions were held to ensure that the children completed entire program. Educator: Health educator Control Group The control group children were given the same education but after the completion of the trial. No special education during the trial.
Statistical Analysis	Data Collection: *Data was collected from the child's school records, medical records of hospital and from separate interviews with parent and child. *Baseline data was collected immediately preceding the intervention and follow up data were collected one year after the education program was completed. Analysis: Multivariate analysis of covariance was used to test simultaneously the hypothesized outcomes of the health education program (Multivariate test of significance controls for the increased risk of type I error when evaluating multiple treatment effects on correlated dependent variables)

<table>
<tr><td>Results/ Outcomes</td><td colspan="2">Outcome Measure</td><td>Intervention group (N = 117)</td><td>Control group (N=87)</td><td>P</td></tr>
<tr><td rowspan="3"></td><td rowspan="3">School Absences</td><td>Baseline</td><td>21.3 ± 13.2</td><td>20.8 ± 13.4</td><td>----</td></tr>
<tr><td>Post intervention</td><td>19.4±13.9</td><td>19.7± 12.6</td><td>----</td></tr>
<tr><td>Change</td><td>-1.9 ± 11.2</td><td>-1.1 ± 12.0</td><td>NS</td></tr>
<tr><td rowspan="3"></td><td rowspan="3">Unschedule d Visits</td><td>Baseline</td><td>4.3 ± 4.2</td><td>3.8 ± 3.0</td><td>----</td></tr>
<tr><td>Post intervention</td><td>3.6 ± 6.2</td><td>3.3 ± 3.8</td><td>----</td></tr>
<tr><td>Change</td><td>-0.7 ± 6.3</td><td>-0.5 ± 4.2</td><td>NS</td></tr>
<tr><td rowspan="3"></td><td rowspan="3">Asthma Attacks</td><td>Baseline</td><td>10.6± 11.4 (93)</td><td>10.1± 12.1 (68)</td><td>----</td></tr>
<tr><td>Follow up</td><td>9.0 ± 14.7</td><td>11.8 ±16.5</td><td>----</td></tr>
<tr><td>Change</td><td>-1.6 ± 15.4</td><td>+1.7 ± 19.8</td><td>0.024</td></tr>
<tr><td></td><td colspan="5">*Significance levels are based on univariate Analysis of covariance of transformed scores
*There were no statistically significant differences between both the groups in school attendance as well as the unscheduled visits.</td></tr>
<tr><td>Limitations of the Study</td><td colspan="5">• Inadequate randomization
• No mention of allocation concealment
• No blinding
• The program was conducted in school children where the severity of asthma was mild so the generizability of the findings to is questionable.
• Since data was self reported there is a potential bias resulting from demand effects, i.e. the tendency of the participants in an experimental program to report results they believe are consistent with the desired outcomes of the program.
• Self reported data are also subject to errors of memory
• No mention of adequacy of statistical power
• Analysis not done on intention to treat basis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="5">School based child centered education program designed for 8-11 year old children with asthma, and conducted without parent attendance, can increase child's asthma management skills, feelings of self-efficacy, and positive influence on parents' management decision</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td>Fireman P et al. Teaching Self-Management Skills to Asthmatic Children and Their Parents in an ambulatory Care Setting. Pediatrics Sep 1981; 68 (3): 341-348</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Controlled clinical</td></tr>
<tr><td>Method of Randomization:
Patients were sequentially assigned to either the study or the comparison group; groups were matched for age</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td>Outcome Assessor Blinding:
Not mentioned</td></tr>
<tr><td rowspan="10">Participants</td><td>
<table>
<tr><td>Eligible</td><td>Not mentioned</td></tr>
<tr><td>Declined/
Accepted but not participate</td><td>Not mentioned</td></tr>
<tr><td>Randomized</td><td>26 (13 Intervention; 13 control)</td></tr>
<tr><td>Dropouts</td><td>None</td></tr>
<tr><td>Completed</td><td>All those randomized</td></tr>
<tr><td>Dropout Rate</td><td>Zero</td></tr>
</table>
</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><th colspan="2">Characteristic</th><th>Intervention group (N = 13)</th><th>Control group (N = 13)</th></tr>
<tr><td colspan="2">Age (mean in yrs)</td><td>7.4</td><td>7.3</td></tr>
<tr><td rowspan="2">Sex</td><td>Males</td><td>9</td><td>12</td></tr>
<tr><td>Females</td><td>4</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>How was Asthma Diagnosed?
Physician diagnosis</td></tr>
<tr><td>Method of Patient Recruitment:
All the patients were recruited from the pediatric allergist's office after they met the criteria and voluntary giving of informed consent</td></tr>
<tr><td>Inclusion Criteria:
1) 2 to 14 years of age 2) History of six or more asthmatic episodes</td></tr>
<tr><td>Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td>Other Exclusions (if any):
Not mentioned</td></tr>
<tr><td>Baseline Characteristics:
• Both the groups were similar in regard to their type and expression of asthma
• There were no statistically significant differences between the control and the experimental group in the baseline characteristics before the intervention</td></tr>
</table>

Interventions	Setting: Not stated
	Intervention Type in Detail: Type (Group, verbal, written, interactive, structured, family member involved, non clinician educator, asthma diary, symptom monitoring, medication monitoring Vs usual medical care) General Instructions All the patients and families, whether in the study or comparison group, were given the same general instructions Experimental Group Characteristics: *The education was focused on description of anatomy of lungs, review of elementary pulmonary physiology and pathophysiology, an explanation of factors that can provoke asthma (allergens, infections, exercise, irritant inhalants, and emotions), and the actions of drugs used for asthma *Booklet--- concerning asthma, allergy, and environmental avoidance procedures was given to each patient *Symptom and medication diary Duration: Four individual sessions of one hour each and two two-hour group sessions during which health education personnel discussed with families the various ramifications of asthma and its management. The average duration study was 12 months. Health educator: Nurse educator Control Group No teaching sessions Training of Nurse Educators Principles of symptom assessment and medical management of asthma was given by the pediatric allergist and the principles of health education was given by the health education specialists
Statistical Analysis	Data Collection: Use of symptom and medication diary, review of school attendance records, and tabulation medical visits to the ER and Hospitalizations Statistical Analysis: • All the Analysis were done on intention to treat basis • No mention of type of statistics used

<table>
<tr><td rowspan="8">Results/ Outcomes</td><td rowspan="2">Outcome measure</td><td colspan="2">2-6 years</td><td colspan="2">6-11 years</td><td colspan="2">11-14 years</td><td colspan="3">All ages (total)</td></tr>
<tr><td>Study Group</td><td>Comp. Group</td><td>Study Group</td><td>Comp. Group</td><td>Study Group</td><td>Comp. Group</td><td>Study Group</td><td>Comp. Group</td><td>P</td></tr>
<tr><td>Hospitalizations</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>2</td><td>0</td><td>4</td><td>-</td></tr>
<tr><td>ER visits</td><td>0</td><td>2</td><td>1</td><td>1</td><td>0</td><td>10</td><td>1</td><td>13</td><td>-</td></tr>
<tr><td>Absent school days</td><td>2</td><td>20</td><td>4</td><td>17</td><td>1</td><td>23</td><td>7</td><td>60</td><td><0.05</td></tr>
<tr><td>Absent school days per patient</td><td>0.5</td><td>5</td><td>0.7</td><td>3</td><td>0.3</td><td>7</td><td>0.5</td><td>4.6</td><td>-</td></tr>
<tr><td>Asthma attacks</td><td>4</td><td>23</td><td>11</td><td>35</td><td>1</td><td>20</td><td>19</td><td>78</td><td><0.01</td></tr>
<tr><td colspan="10">The data collection from the parents by the telephone survey revealed that nine of the 13 families felt that their child's asthma had improved during the study and interestingly ten of the 13 comparison families also thought that their child's asthma had improved during the study</td></tr>
<tr><td>Limitations of the study</td><td colspan="10">• Small study sample
• Inadequate randomization
• No mention of concealment of allocation
• No blinding
• No mention of adequacy of statistical power/sample</td></tr>
<tr><td>Conclusions/ Other remarks</td><td colspan="10">• A planned educational program for asthmatic child and family may play an important role in the successful management of children with chronic or intermittent asthma</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td>George MR et al. A Comprehensive Educational Program Improves Clinical Outcome Measures in Inner-City Patients With Asthma. Archives of Internal Medicine 1999; 159: 1710-1716</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
By random number generator</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not stated</td></tr>
<tr><td>Outcome Assessor Blinding:
Decision to discharge the patient was made by the house staff and the patients' attending physician, who was not a study investigator.</td></tr>
<tr><td rowspan="13">Participants</td><td>
<table>
<tr><td>Eligible</td><td>88</td></tr>
<tr><td>Declined/Accepted but not Participate</td><td>11</td></tr>
<tr><td>Randomized</td><td>77 (44 in intervention group and 33 in control group)</td></tr>
<tr><td>Dropouts</td><td>None</td></tr>
<tr><td>Completed</td><td>All the randomized completed the study (77)</td></tr>
<tr><td>Dropout Rate</td><td>No dropout rate but data not available for 14 intervention and 13 control group patients</td></tr>
</table>
</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><td>Characteristics</td><td>Inpatient Education (n=44)</td><td>Routine group (n=33)</td><td>P</td></tr>
<tr><td>M/F (%)</td><td>15.9/84.1</td><td>27.3/72.7</td><td>0.22 (chi-square)</td></tr>
<tr><td>Age (yrs)</td><td>29.25</td><td>28.61</td><td>0.69 (unpaired t test)</td></tr>
</table>
</td></tr>
<tr><td>Age group between 18 and 45 years of age and no significant differences between both the groups</td></tr>
<tr><td>How was Asthma Diagnosed?
Not stated. Probably by a physician?</td></tr>
<tr><td>Method of Patient Recruitment:
Patients with acute exacerbation of asthma presented in Emergency Department</td></tr>
<tr><td>Inclusion Criteria:
Not mentioned</td></tr>
<tr><td>Other Diseases Excluded:
Patients with comorbid conditions were excluded to limit the study to patients with uncomplicated asthma exacerbations</td></tr>
<tr><td>Other Exclusions (if any):
1) No telephone access; 2) Pregnant; 3) Did not speak English</td></tr>
<tr><td>Baseline Characteristics:
No statistically significant differences between the control and educational group before the intervention</td></tr>
</table>

Interventions	Setting: Emergency department
	Intervention in Detail: Type (Individualized, verbal, interactive, structured, team approach, clinician educator, action plan, PEFR monitoring, regular medical review Vs Usual medical care) Intervention Group Characteristics: Repetitive Teaching Sessions Goals of Teaching Sessions: *Improve metered dose inhaler administration technique, stress chronic nature of asthma and the need for long-term therapy with emphasis on regular outpatient follow up. #Patients were taught early signs of asthma and they received action plans for appropriate responses for these warning signs. #All the patients were screened for obstacles to care (lack of transportation, substance abuse, lack of child care etc) #All the patients were contacted by phone 24 hours following the discharge to address questions about the discharge instructions, medications and asthma symptoms. Outpatient Follow-up: Within the seven days of the discharge Patients received repeated spirometric evaluation of their forced vital capacity and forced expiratory volume in 1-second, a physician examination, and patient education to reinforce the principles introduced at the admission. Educator: Asthma clinical nurse specialist Control Group No special asthma education apart from usual care.
Statistical Analysis	Data Collection: Data on the frequency of ED visits and hospitalizations were obtained from the database of MCO Analysis: • Continuous, normally distributed data were analyzed using t-tests. • Categorical data were analyzed using the Pearson $\chi 2$ test • Nonnormally distributed data were analyzed using the Mann-Whitney taes and the Wilcoxon signed rank test.

<table>
<tr><td>Results/ Outcomes</td><td>Hospital length of stay (LOS), readmission rates, attendance at subsequent out patient appointments, frequency of ED visits, and hospitalizations six months prior to and following study enrollment
<table>
<tr><th colspan="2">Outcome Measures</th><th>Six Months Before Intervention</th><th>Six Months After Intervention</th><th>Within Group (P*)</th><th>B/w Group (P#)</th></tr>
<tr><td rowspan="2">ED Visits</td><td>Intervention (30)</td><td>27</td><td>3</td><td>0.003</td><td rowspan="2">0.04</td></tr>
<tr><td>Control (20)</td><td>17</td><td>15</td><td>0.59</td></tr>
<tr><td rowspan="2">Hospitalizations/ Year</td><td>Intervention (30)</td><td>26</td><td>3</td><td>0.002</td><td rowspan="2">0.04</td></tr>
<tr><td>Control (20)</td><td>14</td><td>12</td><td>0.59</td></tr>
</table></td></tr>
<tr><td>Limitations of the Study</td><td>1. The hospital use data were only available for those enrolled in Medicaid MCO and non-Medicaid patients have different patterns of outpatient and acute care hospital use and may not receive same benefits from this program
2. Placebo effect: It is possible that the benefit that the IEP group derived from the intervention was based solely on more frequent contact with healthcare provider. Because the placebo visits to the inpatient routine care group were not made and because the follow-up visits to the primary care practitioners were not arranged, the benefits of the specific educational program relative to regular health professional contact cannot be determined.
3. Generizability: All the patients who were critically ill and who had clinically significant co morbid conditions were excluded. These excluded may also have substantial benefit.
4. The asthma education had different components and it is unclear that which component had the maximum effect and most beneficial for the patients.
5. Analysis were not based on intention to treat basis
6. No mention of adequacy of statistical power</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>There was an improvement in outpatient follow-up rates resulting in improvement in patient outcomes including reduced acute care use, increased quality if life.</td></tr>
</table>

<table>
<tr><td>Author and study Source</td><td>Guendelman S et al. Improving Asthma Outcomes and Self-management Behaviors of Inner-city Children. Archives of Pediatric and Adolescent Medicine 2002; 156: 114-120</td></tr>
<tr><td>Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td></td><td>Method of Randomization:
Not mentioned</td></tr>
<tr><td></td><td>Concealment/Concealment of Allocation:
Sealed envelope method</td></tr>
<tr><td></td><td>Outcome Assessor Blinding:
Not stated</td></tr>
<tr><td>Participants</td><td><table>
<tr><td>Eligible</td><td>136 children</td></tr>
<tr><td>Declined/Accepted but not Participate</td><td>2</td></tr>
<tr><td>Randomized</td><td>134</td></tr>
<tr><td>Dropouts</td><td>None</td></tr>
<tr><td>Completed</td><td>134 (Intervention=66 and Control=68)</td></tr>
<tr><td>Dropout Rate</td><td>Zero</td></tr>
</table>
Age Group and sex Distribution:
<table>
<tr><td>Characteristic</td><td>Healthy buddy Group (n=66)</td><td>Asthma dairy Group (control) (n=68)</td><td>P value</td></tr>
<tr><td>Age (Mean+SD)</td><td>12.0 (2.3)</td><td>12.2 (2.9)</td><td>0.65 (t test)</td></tr>
<tr><td>Male sex</td><td>40 (61%)</td><td>37 (54%)</td><td>0.47 (χ2)</td></tr>
</table></td></tr>
<tr><td></td><td>How was Asthma Diagnosed?
NHLBI clinical practice guidelines</td></tr>
<tr><td></td><td>Method of Patient Recruitment:
Patients with two or more ED visits and/or at least 1 inpatient admission during the year before the study were identified for possible recruitment through the hospital administrative services. All the patients were recruited at the time of their scheduled clinic appointment for either a healthcare maintenance or an illness visit.</td></tr>
<tr><td></td><td>Inclusion Criteria:
Between the ages of 8 and 16 years, English speaking caregiver, telephone at home, diagnosed as having persistent asthma following NHLBI clinical practice guidelines, two or more ED visits and/or at least 1 inpatient admission during the year before the study</td></tr>
<tr><td></td><td>Other Diseases Excluded:
With comorbid conditions that could affect their quality of life were also excluded</td></tr>
<tr><td></td><td>Other Exclusions (if any):
Involved in other asthma or drug efficacy studies, if involved in research that required behavior modification, mental or physical challenges that made it difficult to use the Healthy Buddy.</td></tr>
<tr><td></td><td>Baseline Characteristics:
<table>
<tr><td>Characteristic</td><td></td><td>Health Buddy Group (n=66)</td><td>Asthma Dairy Group (n=68)</td><td>P value</td></tr>
<tr><td rowspan="3">Asthma severity (Persistence)</td><td>Mild</td><td>15 (23%)</td><td>20 (29%)</td><td rowspan="3">0.66
(Based on χ2)</td></tr>
<tr><td>Moderate</td><td>43 (66%)</td><td>40 (59)</td></tr>
<tr><td>Severe</td><td>7 (11)</td><td>8 (12)</td></tr>
<tr><td colspan="2">ED visits (past 12 months)</td><td>2.10 (2.09)</td><td>2.40 (2.33)</td><td>0.34</td></tr>
<tr><td colspan="2"></td><td>0.53 (1.04)</td><td>0.66 (1.23)</td><td>0.50</td></tr>
</table></td></tr>
<tr><td></td><td>No mention of differences between the groups pre-intervention</td></tr>
</table>

Interventions	Setting: Primary care clinic
	Intervention in Detail: Type (Individual, verbal, software, interactive, family member involved, non clinician educator peak flow meter used, peak flow monitoring, symptom monitoring, medication monitoring, regular medical review Vs asthma diary use, PEFR monitoring, symptom monitoring, medication monitoring) *Standardized teaching session • Participating child was given a peak flow-measuring device and instructed on proper technique and how to establish his or her personal best. • Taught about green-yellow-red zone determination and appropriate use of medications and of health care services. • Instructions on how to record peak flow readings and symptoms Intervention Group (Health Buddy) Characteristics: *Healthy Buddy is a personal and interactive communication device that is connected to a home telephone and can be programmed to present questions and information on a screen and to record responses. Three of the authors with a team of software programmers and asthma specialists at Health hero network developed this. Children accessed the device once a day at regular timings and themselves without the help of the parents. No further telephone contact was established. *Two follow-up visits at 6 and 12 weeks. At each follow up visit, families were interviewed and given a standardized teaching session that reinforced peak flow measurement, compliance with medicines, and tracking symptoms Control Group (Asthma Dairy) The diary allowed the patients to log their symptoms and to monitor peak flow, medication use and restricted activity. *Two follow-up visits as in intervention group Educator: Nurse coordinator
Statistical Analysis	Data collection: The measures of the study were obtained from the interviews that the nurse coordinator conducted with the child and the primary caregiver at the visit Analysis: • Adequate statistical power/sample (85%) • Sample size calculations were based on a comparison of two management approaches by Lieu TA et al. 1997. • $\chi 2$, Fischer exact tests and 2-sample two tests were used to compare the study groups for demographic characteristics, asthma outcomes, and self-care behaviors at baseline and at the 2 follow-up visits. • The results with $p<=0.05$ were justified as significant. • The effect is presented as the intervention odds ratio, which is the ratio of odds of an outcome in the Health Buddy group to that of Asthma dairy group.

<table>
<tr><td rowspan="7">Results/ Outcomes</td><td colspan="2" rowspan="2">Outcome measure</td><td colspan="2">Baseline</td><td colspan="2">6 weeks</td><td colspan="2">12 weeks</td><td rowspan="2">P value</td></tr>
<tr><td>HB Gp (n=66)</td><td>AD Gp (n=68)</td><td>HB Gp (n=66)</td><td>AD Gp. (n=68)</td><td>HB Gp (n=66)</td><td>AD Gp. (n=68)</td></tr>
<tr><td rowspan="2">Missed school days</td><td>Yes</td><td>34</td><td>30</td><td>15</td><td>15</td><td>9</td><td>13</td><td rowspan="2">0.41</td></tr>
<tr><td>No</td><td>32</td><td>38</td><td>48</td><td>50</td><td>53</td><td>47</td></tr>
<tr><td colspan="2">ED visits</td><td>18</td><td>19</td><td>4</td><td>5</td><td>6</td><td>11</td><td>0.21</td></tr>
<tr><td colspan="2">Hospitalizations</td><td>9</td><td>9</td><td>0</td><td>3</td><td>4</td><td>1</td><td>0.96</td></tr>
<tr><td colspan="2">Unscheduled visits</td><td>21</td><td>15</td><td>5</td><td>12</td><td>6</td><td>9</td><td>0.05</td></tr>
<tr><td colspan="9">*HB Gp: Healthy Buddy group *AD Gp: Asthma Dairy group</td></tr>
<tr><td>Limitations of the Study</td><td colspan="9">No adequate randomization and blinding
The population under study was predominantly Medicaid-insured population and the setting was a comprehensive pediatric health center and resident teaching institute. Hence the results may not be generalized.
Case ascertainment bias due to self-reported data despite the attempts by nurse coordinators' check
Children in Asthma dairy might have overstated the compliance (retrospective filling)
Analysis not done on intention to treat basis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="9">Though asthma symptoms decreased more for Healthy Buddy group, symptoms also decreased in the Asthma dairy group
*Indicating the result of consistent standardized asthma education given to children of both groups and the availability of a nurse coordinator.
*This intervention took place shortly after the dissemination of the revised NHLBI asthma guidelines, the findings may reflect enhanced care by the hospital staff resulting from adherence to the guidelines</td></tr>
</table>

Author and study Source	Homer C et al. An Evaluation of an Innovative Multimedia Educational Software Program for Asthma Management: report of a Randomized, controlled Trial. *Pediatrics* 2000; 106 (1): 210-215			
Methods	Study Design: Randomized controlled			
	Method of Randomization: Separate randomization lists were generated by computer for each site, and within site, for children less than 7 years and 7 years and older. Randomization did not match or stratify on any other characteristics.			
	Concealment/Concealment of Allocation: Sealed opaque envelope			
	Outcome Assessor Blinding: Not mentioned			
Participants	Eligible	471		
	Declined/Accepted but not Participate	334		
	Randomized	137 (Intervention 76; Control 61)/31		
	Dropouts	31		
	Completed	106 patients (Intervention 57; Control 49)		
	Dropout Rate	31/137 (22.6%)		
	Age Group and sex Distribution:			
	Characteristic	Control (n=61)	Treatment (n=76)	Total (n=137)
	Age (mean years)	7.1	7.7	7.4
	Female (%)	29.5	31.6	30.7
	How was Asthma Diagnosed? Not stated. Probably doctor?			
	Method of Patient Recruitment: Children were recruited to participate at the time of visits to the care site, either for scheduled healthcare maintenance visits or for illness related encounters, including visits for asthma			
	Inclusion Criteria: Age between 3 and 12 years and had any outpatient visits, ED visits, or inpatient admissions for asthma during the year before enrollment			
	Other Diseases Excluded: Second major chronic illness with a pulmonary component (eg. Cystic fibrosis)			
	Other Exclusions (if any): Patients residence outside of site of the program, involvement in other clinical trials or protocols related to asthma			
	Baseline Characteristics: Asthma severity (based on NIH criteria, mean, 0=mild, 2= severe)			
	Control	Treatment	Total	
	1.05	1.11	1.08	
	Parents rating asthma moderate or severe (%)			
	Control	Treatment	Total	
	71.2	73.2	72.3	
	There were no significant differences between treatment and control group			

Interventions	Setting: A hospital-based primary care clinic and affiliated neighborhood health center.
	Intervention in Detail: <u>Type</u> (Individual, software, interactive, family member involved, Vs written education and usual care) <u>Intervention Group</u> Characteristics: An interactive educational computer program, Asthma control, designed to teach children about asthma and its management. Using a graphic display of a child going through simulated daily events, the game emphasized: 1) Monitoring 2) Allergen identification 3) Use of medication 4) Use of health services 5) Maintenance of normal activity, such as school attendance. Duration: Children were asked to make three visits to use the game <u>Control Group</u> All the children in this group made three visits in which they reviewed an age-appropriate asthma education book and play a non-educational computer game. *There was no statistically significant difference in the number of sessions between the 2 groups *Both children and parents were surveyed before and after each use of the computer game to learn their impressions about the computer game and to assess their knowledge and understanding of asthma. *Children and the parents were observed by a research assistant and made qualitative observation and filled out a structured encounter form.
Statistical Analysis	Data collection: Obtained by parental report and review of administrator encounter data Analysis: • Baseline characteristics were compared with parametric (t-test) and non-parametric (Kruskal-Wallis) test for continuous measures, and $\chi 2$ and Fisher's exact test for categorical measures • Changes over time and differences in changes over time between intervention and control groups were assessed through Poisson regression and 2-way analysis of variance • All the data Analysis were performed using STATA statistical software; all tests of statistical significance were two sided

<table>
<tr><td>Results/ Outcomes</td><td>Primary Outcomes:
1) Total number of emergency department visits 2) Acute office visits during asthma study period
Secondary measures
Childs average asthma specific symptom severity during the study period and functional status at the conclusion of the study
Additional Outcome Measures:
1) Satisfaction care 2) use of peak flow monitoring 3) number of common triggers and allergens in the home environment 4) knowledge of asthma
<table><tr><th colspan="2">Outcome</th><th>Control (49)</th><th>Treatment (57)</th><th>Before and After Comparison</th><th>Comparison Between Groups</th></tr><tr><td rowspan="2">ED Visits (Mean)</td><td>Before intervention</td><td>2.24</td><td>2.14</td><td rowspan="2">β = 0.09
P<0.01</td><td rowspan="2">Not Statistically Significant</td></tr><tr><td>After intervention</td><td>0.73</td><td>0.86</td></tr><tr><td rowspan="2">Acute office visits (Mean)</td><td>Before intervention</td><td>0.96</td><td>0.91</td><td rowspan="2">β = 0.01
P< 0.001</td><td rowspan="2">Not Statistically Significant</td></tr><tr><td>After intervention</td><td>0.77</td><td>0.93</td></tr></table></td></tr>
<tr><td>Limitations of the Study</td><td>• The total number of subjects participated in the study are far less than the identified eligible population.
• No mention of statistical power adequacy
• Analysis not done on intention to treat basis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>*Substantial improvements in both the treatment groups</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td>Kotses et al. A self-management program for adult asthma. Part I: Development and evaluation. Journal of Allergy and Clinical Immunology 1995; 95: 529-540</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
Not mentioned (Randomization was done after the baseline training of 2 months)</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td>Outcome Assessor Blinding:
Not stated</td></tr>
<tr><td rowspan="13">Participants</td><td>Eligible: 126</td></tr>
<tr><td>Declined/Accepted but not Participate: 41</td></tr>
<tr><td>Randomized: 85</td></tr>
<tr><td>Dropouts: 9</td></tr>
<tr><td>Completed: 76 (Intervention 36 and Control 40)</td></tr>
<tr><td>Dropout Rate: 9/85 (10.5%)</td></tr>
<tr><td>Age Group and sex Distribution:</td></tr>
<tr><td>
<table>
<tr><td>Characteristic</td><td></td><td>Intervention</td><td>Control</td></tr>
<tr><td rowspan="2">Sex</td><td>Male</td><td>12</td><td>15</td></tr>
<tr><td>Female</td><td>24</td><td>25</td></tr>
<tr><td>Age</td><td colspan="3">Between 27 and 70 years of age average being 49.8 years. Standard deviation=12.4</td></tr>
</table>
</td></tr>
<tr><td>How was Asthma Diagnosed?
As per the standards established by the American thoracic Society</td></tr>
<tr><td>Method of Patient Recruitment:
Subjects were recruited on a continuing basis. The patients asthma was under control when recruited</td></tr>
<tr><td>Inclusion Criteria:
Not mentioned</td></tr>
<tr><td>Other Diseases Excluded:
Irreversible airway obstruction; concurrent uncontrolled medical conditions; asthma caused by occupational exposure;</td></tr>
<tr><td>Other Exclusions (if any):
Alcohol, tobacco or drug abuse; obesity; weight less than normal standard; either cognitive or intellectual deficits likely to impair learning</td></tr>
<tr><td>Baseline Characteristics:
FEV1 patients described their asthma s moderate to severe
PEFR: am (Intervention 331+/-92; control 333 +/- 123.7)</td></tr>
<tr><td>There were no significant differences between treatment and control group</td></tr>
<tr><td>Interventions</td><td>Setting:
Not specified</td></tr>
</table>

	Intervention in Detail: Type (Group, verbal, interactive, structured, non clinician, peak flow meter used, asthma diary, peak flow meter, symptom monitoring, medical review Vs asthma diary, PEFR monitoring, symptom monitoring and Usual medical care) The patients in both the groups participated in three operations: baseline, self-management training and follow up Intervention Group Characteristics: Baseline: 2 months; Self management training: 2 months; follow-up: 12 months Materials Used: • As Program components as well as means of assessment Weekly asthma dairy; the report of episode/ attack of asthma; mini-Wright Peak flow meter • Exclusively for evaluation Basic information book; the Beck depression inventory, the Asthma self efficacy scale, the Quality of well being scale, the Revised asthma problem behavior check list, the Asthma cost workbook, the Medical symptom record form and the general information form (demographic record). All patients received a patient manual for asthma and the leaders of the group received a group manual. Initial session: physical examination and suitability as participants was evaluated and were told the requirements of the investigation. Intake session: taught how to complete self-management material and trained to use the Mini-Wright peak flow meter. There were seven 90-minute sessions during which group leader presented and discussed the topics of self-management with the participants held once a week. Topics discussed principles of self-management, the natures of asthma, asthma medications, asthma prevention, attack management, consequences of asthma, and problem solving in management of asthma. Subjects who missed more than two sessions were excluded from the program and the individual who missed either first or last session his/her data was not in analysis. Weekly Asthma Diary: Completed for six months on a daily basis, beginning with the first day of baseline period. Also recorded for data recording purposes during a two-week period at the end of 12 month follow up period. PEFR values were recorded when completed weekly asthma dairy. The report of episode/ attack of asthma was completed after each attack. Materials used for evaluation were administered on three occasions: immediately before initiation of the baseline period, at the end of six month participation, and at the end of 12 month follow up. Duration: 16 months Control Group No special education. Controls kept an asthma dairy (symptoms and PEF) for 6 months on a daily basis and again for 2 weeks prior to the 12 months follow up.
Statistical Analysis	Data Collection: From the weekly asthma diary and from medical symptom record forum Analysis: • The changes between the baseline and the follow-up periods were examined in 2x2 repeated measures of Analysis of variance that tested the effects of group assignment and recording period

<table>
<tr><td>Results/ Outcomes</td><td>Asthma symptoms, Medication use, Asthma-related behavior, Cognitive measures, Use of healthcare facilities (outcomes were evaluated over short term and long term).
<table>
<tr><th colspan="2">Outcome measures</th><th>Months 1&2</th><th>Months5&6</th><th>P</th></tr>
<tr><td rowspan="2">AM PEFR (Daily Average)</td><td>Intervention</td><td>331.00±92.10</td><td>345±88.40</td><td>(P<0.05)</td></tr>
<tr><td>Control</td><td>333.00±123.70</td><td>341±112.40</td><td></td></tr>
<tr><td rowspan="2">PM PEFR (Daily Average)</td><td>Intervention</td><td>366.00±86.10</td><td>367±82.20</td><td></td></tr>
<tr><td>Control</td><td>361.00±119.60</td><td>366±111.00</td><td></td></tr>
<tr><td rowspan="2">Physician visits</td><td>Intervention</td><td>2.94±3.08</td><td>2.13±3.97</td><td>(P<0.05)</td></tr>
<tr><td>Control</td><td>1.67±1.90</td><td>1.83±2.15</td><td></td></tr>
<tr><td rowspan="2">ER visits</td><td>Intervention</td><td>0.01±0.08</td><td>0.03±0.11</td><td></td></tr>
<tr><td>Control</td><td>0.01±0.08</td><td>0.04±0.14</td><td></td></tr>
<tr><td rowspan="2">Asthma attack frequency</td><td>Intervention</td><td>14.90 ± 28.50</td><td>8.50 ±12.60</td><td></td></tr>
<tr><td>Control</td><td>10.60 ± 14.80</td><td>6.40 ± 10.10</td><td></td></tr>
</table>
<table>
<tr><th colspan="2">Outcome measures</th><th>Baseline</th><th>Follow-up</th><th>P</th></tr>
<tr><td rowspan="2">AM PEFR (Daily Average)</td><td>Intervention</td><td>312.00±81.10</td><td>332±88.00</td><td></td></tr>
<tr><td>Control</td><td>345.00±120.00</td><td>345±131.00</td><td></td></tr>
<tr><td rowspan="2">PM PEFR (Daily Average)</td><td>Intervention</td><td>351.00±78.00</td><td>367±68.00</td><td></td></tr>
<tr><td>Control</td><td>355.00±129.00</td><td>358±121.00</td><td></td></tr>
<tr><td rowspan="2">Physician visits</td><td>Intervention</td><td>0.55±0.96</td><td>0.61±0.84</td><td></td></tr>
<tr><td>Control</td><td>0.48±0.87</td><td>0.66±0.81</td><td></td></tr>
<tr><td rowspan="2">ER visits</td><td>Intervention</td><td>0.04±0.20</td><td>0</td><td></td></tr>
<tr><td>Control</td><td>0.04±0.20</td><td>0</td><td></td></tr>
<tr><td rowspan="2">Asthma attack frequency</td><td>Intervention</td><td>4.50 ± 8.80</td><td>1.40 ±2.70</td><td>P<0.05</td></tr>
<tr><td>Control</td><td>2.10 ± 3.50</td><td>0.82 ± 1.20</td><td></td></tr>
</table></td></tr>
<tr><td>Limitations of the Study</td><td>• Inadequate randomization
• No allocation concealment
• No blinding
• No mention of statistical power/sample size adequacy
• Analysis not done on intention to treat basis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>The educational procedures and the development of self-management behavior have a significant role in improvements in asthma severity. The educational programs that optimize the communication and learning are effective. The improvements in the outcomes following asthma self-management are due to the acquisition and performance of self-management skills rather than improved medical management, which is in concurrent with the self-management training or component of the training.</td></tr>
</table>

Author and Study Source	Kotses et al. evaluation of Individualized asthma self-Management Programs. *Journal of Asthma* 1996; 33 (2): 113-118	
Methods	Study Design: Randomized controlled	
	Method of Randomization Not stated. Group assignments were made randomly with the restriction that conditions be equated for number of subjects	
	Concealment/Concealment of Allocation Not mentioned	
	Outcome Assessor Blinding Not stated.	
Participants	Eligible	45
	Declined/Accepted but not Participate	Zero
	Randomized	45
	Dropouts	11
	Completed	34 (11 individualized, 11 group, 12 control)
	Dropout Rate	11/45 (24.4%)
	Age Group and sex Distribution: 27 females and 7 males Age: Average age of 42 years	
	How was Asthma Diagnosed? Not mentioned	
	Method of Patient Recruitment: On advertisements for research subjects from Toledo and Ohio area	
	Inclusion Criteria: Not mentioned	
	Other Diseases Excluded: Not mentioned	
	Other Exclusions (if any): Not mentioned	
	Baseline Characteristics: Self reported Severity: Mild: 4 Moderate: 27 Severe: 3 Collected for 30 days prior to intervention. On a daily basis, the patients monitored frequency of AM and PM asthma attacks, AM and PM PEFR, activity limitations and visits to emergency care facilities. All the information was recorded on the dairy.	
	There was a no mention if there were any pre-intervention statistically significant differences between the two groups	

Interventions	Setting: Not mentioned
	Intervention in detail: <u>Type</u> (Group, verbal, visual, audio, interactive, structured, family member involved, asthma diary, peak flow meter, medical review Vs Usual medical care) (Individual, verbal, audio, interactive, structured, peak flow meter, medical review, Vs Usual medical care) <u>Individualized Self-Management Group</u> Characteristics: *The factors related to each patient's asthma was discussed in a 60-minute session. The discussions included the use of PEFR as the early warning sign of onset of asthma and methods for avoiding the precipitants. The patients who had asthma related to emotion were given an audiotape of progressive relaxation instructions. *All the patients were given an asthma diary where the patients kept the record of all the readings All the patients received instructions for reducing asthma exacerbations. All the patients kept a record of: AM and PM asthma attacks AM and PM PEFR scores Their contact with at least 18 asthma precipitants. <u>Group Self-Management</u> Intervention consisted of the Wheezers Anonymous Program and an adult program derived from two pediatric asthma self-management programs (Living with asthma and the family asthma program). Wheezers Anonymous Program outlines the general recommendations for the control of asthma through the use of standardized video and audio materials and discussions facilitated by a group leader. It includes peak flow monitoring. Sessions and Duration: two sessions each of approximately 2.5hours in length. Duration: 90 days Educator: Not clearly mentioned <u>Control Group</u> No specific education or intervention during the intervention period *Note*: followed by intervention was the follow up period of 30 days in which all the outcomes were measured

<table>
<tr><td>Statistical Analysis</td><td>Data Collection:
Interviewing the patients and from the records
Analysis:
• Chi-square Analysis was used to eliminate variables completely unrelated to asthma and logistic regression to determine the degree of association between asthma and all remaining variables</td></tr>
<tr><td>Results/ Outcomes</td><td>
<table>
<tr><th>Outcome measure</th><th>Group</th><th>Baseline</th><th>Follow-up</th><th></th></tr>
<tr><td rowspan="3">AM PEFR</td><td>I</td><td>327.00±91.60</td><td>359.00±186.60*</td><td>P<0.05</td></tr>
<tr><td>W</td><td>387.40±127.70</td><td>418.10±124.00*</td><td>P<0.05</td></tr>
<tr><td>C</td><td>310.30±105.20</td><td>326.80±115.30</td><td></td></tr>
<tr><td rowspan="3">PM PEFR</td><td>I</td><td>366.20± 85.60</td><td>372.50±105.00</td><td></td></tr>
<tr><td>W</td><td>412.20±128.70</td><td>429.30±120.60</td><td></td></tr>
<tr><td>C</td><td>336.80±107.10</td><td>340.10±103.90</td><td></td></tr>
<tr><td rowspan="3">AM Attacks</td><td>I</td><td>10.54± 8.67</td><td>6.63±10.40*</td><td>P<0.05</td></tr>
<tr><td>W</td><td>10.09± 8.47</td><td>8.63±10.49</td><td></td></tr>
<tr><td>C</td><td>9.66±7.20</td><td>11.41±10.63</td><td></td></tr>
<tr><td rowspan="3">PM Attacks</td><td>I</td><td>9.45± 6.93</td><td>9.72± 9.75</td><td></td></tr>
<tr><td>W</td><td>9.09±10.64</td><td>8.81±10.90</td><td></td></tr>
<tr><td>C</td><td>9.58± 8.45</td><td>9.25±10.40</td><td></td></tr>
<tr><td rowspan="3">Emergency visits</td><td>I</td><td>0.82±2.72</td><td>0</td><td></td></tr>
<tr><td>W</td><td>0</td><td>0.91± 0.30</td><td></td></tr>
<tr><td>C</td><td>1.42±3.52</td><td>0.33± 0.09</td><td></td></tr>
</table>
#I=individualized self-management; W=Group self-management; C=Control group
#Improvements in patients in both individualized and group self-management condition in AM PEFR and AM attacks in individualized asthma self-management condition.
#Patients in the control condition had no change in any of the dependant variables from the baseline to the follow up.</td></tr>
<tr><td>Limitations of the Study</td><td>• Small study population
• High rate of dropouts
• Inadequate randomization
• No mention of concealment
• No blinding
• No mention of adequacy of statistical power/sample</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>• The personalized programs were in the aggregate were at least as effective as the group program
• The personalized programs have several advantages like they can be conducted during office visits, more appealing as it does not contain material irrelevant to patient and consistent with medical practice</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td colspan="4">Lewis CH et al. A Randomized Trial of A.C.T. (Asthma Care Training) for Kids. Pediatrics Oct 1984; 74 (4): 478-486</td></tr>
<tr><td rowspan="4">Methods</td><td colspan="4">Study Design:
Randomized controlled</td></tr>
<tr><td colspan="4">Method of Randomization:
From the list of numbered eligible patients, subjects were allocated, using a random numbers table</td></tr>
<tr><td colspan="4">Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td colspan="4">Outcome Assessor Blinding:
Not mentioned</td></tr>
<tr><td rowspan="13">Participants</td><td colspan="2">Eligible</td><td colspan="2">133 subjects</td></tr>
<tr><td colspan="2">Declined/Accepted but not Participate</td><td colspan="2">30</td></tr>
<tr><td colspan="2">Randomized</td><td colspan="2">103 (62 in intervention; 41 in control)</td></tr>
<tr><td colspan="2">Dropouts</td><td colspan="2">27</td></tr>
<tr><td colspan="2">Completed</td><td colspan="2">76(28 in control group and 48 in experimental group)</td></tr>
<tr><td colspan="2">Dropout Rate</td><td colspan="2">27/103 (26.2%)</td></tr>
<tr><td colspan="4">Age Group and sex Distribution:</td></tr>
<tr><td>Characteristics</td><td>Control</td><td>Intervention</td><td>Total</td></tr>
<tr><td>Age (mean)</td><td>10.1</td><td>10.4</td><td>10.3</td></tr>
<tr><td>Sex (male %)</td><td>71</td><td>67</td><td>77</td></tr>
<tr><td colspan="4">There were no differences in the proportion of boys or girls who failed to attend classes or who dropped out.</td></tr>
<tr><td colspan="4">How was Asthma Diagnosed?
Physicians' diagnosis</td></tr>
<tr><td colspan="4">Method of Patient Recruitment:
All the eligible patients were contacted by phone and then recruited if they accepted</td></tr>
<tr><td colspan="4">Inclusion Criteria:
1) Severe asthma (medication required at least 25% of the days of the month) 2) age 7-12 years 3) verbal fluency in English</td></tr>
<tr><td colspan="4">Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td colspan="4">Other Exclusions (if any):
Not mentioned</td></tr>
<tr><td colspan="4">Baseline Characteristic:
The two group children were similar in composition and chronicity of asthma. There were no statistically significant differences in both the groups in the preintervention group</td></tr>
</table>

Interventions	Setting: Kaiser facilities
	Intervention in Detail: Type (Group, verbal, other interventions (stickers, cartoons, games), interactive, structured, family member involved, clinician and non clinician educator, regular medical review Vs group, verbal) Intervention Group (Asthma Care Training-A complement to good medical care rather than replacement to the personal physician) *Characteristics* Children and parents meet in separate groups during initial 45 minutes, are taught same content, and come together at the end of the period so that both can share their perceptions and experiences The education focused on knowledge about the underlying mechanisms in asthma and resultant symptoms and signs, environmental control of irritants and allergens, relaxation skills and breathing exercises, review of prescribed drugs, decision making skills, and concept of balanced living. The car driving safety paradigm was used Use of stickers, cartoons, and games provided a medium for the messages about symptoms and environmental control Duration: Five one hour sessions offered at weekly intervals Educator: Third session (one to one basis on drug usage) by the physician while the other lessons were designed and written to be taught by elementary school teachers, health educators or nurses with teaching interest and experience *Note:* the classes were limited to 5-7 children per group because of the interactive nature Control Group Three 11/2-hour sessions consisting of a lecture, followed by a discussion, held at weekly intervals by one of the authors covering the same content *Note:* the lectures were offered to larger numbers of subjects: six to twelve families or 12-25 persons.
Statistical Analysis	Collection of Data: Medical records were abstracted to determine use of services. Data on scheduled office visits, emergency room visits, and days of hospitalization were recorded for the 12 months before and after the classes Analysis: • Analysis of covariance on number of visits to the emergency room and numbers of hospitalizations, and nonparametric contingency Analysis on proportions of children and parents giving certain responses on pretest and 1-year post test interviews

<table>
<tr><td rowspan="6">Results/ Outcomes</td><td colspan="2">Outcome Measures</td><td>Control Group (N =28)</td><td>Intervention Group (N = 48)</td><td>P</td></tr>
<tr><td rowspan="2">Emergency Room Visits (Mean)</td><td>Pre Intervention</td><td>3.04</td><td>3.68</td><td rowspan="2"><0.05</td></tr>
<tr><td>Post Intervention</td><td>3.71</td><td>2.30</td></tr>
<tr><td rowspan="2">Hospital Days/Child/yr</td><td>Pre Intervention</td><td>0.67</td><td>0.96</td><td rowspan="2"><0.01</td></tr>
<tr><td>Post Intervention</td><td>1.54</td><td>0.67</td></tr>
<tr><td>Hospitalizations</td><td>Post Intervention</td><td>0.60</td><td>0.27</td><td>0.08</td></tr>
<tr><td colspan="5">There was a significant reduction in emergency room visits and the hospitalizations in the experimental group when compared to the control group after the intervention period.</td></tr>
<tr><td>Limitations of the Study</td><td colspan="5">• The study was conducted on one group of patients (middle class, working families enrolled in HMO—so financial barrier to access the care) questioning the generalizability of the results
• The research associates knew from their interactions with the subjects which ones were in the control group and which ones were in experimental group
• The group was receiving the medical care from pediatric allergists and the care would be universally high
• Analysis were not done on intention to treat basis
• No mention of adequacy of statistical power/sample sample</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="5">Asthma care training for kids resulted in significant reduction in ER visits and hospitalizations in the experimental group. There was an equivalence increase in knowledge and changes in belief in both the groups</td></tr>
</table>

<table>
<tr><td>Author and study source</td><td>Marvella EF et al. Health outcomes among African and Caucasian adults following a randomized trial of an asthma education program. Ethnicity & Health Nov 1997; 2 (4): 239-</td></tr>
<tr><td rowspan="11">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
Blocked randomization using randomly chosen sizes of 4, 6 or 8 stratified by site</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td>Outcome Assessor Blinding:
Not mentioned</td></tr>
<tr><td rowspan="7">Participants</td><td>Eligible | 537</td></tr>
<tr><td>Declined/Accepted but not Participate | 296</td></tr>
<tr><td>Randomized | 241 (119 intervention, 122 control)</td></tr>
<tr><td>Dropouts | None</td></tr>
<tr><td>Completed | 241</td></tr>
<tr><td>Dropout Rate | Zero</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><td>Characteristic</td><td>African Americans</td><td>Caucasian</td></tr>
<tr><td>Sex-Females (%)</td><td>69.9</td><td>56.4</td></tr>
<tr><td>Age (mean, SD)</td><td>35.8 (13.3)</td><td>40.2 (15.4)</td></tr>
</table></td></tr>
<tr><td>How was Asthma Diagnosed?
Physician's diagnosis</td></tr>
<tr><td>Method of Patient Recruitment:
From two different hospital Emergency departments</td></tr>
<tr><td>Inclusion Criteria:
All asthma patients between the ages of 18 and 70 years who were seen and evaluated in two hospital emergency departments (inner city and suburban) between July 1, 1986, and march 15 1987</td></tr>
<tr><td>Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td>Other Exclusions (if any):
Language or psychiatric barriers to class attendance</td></tr>
<tr><td>Baseline Characteristics:
Demographic data, yearly average ED visits due to asthma, asthma knowledge belief scores and yearly average days of limited activity were noted.</td></tr>
<tr><td>No statistically significant differences were found in both the groups before the intervention</td></tr>
</table>

<table>
<tr><td>Interventions</td><td>Setting:
Emergency department

Intervention in Detail:
<u>Type</u>
(Group, verbal, interactive, structured, non clinician educator Vs usual medical care)
<u>Intervention Group</u>
Characteristics
3 sessions that emphasized on
• Anatomy and physiology of asthma
• Use of relaxation techniques to reduce the stress associated with asthma attacks
• Encouraged to take charge of their health and their interactions with their physicians
• Information on common asthma medication (a mariner was provided)
• Information on precipitating factors
• What to do when an asthma attack
• Relationships among smoking, exercise and asthma
Note: The intervention group participants who did not attend the sessions were mailed the educational material.
Duration:
12 months
Educator:
Specially trained health care professional
<u>Control Group</u>
No specific intervention apart from usual care</td></tr>
<tr><td>Statistical Analysis</td><td>Data Collection:
By interviewing the patients and emergency department data
Analysis:
• Intention to treat principle was incorporated in Analysis (including Analysis of follow up data)
• Baseline differences were tested with two sample Student's t-tests.
• Categorical variables were tested using chi-square test.
• Analysis of follow up data for intervention and control group emergency department visits was performed using ANOVA model.
ANCOVA used to confirm the ANOVA results</td></tr>
<tr><td>Results/ Outcomes</td><td><table>
<tr><td colspan="2">Outcome Measures</td><td>Intervention group</td><td>Control group</td></tr>
<tr><td rowspan="2">ED Visits (Mean +SD)</td><td>Baseline</td><td>4.85 ± 4.04</td><td>6.6 ± 8.40</td></tr>
<tr><td>After Intervention</td><td>2.1 ± 2.95</td><td>4.75 ± 8.61</td></tr>
</table></td></tr>
<tr><td>Limitations of the Study</td><td>• No mention of concealment of allocation
• No blinding
• No mention of adequacy of statistical power/sample size</td></tr>
</table>

Conclusions/ Other remarks	• Asthma education is useful in promoting positive asthma related health behaviors • Mailing the educational material to adults is as useful as more resource intensive and time consuming educational classes • There was a little of changes occurred after four month post-intervention period, suggesting the need for refresher/ remainder classes or other approaches designed to sustain behavior change

<table>
<tr><td>Author and study source</td><td>McNabb WL et al. Self-management Education of Children with Asthma: AIR WISE. American Journal of Public Health 1985; 75 (10): 1219-1220.</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
Not stated</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not stated</td></tr>
<tr><td>Outcome Assessor Blinding:
Not stated</td></tr>
<tr><td rowspan="13">Participants</td><td>Eligible: 16</td></tr>
<tr><td>Declined/Accepted but not Participate: None</td></tr>
<tr><td>Randomized: 16 (Intervention 8; Control 8)</td></tr>
<tr><td>Dropouts: One control subject dropped and one matched subject from experimental group was excluded from the Analysis</td></tr>
<tr><td>Completed: 15</td></tr>
<tr><td>Dropout Rate: 1/16 (6.25%)</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><th colspan="2">Characteristics</th><th>Intervention</th><th>Control</th></tr>
<tr><td colspan="2">Age (average)</td><td>10.5 years</td><td>10.4 years</td></tr>
<tr><td rowspan="2">Sex</td><td>Males</td><td>6</td><td>5</td></tr>
<tr><td>Females</td><td>1</td><td>2</td></tr>
</table></td></tr>
<tr><td>How was Asthma Diagnosed?
Not mentioned</td></tr>
<tr><td>Method of Patient Recruitment:
From two allergy clinics in the Kaiser Permanente Medical Groups in northern California and who met the inclusion criteria</td></tr>
<tr><td>Inclusion Criteria:
1) 9-13 years of age on a regimen of bronchodialator 2) at least one emergency treatment for asthma in the previous year 3) no known developmental or behavioral problems</td></tr>
<tr><td>Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td>Other Exclusions (if any):
Not mentioned</td></tr>
<tr><td>Baseline Characteristics:
*Preintervention data was collected which included number of emergency treatments for asthma per month, number of non-emergency physician contacts for asthma per month, and current asthma drug regimen
*There were no major differences between the groups in the dependent variables over the 12-month baseline</td></tr>
<tr><td>There were no statistically significant differences between the groups before the educational program</td></tr>
</table>

<table>
<tr><td>Interventions</td><td>Setting:
Clinical setting (exact setting not mentioned)

Intervention in Detail:
<u>Type</u>
(Individual, verbal, interactive, team approach, family member involved, non clinician educator, medical review Vs usual medical care)
<u>Intervention Group (AIR WISE)</u>
Characteristics:
The content based on a study of the self-management practices of children with asthma. By making use of diagnostic/prescriptive teaching technique, the educator in the AIR WISE could identify the self-management problems to each child and then use the AIR WISE materials to prepare a tailored educational program
Written educational protocols guided the development and implementation of the educational plans, enabling educators to conduct the intervention in a standard manner and at the same time adapting to the individual needs of the children.
The education provided to the children utilized the goal setting, self-evaluation, and self-monitoring
Interactive education between the student and the nurse educator while child's' parents and physician were included in the educational process.
Duration:
Four 45 minute sessions, administered on a weekly basis for 12 months
Educator:
Nurse educator
<u>Control Group</u>
No special education</td></tr>
<tr><td>Statistical Analysis</td><td>Data Collection:
Not mentioned
Analysis:
Not mentioned</td></tr>
<tr><td>Results/ Outcomes</td><td><table>
<tr><th colspan="2">Outcome Measure</th><th>Baseline</th><th>Post intervention</th></tr>
<tr><td rowspan="2">Emergency Treatments (Average)</td><td>Control</td><td>5.7</td><td>7.4</td></tr>
<tr><td>Experimental</td><td>6.1</td><td>1.9</td></tr>
</table></td></tr>
<tr><td>Limitations of the Study</td><td>No adequate randomization
No mention of concealment f allocation
No blinding
Small sample size hence generizability is questionable
Analysis was not done on intention to treat basis
There was no mention of adequacy of statistical power/sample size</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>AIR WISE can serve as an important adjunct to the medical management of asthma and result in decline of the morbidity.</td></tr>
</table>

<table>
<tr><td>Author and study source</td><td>Perrin JM et al. Improving the Psychological Status of Children with Asthma: A Randomized Controlled Trial. Journal of Developmental and Behavioral Pediatrics 1992; 13:241-247</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
Not mentioned</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td>Outcome Assessor Blinding:
Not mentioned</td></tr>
<tr><td rowspan="13">Participants</td><td>
<table>
<tr><td>Eligible</td><td>250</td></tr>
<tr><td>Declined/Accepted but not participate</td><td>169</td></tr>
<tr><td>Randomized</td><td>81</td></tr>
<tr><td>Dropouts</td><td>25</td></tr>
<tr><td>Completed</td><td>56</td></tr>
<tr><td>Dropout Rate</td><td>25/81 (30.8%)</td></tr>
</table>
</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><th colspan="2">Characteristic</th><th>Intervention (29)</th><th>Control (27)</th><th>Total (56)</th></tr>
<tr><td rowspan="3">Age (Years)</td><td>6-8</td><td>11 (38%)</td><td>10 (37%)</td><td>21 (38%)</td></tr>
<tr><td>9-11</td><td>15 (52%)</td><td>11 (41%)</td><td>26 (46%)</td></tr>
<tr><td>12-14</td><td>3 (10%)</td><td>6 (22%)</td><td>9 (16%)</td></tr>
<tr><td rowspan="2">Sex</td><td>Male</td><td>17 (59%)</td><td>18 (67%)</td><td>35 (62%)</td></tr>
<tr><td>Female</td><td>12 (41%)</td><td>9 (33%)</td><td>21 (38%)</td></tr>
</table>
</td></tr>
<tr><td>How was asthma diagnosed?
Doctors' diagnosis</td></tr>
<tr><td>Method of Patient Recruitment:
90% subjects from community pediatric settings and 10% from general pediatric and allergy clinics at a children's hospital</td></tr>
<tr><td>Inclusion Criteria:
Not mentioned</td></tr>
<tr><td>Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td>Other Exclusions (if any):
Not mentioned</td></tr>
<tr><td>Baseline Characteristics:
<table>
<tr><th>Clinical severity</th><th>Intervention (29)</th><th>Control (27)</th><th>Total (56)</th></tr>
<tr><td>Mild</td><td>7 (25%)</td><td>11 (44%)</td><td>18 (34%)</td></tr>
<tr><td>Moderate</td><td>17 (61%)</td><td>12 (48%)</td><td>29 (55%)</td></tr>
<tr><td>Severe</td><td>4 (11%)</td><td>2 (8%)</td><td>6 (11%)</td></tr>
</table>
</td></tr>
<tr><td>No statistically significant differences noticed in both the groups before the intervention</td></tr>
</table>

Interventions	Setting: Not mentioned. Probably community practice setting? Intervention in Detail: Type (Group, verbal, other interventions (anatomic models and balloons), interactive, structured, family member involved, medical review Vs usual medical care) Intervention Group Characteristics: Four sessions where in Session one emphasized basic lung function and anatomy and mechanisms of breathing and breathing control Session two covered changes in lungs related to asthma and the effects of these changes on other bodily functions Session three focused on methods of prevention and treatment and mechanisms by which the medicines and the other therapies changed the symptoms Session four included a review of the previous three and discussion of exercise, long term outcomes, and growing up with asthma Stress management activity consisted of relaxation training and contingency coping exercises Note: *Parents and children participated in the educational program together while the stress management activity was carried out with participating children alone and the parents had the opportunity to meet the staff physician to ask any additional questions regarding condition. *Although a special curriculum was used for each session, the educational component was interactive in that children participated with the use of anatomic models and balloons and were encouraged to ask questions about each topic area. Duration: Each session of 2 hour duration Control Group Received same combined intervention program but after the trial was completed. During the trail no asthma education was provided.
Statistical Analysis	Data Collection: Not mentioned clearly. Probably from school records Analysis: • Chi-square test and *t*-test were used to determine differences. No differences were noticed in between the recruited and the completed sample • Multiple regression Analysis were used to determine whether the combined intervention had an effect on psychological status and functional outcomes

<table>
<tr><td rowspan="4">Results/ Outcomes</td><td rowspan="2">Characteristics</td><td colspan="2">Intervention group</td><td colspan="2">Control group</td></tr>
<tr><td>Pre intervention</td><td>Post intervention</td><td>Pre intervention</td><td>Post intervention</td></tr>
<tr><td>School days missed (no./month)</td><td>0.73 ± 1.5</td><td>0.24 ± 0.9</td><td>0.14 ± 0.34</td><td>0.22 ± 1.0</td></tr>
<tr><td colspan="5">Pre- to post differences, p<0.02
No significant differences between intervention and the control group scores before intervention</td></tr>
<tr><td>Limitations of the Study</td><td colspan="5">• No adequate randomization
• No concealment of allocation
• No blinding
• The study population was predominantly middle class and came from community practice settings. The results therefore cannot be generalized to other populations of children with asthma, such as those in hospital settings or those from different socioeconomic backgrounds.
• There is a large difference between the numbers who were eligible and those who completed the study
• The attrition rate is similar to those in other group educational studies and probably this kind of intervention will likely work only with motivated children and parents.
• No mention of adequacy of statistical power/sample size
• Analysis was not done on intention to treat Analysis</td></tr>
<tr><td>Conclusions/ Other remarks</td><td colspan="5">• The intervention had no significant effect on numbers of school days missed, participation in after school activities, or time playing with friends, although in all cases the trend was in the desired direction for the intervention group but not control group.
• Asthma knowledge test scores increased with the intervention.</td></tr>
</table>

Author and Study Source	Persaud et al. An Asthma Self-Management Program for Children, Including Instruction in Peak Flow Monitoring by School Nurses. *Journal of Asthma* 1996; 33(1); 37-43			
Methods	Study Design: Randomized controlled			
	Method of Randomization: Within each school, students were randomly assigned to be either intervention or control subjects.			
	Concealment/Concealment of Allocation Not mentioned			
	Outcome Assessor Blinding: All the primary care providers were blinded as to the assignment to treatment or control groups.			
Participants	Eligible		60 subjects but 43 were contacted	
	Declined/Accepted but not Participate		7	
	Randomized		36	
	Dropouts		None	
	Completed		All those randomized	
	Dropout Rate		Zero	
	Age Group and sex Distribution: Average age of the subjects was 10.2 years			
	Characteristics	Control (18)	Intervention (18)	
	Age (years)	10.2 ± 1.7	10.2 ± 1.5	
	Sex (male)	72%	55%	
	How was asthma diagnosed? Doctors diagnosis			
	Method of Patient Recruitment: All the subjects who were eligible were identified from the medical records from the pediatric resident group practice at the University of Texas Medical Branch. All the students attended schools in the Galveston Independent School District			
	Inclusion Criteria: Age group between 8 and twelve years, diagnosed as asthmatic (several prior episodes of airway obstruction, clinical response to bronchodilater, and absence of other pulmonary disease)			
	Other Diseases Excluded: Other pulmonary diseases			
	Other Exclusions (if any): Not mentioned			
	Baseline Characteristics:			
	Characteristics		Control	Treatment
	Lung Function	FVC	80.4 ± 13.2	80.7 ± 10.5
		FEV_1	74.4 ± 10.4	75.6 ± 10.8
		% FEV_1	87.1 ± 11.3	84.6 ± 8.9
		%PEF	74.9 ± 18.1	78.4 ± 12.5
	Asthma Severity	Mild	44%	44%
		Moderate	55%	44%
		Severe	0%	11%
	Greater severity and early onset of illness is seen in control group before the administration of intervention. The differences between all other characteristics between both the groups before the intervention were not statistically significant			

Interventions	Setting: Pediatric ambulatory care unit
	Intervention in Detail: Type (Individual, verbal, written, interactive, team approach, family member involved, non clinician educator, peak flow meter used, self management plan, asthma diary, PEFR monitoring, medical review Vs usual medical care) Preintervenion Initial Assessment: conducted by physician assistant and pediatric resident *History, physical examination, pulmonary function tests, and questionnaires completed *Structured interviews conducted to obtain socio-demographic information, asthma symptoms experienced, frequency of attacks, medication use, triggers, and precipitating events *Patients and caregivers were given written guidelines (individual management plans and optimum peak expiratory flow rates) for medication usage, asthma control, and prevention *Each child was given a peak flow meter and an asthma diary Intervention Group Characteristics: At every visit *Review of asthma diary with the student, discuss progress, symptoms, and ability to take appropriate measures to control asthma *Child demonstrated proper use of inhaled medication and peak flow meter Duration: Individualized, weekly, 20-minute education sessions Educator: School nurse Control Group Attended the nurses' offices sporadically on their own initiative, but no additional intervention from the school nurses *Note:* 1) Both the groups continued to receive the regular care from their primary care provider during and after the educational intervention 2) The six participating school nurses attended two 4-hour in-service sessions presented by the principal investigator where the nurses knowledge and skill about the asthma was improved and nurses learned how to initiate dialogue with a student, conduct open ended interviews, role play and provide positive reinforcement.

<table>
<tr><td>Statistical Analysis</td><td>Data Collection:
From standard questioners and the records of ER
Analysis:
• All Analysis were done on intention to treat basis
• Group differences on demographic and medical history variables were tested with a chi-square test for categorical variables (gender, severity of illness) and t-test for interval scale variables (age, years of duration)
• Analysis of covariance was used to test for post intervention changes</td></tr>
<tr><td>Results/ Outcomes</td><td><table><tr><th>Outcome measures</th><th>Control (n=18)</th><th>Treatment (n=18)</th><th>P value</th></tr><tr><td>Emergency room visits (post intervention)
(Percentage of subjects)</td><td>50%</td><td>22%</td><td>N.S</td></tr></table>*There was also no significant difference in the school days missed in the groups</td></tr>
<tr><td>Limitations of the Study</td><td>• Inadequate randomization
• No mention of concealment of allocation
• Although the randomly assigned to groups, there were some indicators of greater severity of illness in the control group. Control subjects reported an early onset of illness (2.6 years vs. 5.2 years) and reported more attacks (8.2 Vs. 4.3).
• The sample size was too small. In a larger sample, significant differences between control and intervention groups might be demonstrated.
• The intervention period of 8 weeks is too short to show significant outcomes in the areas measured.
• No mention of adequacy of statistical power/sample size Analysis</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td>The percentage of subjects who visited the ER for exacerbations of asthma was significantly higher in control group than in the intervention group, but the difference disappeared when the number of ER visits per child was controlled for age of onset of illness.</td></tr>
</table>

<table>
<tr><td>Author and Study Source</td><td>Rubin DH et al. Educational Intervention by Computer in Childhood Asthma: A Randomized Clinical Trial Testing the Use of a New Teaching Intervention in Childhood asthma. Pediatrics Jan 1986; 77 (1): 1-10</td></tr>
<tr><td rowspan="4">Methods</td><td>Study Design:
Randomized controlled</td></tr>
<tr><td>Method of Randomization:
Random number table. The groups were balanced after every tenth patient to ensure an equal number of patients in each group.</td></tr>
<tr><td>Concealment/Concealment of Allocation:
Not mentioned</td></tr>
<tr><td>Outcome Assessor Blinding:
Follow data was collected by principal investigator who was blind to group assignment</td></tr>
<tr><td rowspan="11">Participants</td><td>
<table>
<tr><td>Eligible</td><td>86</td></tr>
<tr><td>Declined/Accepted but not participate</td><td>19</td></tr>
<tr><td>Randomized</td><td>65</td></tr>
<tr><td>Dropouts</td><td>None</td></tr>
<tr><td>Completed</td><td>65</td></tr>
<tr><td>Dropout Rate</td><td>Zero</td></tr>
</table>
</td></tr>
<tr><td>Age Group and sex Distribution:
<table>
<tr><th>Characteristics</th><th>Control (N=33)</th><th>Experimental (N=32)</th><th>P</th></tr>
<tr><td>Age (yrs)</td><td>9.5 ± 1.9</td><td>9.8 ± 2.1</td><td><0.56</td></tr>
<tr><td>Sex (Male (%))</td><td>58</td><td>53</td><td>0.72</td></tr>
</table>
</td></tr>
<tr><td>How was asthma Diagnosed?
Physicians diagnosis</td></tr>
<tr><td>Method of Patient Recruitment:
By contacting the patients and patients met the standard criteria of the Yale University school of Medicine.</td></tr>
<tr><td>Inclusion Criteria:
All the children with asthma who were
1) Patients at Yale-New Haven Hospital, Hospital of St. Raphael, Yale Health Plan (a university based HMO), and one pediatrician's office
2) English speaking
3) 7-12 years of age; and
4) Living in the greater New Haven, Connecticut
With at least three acute visits because of asthma during the year preceding the study to the emergency room, outpatient clinic, or physician's offices.</td></tr>
<tr><td>Other Diseases Excluded:
Not mentioned</td></tr>
<tr><td>Other Exclusions (if any):
Not mentioned</td></tr>
<tr><td>Baseline Characteristics:
Baseline information collected prior to randomization included 1) demographic information 2) prior experience with computers 3) behaviors related to the management of asthma
4) Psychological tests 5) knowledge of asthma, 6) general behaviors (not asthma-specific), and 7) previous morbidity from asthma.</td></tr>
<tr><td>No mention of baseline differences between the control and the intervention group before the intervention</td></tr>
</table>

Interventions	Setting: Yale Health Plan or at the Community Health Care Plan
	Intervention in Detail: Type (Individual, software, interactive, non clinician educator Vs Group, verbal, non clinician educator and usual medical care) Intervention Group Characteristics *Emphasizes basic principles in the management of asthma. *It reflects (as close as possible) the daily routines of the child with asthma *Children use their own specific medications and allergens *They are forced to anticipate potentially harmful allergens, take the correct dosage of the medicine at the right time, use the emergency room or physicians' office an appropriate manner, and attend school Duration: 45 minutes of each session scheduled every six weeks during a period of ten months **Forty minutes were devoted to playing the game while the last five minutes were spent reviewing the computer printout that detailed a subject's performance. Educator: Research assistant Control Group *Forty minutes playing with computer games not related to asthma *Five to ten minutes of supplemental verbal instructions about proper management of asthma (The verbal instructions were designed to duplicate the basic principles of management of the childhood asthma contained in the experimental group's intervention)
Statistical Analysis	Data Collection: Follow-up data was collected from the children and parents separately by an interview. The data included variables that were identical to those examined at the baseline. Analysis: • All the Analysis were done on intention to treat basis • Differences between the follow-up and baseline measures in each group were compared using the t-test for dimensional data and $\chi 2$ for categorical data. • Confounding effects of the specific variables were controlled by stepwise regression with analysis of variance. • All *P* values are based on two-tailed tests of significance. Results are indicated in Mean ± SD

<table>
<tr><td rowspan="5">Results/ Outcomes</td><td rowspan="2">Outcome Measure</td><td colspan="3">Baseline</td><td colspan="3">Change</td></tr>
<tr><td>Control (N=33)</td><td>Intervention (N=32)</td><td>P<</td><td>Control (N=25)</td><td>Intervention (N=29)</td><td>P<</td></tr>
<tr><td>Acute visits due to asthma</td><td>5.2 ± 2.7</td><td>5.6 ± 4.3</td><td>0.62</td><td>-0.7 ± 6.3</td><td>-2.8 ± 2.6</td><td>0.13</td></tr>
<tr><td>Hospital days due to asthma</td><td>1.2 ± 2.6</td><td>0.8± 2.4</td><td>0.47</td><td>-0.2 ± 4.0</td><td>0.03 ± 1.6</td><td>0.78</td></tr>
<tr><td>School days absent</td><td>17.0 ±15.0</td><td>13.0 ± 7.8</td><td>0.19</td><td>1.6 ± 13.6</td><td>1.1 ± 11.2</td><td>0.89</td></tr>
<tr><td colspan="7">*There was trend towards improvement in the experimental group in reducing the number of acute visits due to asthma
*Higher percentage of children in the control group had reduced their number of hospital days due to asthma</td></tr>
<tr><td>Limitations of the Study</td><td colspan="7">• Small sample size
• Short period of study
• No concealment of allocation
• No outcome assessor binding
• No mention of adequacy of statistical power/sample size</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="7">*Exposure of children with moderately severe asthma to an asthma specific computer game can affect the subsequent management of their chronic disease</td></tr>
</table>

Author and study source	Wilson SR et al. A Controlled Trial of Two Forms of Self-Management Education for Adults With Asthma. *The American Journal of Medicine* 1993; 94: 564-576	
Methods	Study Design: Randomized controlled	
	Method of Randomization: Blocked randomization. Blocked according to severity	
	Concealment/Concealment of Allocation: Not stated	
	Outcome Assessor Blinding: Physicians who assessed asthma status were blinded as to group assignment of patients. However it is unclear whether the nurse who administered questionnaires ad assessed MDI technique was blinded	
Participants	Eligible	579 patients
	Declined/ Accepted but not Participate	256
	Randomized	323 (83 Group education, 81 individual education, 75 information control, 71 usual control)
	Dropouts	3
	Completed	320
	Dropout Rate	3/323 (0.9%)
	Age Group and sex Distribution: 18-50 years of age. No clear distribution given however it says there was no significant difference in age, gender, education level, asthma severity rating, hospitalization in base year, compliance rating and source	
	How was Asthma Diagnosed? Doctor's diagnosis and objective lung function	
	Method of Patient Recruitment: From community; Kaiser Medical Centers in CALIFORNIA	
	Inclusion Criteria: 1) Be 18- 50 years of age 2) be members of Kaiser Permanente Medical Care Program for at least one year 3) confirmed diagnosis of asthma 4) considered by the physician to have moderate to severe asthma 5) at least three physician visits for asthma during the screening year 6) have been on daily medication in the past year	
	Other Diseases Excluded: Irreversible respiratory diseases (Emphysema, COPD)	
	Other Exclusions (if any): Not mentioned	
	Baseline Characteristics: A change in FEV_1 of > 15% A change in PEFR of > 20% following bronchodilater treatment	
	No statistically significant differences in the baseline characteristics of the intervention and the control group	

Interventions	Setting: Kaiser Permanente Clinics
	Intervention in Detail: Type (Group, verbal, interactive, structured, team approach, non clinician educator, peak flow meter used, asthma diary, peak flow monitoring, symptom monitoring, medication monitoring, medical review Vs usual medical care) (Individual, verbal, interactive, structured, team approach, non clinician educator, peak flow meter used, asthma diary, peak flow monitoring, symptom monitoring, medication monitoring, medical review Vs usual medical care) Small Group Program Characteristics: Six to eight individuals in each group. Four 90 minute sessions including *Introduction to Asthma *Understanding the Medications *Prevention and Avoidance and *Managing the Symptoms. A detailed manual was prepared to guide educators through each session. Individual Intervention Program Characteristics: A diagnostic interview and an education planning form were used to identify and focus on an individual patient's specific management needs. 18 instructional modules (same content as in group program) were used to develop program tailored to the needs of individual patient. Three to five 45-minute meetings between the patient and the educator at 1-week interval. It required 180 minutes of nurse time for education. This did not provide peer support. However it had maximum interaction between the educator and the patient and attention to the specific needs of the individual patient. **Both the small group and individual intervention patients were reviewed after 5 and 12 months. Workbook (information) control (no formal asthma education) An 80-page workbook was prepared based on the same educational objectives as the 2 educational programs. It had a readability of 8th grade level however; there was no interaction with peers and the health professionals. Usual Control No supplemental education
Statistical Analysis	Data Collection: Using questionnaires that were identical both at the beginning and at the end of the study (included several standard scales). A chart review was performed and all the data regarding the patient's visits were noted in this. Analysis: • All Analysis were done on an intent to treat basis. • Adequate statistical power/sample size • Data were described using proportions, means, standard deviations, and medians. In all Analysis, pair wise comparisons between treatment groups were carried out only when the omnibus test among all four groups was significant at the 0.05 levels.

<table>
<tr><td rowspan="4">Results/ Outcomes</td><td colspan="2">Outcome Measure</td><td>Intervention Group</td><td></td><td>Control Group</td><td></td></tr>
<tr><td colspan="2"></td><td>Group (83)</td><td>Individual (81)</td><td>Information (75)</td><td>Usual (71)</td></tr>
<tr><td rowspan="2">Unscheduled doctor Visits</td><td>Baseline</td><td>3.9 (0.38)</td><td>3.50 (0.37)</td><td>3.5 (0.43)</td><td>3.50 (0.32)</td></tr>
<tr><td>Follow up</td><td>2.9 (0.30)</td><td>2.8 (0.33)</td><td>3.1 (0.37)</td><td>2.6 (0.35)</td></tr>
<tr><td colspan="6">Group education was associated with a significantly ($p<0.05$) greater reduction in the annual rate of acute visits (unscheduled doctor visits) compared with all other conditions. The overall hospitalization rate with moderate to severe asthma was 8% in the baseline year and 3% in the 2 years after enrollment.</td></tr>
<tr><td>Limitations of the Study</td><td colspan="6">• No concealment of allocation
• High difference between the eligible and the population participated</td></tr>
<tr><td>Conclusions/ Other Remarks</td><td colspan="6">• This study suggests that the evaluation of educational and behavioral interventions, especially for adults with long-standing disease, requires long term follow up (1 to 2 years) if the benefits of improved management and symptom control are to be detected.
• Though the instructional modalities as well as the workbook provided to the patients discussed the need for eliminating the aero-allergens in the home environment, the health consequences of smoking, and the particular risks that smoking poses for the asthma patients neither the educational format nor the workbook pattern, effected a change in patients behavior or exposure to allergic pets in the home</td></tr>
</table>

APPENDIX D:

FORMULAE USED

FORMULAE USED

$$SE_{pooled} = \frac{mean_{treatment} - mean_{control}}{t\text{-statistic}}$$

$$SD_{pooled} = SE_{pooled} \times \text{square root of 'n'}$$

$$\text{Mean Effect Size (ES)} = \frac{\sum (w \times ES)}{\sum w}$$

$$\text{Standard Error of mean ES} = \frac{1}{\sum w}$$

$$\text{Z-test for the mean ES} = \frac{ES}{se_{ES}}$$

$$95\% \text{ Confidence Intervals} = ES \pm 1.96\ se_{ES}$$

APPENDIX E:

RESULTS TABLES

Number of Hospitalizations

Self-Management and Regular Medical Review Vs. Usual Care

Table 1 Optimal Self-Management Vs. Usual Care

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R6	George et al	0.02	-0.28	30	0.10	-0.28	20	-0.28(-0.85, 0.29)	0.29	11.89	-3.33	0.93
Subtotal (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=-0.96;Q-statistic=0.00(*df*=0)												

Table 2 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.00	-0.15	13	0.02	-0.15	13	-0.13(-0.90, 0.64)	0.39	6.57	-0.85	0.11
Subtotal (R5)				13			13			6.57	-0.85	0.11
Mean ES=-0.13(-0.90,0.64);Standard Error of mean ES=0.39;Z-test for the mean ES=-0.33;Q-statistic=0.00(*df*=0)												

Table 3 Optimal Education and Regular Medical Review Vs. Usual Care

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R3	Clark et al	0.11	0.43	207	0.21	0.85	103	-0.17 (-0.40,0.07)	0.12	69.44	-11.80	2.01
Subtotal (R3)				207			103			69.44	-11.80	2.01
Mean ES=-0.17(-0.40,0.06);Standard Error of mean ES=0.12;Z-test for the mean ES=-1.42; Q-statistic=0.00(df= 0)												
Subtotal (R3, R5, R6)				250			136			87.90	-15.98	3.05
Mean ES=-0.18(-0.39,0.03);Standard Error of mean ES=0.11;Z-test for the mean ES=-1.64;Q-statistic=0.14(df=2)												
Individual self-management (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=-0.96;Q-statistic=0.00(df=0)												
Group self-management (R3, R5)				220			116			76.01	-12.65	2.12
Mean ES=-0.17(-0.39,0.05);Standard Error of mean ES=0.11;Z-test for the mean ES=-1.54;Q-statistic=0.01(df=1)												

Optimal Education Vs. Minimal Education

Table 4 Optimal Education Vs. Minimal Education

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R11	Lewis et al	0.02	-0.13	48	0.05	-0.13	28	-0.23(-0.69,0.24)	0.24	17.36	-3.99	0.92
Subtotal (R11)				48			28			17.36	-3.99	0.92
Mean ES=-0.23(-0.69,0.24);Standard Error of mean ES=0.24;Z-test for the mean ES=-0.96;Q-statistic=0.00(df= 0)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 5 Optimal Education and Self-Monitoring Vs. Self-Monitoring

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES ^{2}
R7	Guendelman et al	0.05	0.653	62	0.01	0.653	60	0.06(-0.29, 0.42)	0.18	30.86	1.85	0.11
Subtotal (R7)				62			60			30.86	1.85	0.11
Mean ES=0.06(-0.29, 0.42);Standard Error of mean ES=0.18;Z-test for the mean ES=0.33;Q-statistic=0.00(df= 0)												
Total (R3,R5,R6,R7,R11)				360			224			136.12	-18.12	4.08
Mean ES= -0.13(-0.30,0.04);Standard Error of mean ES=0.08;Z-test for the mean ES=-1.62;Q-statistic=1.67(df=4)												

Number of Hospitalizations (Adults)

Self-Management and Regular Medical Review Vs. Usual Care

Table 6 Optimal Self-Management Vs. Usual Care (Adults)

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R6	George et al	0.02	-0.28	30	0.10	-0.28	20	-0.28(-0.85, 0.29)	0.29	11.89	-3.33	0.93
Total (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=-0.96;Q-statistic=0.00(df=0)												

Number of Hospitalizations (Children)

Self-Management and Regular Medical Review Vs. Usual Care

Table 7 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Children)

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.00	-0.15	13	0.02	-0.15	13	-0.13(-0.90, 0.64)	0.39	6.57	-0.85	0.11
Subtotal (R5)				13			13			6.57	-0.85	0.11
Mean ES=-0.13(-0.90,0.64);Standard Error of mean ES=0.39;Z-test for the mean ES=-1.33;Q-statistic=0.00(*df*=0)												

Table 8 Optimal Education and Regular Medical Review Vs. Usual Care (Children)

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R3	Clark et al	0.11	0.43	207	0.21	0.85	103	-0.17 (-0.40,0.07)	0.12	69.44	-11.80	2.01
Subtotal (R3)				207			103			69.44	-11.80	2.01
Mean ES=-0.17(-0.40,0.06);Standard Error of mean ES=0.12;Z-test for the mean ES=-1.42; Q-statistic=0.00(*df*= 0)												
Group self-management(R3,R5)				220			116			76.01	-12.65	2.12
Mean ES=-0.17(-0.39,0.05);Standard Error of mean ES=0.11;Z-test for the mean ES=-1.54;Q-statistic=0.01(*df*=1)												

Optimal Education Vs. Minimal Education

Table 9 Optimal Education Vs. Minimal Education (Children)

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R11	Lewis et al	0.02	-0.13	48	0.05	-0.13	28	-0.23(-0.69,0.24)	0.24	17.36	-3.99	0.92
Subtotal (R11)				48			28			17.36	-3.99	0.92
Mean ES=-0.23(-0.69,0.24);Standard Error of mean ES=0.24;Z-test for the mean ES=-0.96;Q-statistic=0.00(df= 0)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 10 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Children)

Hospitalizations (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R7	Guendelman et al	0.05	0.653	62	0.01	0.653	60	0.06(-0.29, 0.42)	0.18	30.86	1.85	0.11
Subtotal (R7)				62			60			30.86	1.85	0.11
Mean ES=0.06(-0.29, 0.42);Standard Error of mean ES=0.18;Z-test for the mean ES=0.33;Q-statistic=0.00(df= 0)												
Total (R3,R5,R7,R11)				330			204			124.23	-14.79	3.25
Mean ES= -0.12(-0.30,0.06);Standard Error of mean ES=0.09;Z-test for the mean ES=-1.33;Q-statistic=1.49(df=3)												

Number Of Emergency Departments Visits

Self-Management and Regular Medical Review Vs. Usual Care

Table 11 Optimal Self-Management Vs. Usual Care

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R6	George et al	0.02	-0.35	30	0.12	-0.35	20	-0.28 (-0.85, 0.29)	0.29	11.89	-3.33	0.93
Subtotal (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=0.96;Q-statistic=0.00 (df=0)												

Optimal Education and Regular Medical Review Vs. Usual Care

Table 12 Group Optimal Education and Regular Medical Review Vs. Usual Care

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R3	Clark et al	1.72	4.2	207	2.49	6.26	103	-0.15(-0.39,0.08)	0.12	69.44	-10.42	1.56
R12	Marvella et al	2.1	2.95	119	4.75	8.61	122	-0.41(-0.66,-0.15)	0.13	59.17	-24.56	9.95
Subtotal (R3,R12)				326			225			128.61	-34.98	11.51
Mean ES=-0.27(-0.45,-0.09);Standard Error of mean ES=0.09;Z-test for the mean ES=-3.00;Q-statistic=2.00(df=1)												

Table 13 Individual Optimal Education and Regular Medical Review Vs. Usual Care

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R13	McNabb et al	0.16	-2.48	7	0.62	-2.48	7	-0.19 (-1.22, 0.88)	0.54	3.43	-0.65	0.12
Subtotal (R13)				7			7			3.43	-0.65	0.12
Mean ES=-0.19(-1.22,0.88);Standard Error of mean ES=0.54;Z-test for the mean ES=-0.35; Q-statistic=0.00(*df*=0)												
Subtotal (R3,R12,R13)				333			232			132.04	-35.63	11.63
Mean ES=-0.27(-0.45,-0.09);Standard Error of mean ES=0.09;Z-test for the mean ES=-3.00;Q-statistic=2.01(*df*=2)												

Table 14 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.006	-0.55	13	0.08	-0.55	13	-0.13(-0.90, 0.64)	0.39	6.57	-0.85	0.11
R10	Kotses et al 96G	0.91	0.30	11	0.33	0.09	12	2.67 (1.47, 3.68)	0.56	3.19	8.51	22.73
Total				24			25			9.76	7.66	22.84
Mean ES=0.78(0.15, 1.41);Standard Error of mean ES=0.32;Z-test for the mean ES=2.44;Q-statistic=16.83(*df*=1)												
Subtotal (R3,R5,R6,R10,R12,R13)				387			277			153.69	-31.30	35.40
Mean ES=-0.20(-0.36,0.04);Standard Error of mean ES=0.08;Z-test for the mean ES=-2.50;Q-statistic=29.02(*df*=5)												
Excluding R10				376			265			150.50	-39.81	12.67
Mean ES=-0.26(-0.42,0.10);Standard Error of mean ES=0.08;Z-test for the mean ES=-3.25;Q-statistic=2.13(*df*=4)												
Individual self-management (R6,R13)				37			27			15.32	-3.98	1.05
Mean ES=-0.26(-0.38,-0.13);Standard Error of mean ES=0.06;Z-test for the mean ES=-4.33;Q-statistic=0.02(*df*=1)												
Group self management(R3,R5,R10,R12)				350			250			138.37	-27.32	34.35
Mean ES=-0.20(-0.37,-0.03);Standard Error of mean ES=0.08;Z-test for the mean ES=-2.5;Q-statistic=28.95(*df*=3)												
Excluding R10(R3,R5,R12)				339			238			135.18	-35.83	11.82
Mean ES=-0.26(-0.43,-0.08);Standard Error of mean ES=0.09;Z-test for the mean ES=-2.88;Q-statistic=2.32(*df*=2)												

Optimal Education and Self-Monitoring Vs. Self Monitoring

Table 15 Optimal Education and Self-Monitoring Vs. Self Monitoring

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R7	Guendelman et al	0.07	0.56	62	0.14	0.56	60	-0.13 (-0.48, 0.23)	0.18	30.86	-4.01	0.52
R9	Kotses et al 95	0.03	0.11	36	0.04	0.14	40	-0.08 (-0.53, 0.37)	0.23	18.90	-1.51	0.12
Subtotal (R7, R9)				98			100			49.76	-5.52	0.64
Mean ES=-0.11(-0.38,0.61);Standard Error of mean ES=0.14;Z-test for the mean ES=0.78;Q-statistic=0.03(df=1)												

Optimal Education Vs. Minimal Education

Table 16 Optimal Education Vs. Minimal Education

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R8	Homer et al	0.07	0.15	57	0.06	0.15	49	0.07(-0.32, 0,45)	0.19	27.70	1.94	0.13
R11	Lewis et al	0.19	-0.53	48	0.31	-0.53	28	-0.23(-0.69, 0.24)	0.24	17.36	-3.99	0.92
Subtotal (R8, R11)				105			77			45.06	-2.05	1.05
Mean ES=-0.04(-0.33,0.25);Standard Error of mean ES=0.15;Z-test for the mean ES=-0.27;Q-statistic=0.96(df=1)												
Total (R3,R5,R6,R7,R8,R9,R10,R11,R12,R13)				560			434			248.51	-38.87	37.09
Mean ES=-0.16(-0.28,-0.04);Standard Error of mean ES=0.06; Z-test for the mean ES=-2.67;Q-statistic=31.01(df=9)												
Excluding R10				549			422			233.43	-44.05	13.43
Mean ES=-0.19(-0.32,-0.06);Standard Error of mean ES=0.06; Z-test for the mean ES=-3.17;Q-statistic=5.12(df=8)												
Excluding R8 and R10				492			373			205.73	-45.99	13.30
Mean ES=-0.22(-0.29, -0.16); Standard Error of mean ES=0.07; Z-test for the mean ES=-3.14;Q-statistic=3.02(df=7)												

Number of Emergency Departments Visits (Adults)

Self-Management and Regular Medical Review Vs. Usual Care

Table 17 Optimal Self-Management Vs. Usual Care (Adults)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R6	George et al	0.02	-0.35	30	0.12	-0.35	20	-0.28 (-0.85, 0.29)	0.29	11.89	-3.33	0.93
Subtotal (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=-0.96;Q-statistic=0.00 (df=0)												

Table 18 Optimal Education and Regular Medical Review Vs. Usual Care (Adults)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R12	Marvella et al	2.1	2.95	119	4.75	8.61	122	-0.41(-0.66,-0.15)	0.13	59.17	-24.56	9.95
Subtotal (R12)				119			122			59.17	-24.56	9.95
Mean ES=-0.41(-0.66,-0.15);Standard Error of mean ES=0.13;Z-test for the mean ES=-3.15;Q-statistic=0.00(df=0)												
Total (R6, R12)				149			142			71.06	-27.89	10.88
Mean ES=-0.39(-0.62,-0.16);Standard Error of mean ES=0.12;Z-test for the mean ES=-3.25;Q-statistic=-0.07(df=1)												

Table 19 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES²
R10	Kotses et al 96G	0.91	0.30	11	0.33	0.09	12	2.67 (1.47, 3.68)	0.56	3.19	8.51	22.73
Subtotal (R10)				11			12			3.19	8.51	22.73
Mean ES=2.67(1.47,3.68);Standard Error of mean ES=0.56;Z-test for the mean ES=4.77;Q-statistic=0.00(df=0)												
Subtotal (R6,R10,R12)				160			154			74.25	-19.38	33.61
Mean ES=-0.26(-0.49,-0.02);Standard Error of mean ES=0.12;Z-test for the mean ES=-2.17;Q-statistic=28.55(df=2)												
Group self-management (R10, R12)				130			134			62.36	-16.05	32.68
Mean ES=-0.26(-0.51,-0.01);Standard Error of mean ES=0.13;Z-test for the mean ES=-2.00;Q-statistic=28.55(df=1)												
Individual self-management (R6)				30			20			11.89	-3.33	0.93
Mean ES=-0.28(-0.85,0.29);Standard Error of mean ES=0.29;Z-test for the mean ES=-0.96;Q-statistic=0.00(df=0)												

Optimal Education and Self-Monitoring Vs. Self Monitoring

Table 20 Optimal Education and Self-Monitoring Vs. Self Monitoring (Adults)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES²
R9	Kotses et al 95	0.03	0.11	36	0.04	0.14	40	-0.08(-0.53,0.37)	0.23	18.90	-1.51	0.12
Subtotal (R9)				36			40			18.90	-1.51	0.12
Mean ES=-0.08(-0.53,0.37);Standard Error of mean ES=0.23;Z-test for the mean ES=0.35;Q-statistic=0.00(df=0)												
Total (R6,R9,R10,R12)				196			194			93.15	-20.89	33.73
Mean ES=-0.22(-0.42,-0.02);Standard Error of mean ES=0.10;Z-test for the mean ES=-2.2;Q-statistic=29.04(df=3)												
Excluding R10 (R6,R9,R12)				185			182			89.96	-29.40	11.00
Mean ES=-0.33(-0.53,-0.12);Standard Error of mean ES=0.10;Z-test for the mean ES=-3.30;Q-statistic=1.39(df=2)												

Number of Emergency Departments Visits (Children)

Self-Management and Regular Medical Review Vs. Usual Care

Table 21 Optimal Education and Regular Medical Review Vs. Usual Care (Children)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R3	Clark et al	1.72	4.2	207	2.49	6.26	103	-0.15(-0.39,0.08)	0.12	69.44	-10.42	1.56
R13	McNabb et al	0.16	-2.48	7	0.62	-2.48	7	-0.19 (-1.22, 0.88)	0.54	3.43	-0.65	0.12
Subtotal (R3,R13)				214			110			72.87	-11.07	1.68
Mean ES=-0.15(-0.38,-0.26);Standard Error of mean ES=0.12;Z-test for the mean ES=-1.25;Q-statistic=0.002(df=1)												

Table 22 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Children)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.006	-0.55	13	0.08	-0.55	13	-0.13 (-0.90, 0.64)	0.39	6.57	-0.85	0.11
Subtotal (R5)				13			13			6.57	-0.85	0.11
Mean ES=-0.13 (-0.90,0.64);Standard Error of mean ES=0.39;Z-test for the mean ES=-0.33;Q-statistic=0.00(df=0)												
Subtotal (R3,R5,R13)				227			123			79.44	-11.92	1.79
Mean ES=-0.15 (-0.17,-0.12);Standard Error of mean ES=0.11;Z-test for the mean ES=-1.36;Q-statistic=0.001(df=2)												
Group self-management (R3,R5)				220			116			76.01	-11.27	1.67
Mean ES=-0.15(-0.38,0.07);Standard Error of mean ES=0.11;Z-test for the mean ES=-1.36;Q-statistic=0.001(df=1)												
Individual self-management (R13)				7			7			3.43	-0.65	0.12
Mean ES=-0.19(-1.22,0.88);Standard Error of mean ES=0.54;Z-test for the mean ES=-0.35;Q-statistic=0.00(df=0)												

Optimal Education and Self-Monitoring Vs. Self Monitoring

Table 23 Optimal Education and Self-Monitoring Vs. Self Monitoring (Children)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R7	Guendelman et al	0.07	0.56	62	0.14	0.56	60	-0.13 (-0.48, 0.23)	0.18	30.86	-4.01	0.52
Subtotal (R7)				62			60			30.86	-4.01	0.52
Mean ES=-0.13 (-0.48, 0.23);Standard Error of mean ES=0.18;Z-test for the mean ES=0.72;Q-statistic=0.00(df=0)												

Optimal Education Vs. Minimal Education

Table 24 Optimal Education Vs. Minimal Education (Children)

Emergency Department Visits (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R8	Homer et al	0.07	0.15	57	0.06	0.15	49	0.07 (-0.32, 0,45)	0.19	27.70	1.94	0.13
R11	Lewis et al	0.19	-0.53	48	0.31	-0.53	28	-0.23 (-0.69, 0.24)	0.24	17.36	-3.99	0.92
Subtotal (R8,R11)				105			77			45.06	-2.05	1.05
Mean ES=-0.04(-0.33,0.25);Standard Error of mean ES=0.15;Z-test for the mean ES=-0.27;Q-statistic=0.96(df=1)												
Total (R3,R5,R7,R8,R11,R13)				394			260			155.36	-17.98	3.36
Mean ES= -0.11(-0.27,0.05);Standard Error of mean ES=0.08;Z-test for the mean ES=-1.37;Q-statistic=1.28(df=5)												
Excluding R8 (R3,R5,R7,R11,R13)				337			211			127.66	-19.92	3.23
Mean ES= -0.16(-0.33,0.02);Standard Error of mean ES=0.09;Z-test for the mean ES=-1.78;Q-statistic=0.12(df=4)												

Number of Subjects Visited Emergency Departments (Adults)

Optimal Self Management Vs. Minimal Education

Table 25 Optimal Self Management Vs. Minimal Education (Adults)

Emergency Department Visits (Subjects)											
R.No	Study	Experimental		Control		Odds ratio 95%CI	Log odds ratio	SE	Weight (w)	W*lnOR	W*lnOR^2
		No of subjects	N	No of subjects	N						
R1	Bailey et al	17	124	16	101	0.84 (0.40,1.77)	-0.17	0.38	7.02	-1.19	0.20

Number of Subjects Visited Emergency Departments (Children)

Optimal Self-Management Vs. Usual Care

Table 26 Optimal Self-Management Vs. Usual Care (Children)

Emergency Department Visits (Subjects)											
R.No	Study	Experimental		Control		Odds ratio 95%CI	Log odds ratio	SE	Weight (w)	W*lnOR	W*lnOR^2
		No of subjects	N	No of subjects	N						
R15	Persaud et al	4	18	9	18	0.28 (0.06,1.21)	-1.27	0.74	1.84	-2.34	2.9 7
Total (R1,R15)			142		119				8.86	-3.53	3.17
Pooled lnOR=-0.40(-1.06,0.26); OR=0.67(0.35,1.30); SElnOR=0.33;Z-test=-1.21;Q-statistic=12.10(df=1)											

Number of Unscheduled Doctor Visits

Self-Management and Regular Medical Review Vs. Usual Care

Table 27 Optimal Education and Regular Medical Review Vs. Usual Care

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R4	Evans et al	3.6	6.2	117	3.3	3.8	87	0.06 (-0.22, 0.33)	0.14	51.02	3.06	0.18
Subtotal (R4)				117			87			51.02	3.06	0.18
Mean ES=0.06(-0.22, 0.33);Standard Error of mean ES=0.14;Z-test for the mean ES=0.43;Q-statistic=0.00(df=0)												

Table 28 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R17	Wilson et al G	2.3	0.30	83	2.6	0.35	71	-0.93(-1.25,-0.59)	0.17	34.60	-32.17	29.93
R17	Wilson et al I	2.6	0.33	81	2.6	0.35	71	0.00(-0.32, 0.32)	0.16	39.06	0.00	0.00
Subtotal (R17I,R17G)				164			142			73.66	-32.17	29.93
Mean ES=-0.44(-0.67,-0.20);Standard Error of mean ES=0.12;Z-test for the mean ES=-3.67;Q-statistic=15.88(df=1)												
Subtotal (R4,R17G,R17I)				281			219			124.68	-29.11	30.11
Mean ES=-0.23(-0.41,-0.05);Standard Error of mean ES=0.09;Z-test for the mean ES=-2.55;Q-statistic=23.31(df= 2)												
Group self-management (R4,R17G)				200			148			85.62	-29.11	30.11
Mean ES=-0.34(-0.55,-0.13);Standard Error of mean ES=0.11;Z-test for the mean ES=-2.55;Q-statistic=3.09(df=1)												
Individual self-management (R17I)				81			71			39.06	0.00	0.00
Mean ES=0.00(-0.32, 0.32); Standard Error of mean ES=0.16;Z-test for the mean ES=0.00;Q-statistic=0.00(df=0)												

Optimal Education Vs. Minimal Education

Table 29 Optimal Education Vs. Minimal Education

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R8	Homer et al	0.08	0.3	57	0.06	0.3	49	0.07(-0.32, 0.45)	0.19	27.70	1.94	0.13
R16	Rubin et al	0.23	-0.66	29	0.38	-0.66	25	-0.23(-0.76,0.31)	0.27	13.72	-3.15	0.72
Subtotal (R8,R16)				86			74			41.42	-1.21	0.85
Mean ES=-0.03(-0.32,0.26);Standard Error of mean ES=0.15;Z-test for the mean ES=-0.2;Q-statistic=0.81(df= 1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 30 Optimal Education and Self-Monitoring Vs. Self-Monitoring

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R7	Guendelman et al	0.07	-0.22	62	0.11	-0.22	60	-0.18(-0.54, 0.17)	0.18	30.86	-5.55	0.99
R9	Kotses et al 95	0.61	0.84	36	0.66	0.81	40	-0.06(-0.51, 0.39)	0.23	18.90	-1.13	0.07
Subtotal (R7,R9)				98			100			49.76	-6.68	2.06
Mean ES=-0.13(-0.40,0.14);Standard Error of mean ES=0.14;Z-test for the mean ES=-0.93;Q-statistic=1.16(df=1)												
Total (R4,R7,R8,R9,R16,R17G,R17I)				465			393			215.86	-37.00	33.02
Mean ES=-0.17(-0.31,-0.03);Standard Error of mean ES=0.07;Z-test for the mean ES=-2.43;Q-statistic=26.68(df=6)												

Number of Unscheduled Doctor Visits (Adults)

Self-Management and Regular Medical Review Vs. Usual Care

Table 31 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R17	Wilson et al G	2.3	0.30	83	2.6	0.35	71	-0.93(-1.25,-0.59)	0.17	34.60	-32.17	29.93
R17	Wilson et al I	2.6	0.33	81	2.6	0.35	71	0.00(-0.32, 0.32)	0.16	39.06	0.00	0.00
Subtotal (R17G,R17I)				164			142			73.66	-32.17	29.93
Mean ES=-0.44(-0.67,-0.20);Standard Error of mean ES=0.12;Z-test for the mean ES=-3.67;Q-statistic=15.88(df=1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 32 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Adults)

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R9	Kotses et al 95	0.61	0.84	36	0.66	0.81	40	-0.06(-0.51, 0.39)	0.23	18.90	-1.13	0.07
Subtotal (R9)				36			40			18.90	-1.13	0.07
Mean ES=-0.06(-0.51,0.39);Standard Error of mean ES=0.23Z-test for the mean ES=-0.26-statistic=0.00(df=0)												
Total (R9,R17G,R17I)				200			182			92.56	-33.30	30.00
Mean ES=-0.36(-0.56,-0.16);Standard Error of mean ES=0.10;Z-test for the mean ES=-3.6;Q-statistic=18.01(df=2)												

Number of Unscheduled Doctor Visits (Children)

Self-Management and Regular Medical Review Vs. Usual Care

Table 33 Optimal Education and Regular Medical Review Vs. Usual Care (Children)

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R4	Evans et al	3.6	6.2	117	3.3	3.8	87	0.06 (-0.22, 0.33)	0.14	51.02	3.06	0.18
Subtotal (R4)				117			87			51.02	3.06	0.18
Mean ES=0.06(-0.22, 0.33);Standard Error of mean ES=0.14;Z-test for the mean ES=0.43;Q-statistic=0.00(df=0)												

Optimal Education Vs. Minimal Education

Table 34 Optimal Education Vs. Minimal Education (Children)

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R8	Homer et al	0.08	0.3	57	0.06	0.3	49	0.07(-0.32, 0.45)	0.19	27.70	1.94	0.13
R16	Rubin et al	0.23	-0.66	29	0.38	-0.66	25	-0.23(-0.76,0.31)	0.27	13.72	-3.15	0.72
Subtotal (R8,R16)				86			74			41.42	-1.21	0.85
Mean ES=-0.03(-0.32,0.26);Standard Error of mean ES=0.15;Z-test for the mean ES=-0.2;Q-statistic=0.81(df= 1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 35 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Children)

Unscheduled Doctor Visits												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R7	Guendelman et al	0.07	-0.22	62	0.11	-0.22	60	-0.18(-0.54, 0.17)	0.18	30.86	-5.55	0.99
Subtotal (R7)				62			60			30.86	-5.55	0.99
Mean ES=-0.18(-0.54,0.17));Standard Error of mean ES=0.18;Z-test for the mean ES=-1.00;Q-statistic=0.00(d*f*=0)												
Total (R4,R7,R8,R16)				265			221			123.30	-3.70	2.02
Mean ES=-0.03(-0.20,0.15);Standard Error of mean ES=0.09;Z-test for the mean ES=-0.33;Q-statistic=1.90(d*f*=3)												

Hospital Days Due to Asthma

Optimal Education Vs. Minimal Education

Table 36 Optimal Education Vs. Minimal Education (Children)

Hospital Days												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R11	Lewis et al	0.06	-0.23	48	0.13	-0.23	28	-0.30(-0.77, 0.17)	0.24	17.36	-5.21	1.56
R16	Rubin et al	0.07	-0.11	29	0.08	-0.11	25	-0.09(-0.63, 0.44)	0.27	13.72	-1.23	0.11
Total (R11,R16)				77			53			31.08	-6.44	1.67
Mean ES=-0.21(-0.56,0.14);Standard Error of mean ES=0.18;Z-test for the mean ES=-1.17;Q-statistic=0.335(d*f*=1)												

Number of Days Lost From School

Self-Management and Regular Medical Review Vs. Usual Care

Table 37 Optimal Education and Regular Medical Review Vs. Usual Care (Children)

Days Lost From School												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R4	Evans et al	19.4	13.9	117	19.7	12.6	87	-0.02(-0.30, 0.26)	0.14	51.02	-1.02	0.02
R14	Perrin et al	0.24	0.9	29	0.22	1.0	27	0.02(-0.50, 0.54)	0.27	13.72	0.27	0.01
Subtotal (R4,R14)				146			114			64.74	-0.75	0.03
Mean ES=-0.01(-0.24,0.22);Standard Error of mean ES=0.12;Z-test for the mean ES=-0.08;Q-statistic=0.02(*df*=1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 38 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Children)

Days Lost From School												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.04	-0.84	13	0.38	-0.84	13	-0.40(-1.17, 0.38)	0.40	6.25	-2.50	1.00
Subtotal (R5)				13			13			6.25	-2.50	1.00
Mean ES=-0.40(-1.17,0.38);Standard Error of mean ES=0.40;Z-test for the mean ES=-1.00;Q-statistic=0.00(*df*=0)												
Group self-management (R4,R5,R14)				159			127			70.99	-3.25	1.03
Mean ES=-0.04(-0.27,0.19);Standard Error of mean ES=0.12;Z-test for the mean ES=-0.33;Q-statistic=0.88(*df*=2)												

Optimal Education Vs. Minimal Education

Table 39 Optimal Education Vs. Minimal Education (Children)

Days Lost From School												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R16	Rubin et al	1.17	-4.11	29	1.55	-4.11	25	-0.09 (-0.63, 0.44)	0.27	13.72	-1.23	0.11
Subtotal (R16)				29			25			13.72	-1.23	0.11
Mean ES=-0.09(-0.63,0.44);Standard Error of mean ES=0.27;Z-test for the mean ES=-0.33;Q-statistic=0.00(df=1)												
Total (R4,R5,R14,R16)				188			152			84.71	-4.48	1.14
Mean ES=-0.05(-0.26,0.16);Standard Error of mean ES=0.11;Z-test for the mean ES=-0.45;Q-statistic=0.90(df=3)												

Number of Asthma Attacks

Self-Management and Regular Medical Review Vs. Usual Care

Table 40 Optimal Education and Regular Medical Review Vs. Usual Care (Children)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R4	Evans et al	9.0	14.7	93	11.8	16.5	68	-0.18 (-0.49, 0.13)	0.16	39.06	-7.03	1.26
Subtotal (R4)				93			68			39.06	-7.03	1.26
Mean ES=-0.18(-0.49,0.13);Standard Error of mean ES=0.16;Z-test for the mean ES=-1.12;Q-statistic=0.00(df= 0)												

Table 41 Optimal Education, Self-Monitoring and Regular Medical Care Vs. Usual Care (Children)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R5	Fireman et al	0.11	-0.71	13	0.50	-0.71	13	-0.55 (-1.31, 0.25)	0.40	6.25	-3.44	1.89
Subtotal (R5)				13			13			6.25	-3.44	1.89
Mean ES=-0.55(-1.31,0.25);Standard Error of mean ES=0.40;Z-test for the mean ES=-1.37;Q-statistic=0.00(df= 0)												
Group self-management (R4, R5)				106			81			45.31	-10.47	3.15
Mean ES=-0.23(-0.52,0.06);Standard Error of mean ES=0.15;Z-test for the mean ES=-1.53;Q-statistic=0.73(df =1)												

Number of AM Asthma Attacks

Self-Management and Regular Medical Review Vs. Usual Care

Table 42 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R10	Kotses et al 96G	8.63	10.49	11	11.41	10.63	12	-0.26(-1.08,0.57)	0.42	5.67	-1.47	0.38
R10	Kotses et al 96I	6.63	10.40	11	11.41	10.63	12	-0.45(-1.27,0.39)	0.42	5.67	-2.55	1.15
Subtotal (R10G, R10I)				22			24			11.34	-4.02	1.53
Mean ES=-0.35(-0.94, 0.24);Standard Error of mean ES=0.30;Z-test for the mean ES=-1.73;Q-statistic=0.10(df=1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 43 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Adults)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R9	Kotses et al 95	1.40	2.70	36	0.82	1.20	40	0.28 (-0.17, 0.73)	0.23	18.90	5.29	1.48
Subtotal (R9)				36			40			18.90	5.29	1.48
Mean ES=0.28(-0.17, 0.73);Standard Error of mean ES=0.23;Z-test for the mean ES=1.22;Q-statistic=0.00(df=0)												
Total ((R9, R10G, R10I)				58			64			30.24	1.27	3.01
Mean ES=0.04(-0.32,0.40);Standard Error of mean ES=0.18;Z-test for the mean ES=0.22;Q-statistic=2.96(df=2)												

Number of PM Asthma Attacks

Self-Management and Regular Medical Review Vs. Usual Care

Table 44 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R10	Kotses et al 96G	8.81	10.90	11	9.25	10.20	12	-0.04 (-0.86, 0.78)	0.42	5.67	-0.23	0.01
R10	Kotses et al 96I	9.72	9.75	11	9.25	10.20	12	0.05 (-0.77, 0.86)	0.42	5.67	0.28	0.01
Subtotal (R10G, R10I)				22			24			11.34	0.05	0.02
Mean ES=0.004(0.003,0.005);Standard Error of mean ES=0.30;Z-test for the mean ES=0.01;Q-statistic=0.02(df=1)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 45 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Adults)

Asthma Attacks (Number)												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R9	Kotses et al 95	0.38	0.90	36	1.58	2.60	40	-0.60(-1.06,-0.14)	0.23	18.90	-11.34	6.80
Subtotal (R9)				36			40			18.90	-11.34	6.80
Mean ES=-0.60(-1.06,-0.14);Standard Error of mean ES=0.23;Z-test for the mean ES=-2.61;Q-statistic=0.00(df= 0)												
Total (R9, R10G, R10I)				58			64			30.24	-11.29	6.82
Mean ES=-0.37(-0.72,-0.02);Standard Error of mean ES=0.18;Z-test for the mean ES=-2.05;Q-statistic=2.60(df=2)												

Daily Average AM PEFR Measurements

Self-Management and Regular Medical Review Vs. Usual Care

Table 46 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

AM PEFR Measurements												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R2	Berg et al	359	108	31	364	142	24	-0.04 (-0.57, 0.49)	0.27	13.72	-0.55	0.02
R10	Kotses et al 96G	418	124	11	327	105	12	0.80 (-0.08, 1.61)	0.43	5.41	4.33	3.46
R10	Kotses et al 96I	359	186	11	327	105	12	0.21 (-0.61, 1.03)	0.42	5.67	1.19	0.25
Subtotal (R2, R10G, R10I)				53			48			24.80	3.97	3.73
Mean ES=0.16(-0.23,0.55);Standard Error of mean ES=0.20;Z-test for the mean ES=0.8;Q-statistic=3.09(df=2)												
Group self-management(R2,R10G)				42			36			19.13	3.78	3.48
Mean ES=0.20(0.10,0.30);Standard Error of mean ES=0.23;Z-test for the mean ES=0.87;Q-statistic=0.96(df=1)												
Individual self-management(R10I)				11			12			5.67	1.19	0.25
Mean ES=0.21(-0.61,1.03);Standard Error of mean ES=0.42;Z-test for the mean ES=0.50;Q-statistic=0.00(df=0)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 47 Optimal Education and Self-Monitoring Vs. Self-Monitoring (Adults)

AM PEFR Measurements												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R9	Kotses et al 95	332	88	36	345	131	40	-0.12(-0.56,0.34)	0.23	18.90	-2.27	0.27
Subtotal (R9)				36			40			18.90	-2.27	0.27
Mean ES=-0.12(-0.56, 0.34);Standard Error of mean ES=0.23;Z-test for the mean ES=-0.52;Q-statistic=0.00(df=0)												
Total (R2, R9, R10G, R10I)				89			88			43.70	1.70	4.00
Mean ES=0.04(-0.25,0.33);Standard Error of mean ES=0.15;Z-test for the mean ES=0.27;Q-statistic=3.93(df=3)												

Daily Average PM PEFR Measurements

Self-Management and Regular Medical Review Vs. Usual Care

Table 48 Optimal Education, Self-Monitoring and Regular Medical Review Vs. Usual Care (Adults)

PM PEFR Measurements												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R2	Berg et al	366	118	31	381	150	24	-0.11 (-0.64, 0.42)	0.27	13.72	-1.51	0.17
R10	Kotses et al 96G	429	121	11	340	104	12	0.79 (-0.08, 1.61)	0.43	5.41	4.27	3.38
R10	Kotses et al 96I	372	105	11	340	104	12	0.31 (-0.53, 1.12)	0.42	5.67	1.76	0.54
Subtotal (R2, R10G, R10I)				53			48			24.80	4.52	4.09
Mean ES=0.18(-0.21,0.57);Standard Error of mean ES=0.20;Z-test for the mean ES=0.9;Q-statistic=3.27(df=2)												
Group self-management (R2,R10G)				42			36			19.13	2.76	3.55
Mean ES=0.14(0.59,-0.31);Standard Error of mean ES=0.23;Z-test for the mean ES=0.61;Q-statistic=3.15(df=1)												
Individual self-management (R10I)				11			12			5.67	1.76	0.54
Mean ES=0.31(-0.53,1.12);Standard Error of mean ES=0.42;Z-test for the mean ES=0.74;Q-statistic=0.00(df=0)												

Optimal Education and Self-Monitoring Vs. Self-Monitoring

Table 49 Optimal Education And Self-Monitoring Vs. Self-Monitoring (Adults)

PM PEFR Measurements												
R.No	Study	Experimental			Control			Standardized Effect Size				
		Mean	SD	N	Mean	SD	N	Effect Size (ES) and 95% CI	SE of ES	Weight (w)	w*ES	w*ES^2
R9	Kotses et al 95	367	68	36	358	121	40	0.09 (-0.36, 0.54)	0.23	18.90	1.70	0.15
Subtotal (R9)				36			40			18.90	1.70	0.15
Mean ES=0.09(-0.36,0.54);Standard Error of mean ES=0.23;Z-test for the mean ES=0.39;Q-statistic=0.00(df= 0)												
Total (R2,R9,R10G,R10I)				89			88			43.70	6.22	4.24
Mean ES=0.14(-0.15, 0.43);Standard Error of mean ES=0.15;Z-test for the mean ES=0.93;Q-statistic=3.33(df=3)												

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